



**NOTICE INVITING TENDER**

**FOR**

**SUPPLY AND CONSTRUCTION**  
**OF**  
**ASH POND AND ALLIED SERVICES**

**AT**

**TALCHER FERTILIZERS LTD.,**  
**ANGUL, ODISHA**



**NIT NO. : PNPM/PC-183/E/206/NCB**

**PREPARED AND ISSUED BY**



**PROJECTS & DEVELOPMENT INDIA LTD.**  
**(A Govt. of India Enterprise)**  
**PDIL BHAWAN, A-14, Sector-1,**  
**NOIDA-201301, U.P., India**

***JUNE, 2022***

	<b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILISER LIMITED, ANGUL, ODISHA</b>  <b>MASTER INDEX</b>	PC-183/ E/ 206/ MI	0	
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## MASTER INDEX

**NIT NO. : PNP/PC-183/E/206/NCB**

**NIT DESCRIPTION : SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LIMITED, ANGUL, ODISHA**

Section-I	Invitation for Bid [IFB]
Section-II	BID EVALUATION CRITERIA [BEC] & Evaluation methodology
Section-III	Instructions to Bidders [ITB] Annexure(s) Forms & Formats
Section-IV	General Conditions of Contract [GCC]
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**SECTION-I**

**INVITATION FOR BID (IFB)**

**SECTION-I**  
**"INVITATION FOR BID (IFB)"**

Ref No: PNP/PC-183/E/206/NCB

Date:15.06.2022

To,

**PROSPECTIVE BIDDERS**

**SUB: TENDER DOCUMENT FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES**

**Dear Sir/Madam,**

1.0 Projects and Development India Limited (PDIL), hereinafter referred to as CONSULTANT on behalf of M/s Talcher Fertilizers Ltd. (TFL), hereinafter referred as OWNER, has the pleasure of inviting eligible bidders to submit Bid ONLINE through Central Public Procurement (CPP) Portal (<https://eprocure.gov.in>) in Single Stage Two Bid System, for the subject Project.

The entire set of Bidding documents is also placed on the website at TFL website (<http://tflonline.co.in>) and PDIL website ([www.pdilin.com](http://www.pdilin.com)),

2.0 The brief details of the tender are as under:

<b>(A)</b>	NAME OF WORK / BRIEF SCOPE OF WORK/JOB	SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA				
<b>(B)</b>	TENDER NO. & DATE	PNPM/PC-183/E/206/NCB dated 15.06.2022				
<b>(C)</b>	TYPE OF BIDDING SYSTEM	<table border="1"><tr><td>SINGLE BID SYSTEM</td><td style="text-align: center;"><input type="checkbox"/></td></tr><tr><td>TWO BID SYSTEM</td><td style="text-align: center;"><input checked="" type="checkbox"/></td></tr></table>	SINGLE BID SYSTEM	<input type="checkbox"/>	TWO BID SYSTEM	<input checked="" type="checkbox"/>
SINGLE BID SYSTEM	<input type="checkbox"/>					
TWO BID SYSTEM	<input checked="" type="checkbox"/>					
<b>(D)</b>	TYPE OF TENDER	<table border="1"><tr><td>E-TENDER (CPP PORTAL)</td><td style="text-align: center;"><input checked="" type="checkbox"/></td></tr><tr><td>MANUAL</td><td style="text-align: center;"><input type="checkbox"/></td></tr></table>	E-TENDER (CPP PORTAL)	<input checked="" type="checkbox"/>	MANUAL	<input type="checkbox"/>
E-TENDER (CPP PORTAL)	<input checked="" type="checkbox"/>					
MANUAL	<input type="checkbox"/>					

(E)	COMPLETION PERIOD	15 (Fifteen) Months from date of issuance of 'FAX OF ACCEPTANCE'				
(F)	BID VALIDITY	The bid validity period shall be Four (4) Months from due date of Technical Bid opening.				
(G)	BID SECURITY / EARNEST MONEY DEPOSIT (EMD)	<table border="1"> <tr> <td>APPLICABLE</td> <td>✓</td> </tr> <tr> <td>NOT APPLICABLE</td> <td>✗</td> </tr> </table> <p>Amount: <b>Rs. 51.00 Lakh</b> (Rupees Fifty One Lakh Only).</p> <p>Exempted Bidders (i.e. MSEs, Start-ups and Govt Dept./PSUs) are required to submit declaration for Bid security as per Form F-2B</p> <p>(Also refer clause no.16 of ITB)</p>	APPLICABLE	✓	NOT APPLICABLE	✗
APPLICABLE	✓					
NOT APPLICABLE	✗					
(H)	AVAILABILITY OF TENDER DOCUMENT ON WEBSITE(S)	<p>From 15.06.2022 (09:00 Hrs, IST) to 14.07.2022 (15:00 Hrs, IST) on following websites:</p> <p>(i) Govt. CPP Portal <a href="https://eprocure.gov.in">https://eprocure.gov.in</a></p> <p>(ii) TFL Website - <a href="http://tflonline.co.in">http://tflonline.co.in</a></p> <p>(iii) PDIL website - <a href="http://www.pdilin.com">www.pdilin.com</a></p>				
(I)	DATE, TIME & VENUE OF PRE-BID MEETING	On 27.06.2022 (14:30 Hrs, IST), through online (MS Team). Link for Pre Bid meeting will be uploaded on above mentioned website before Pre Bid meeting.				
(J)	START OF BID SUBMISSION ON CPP PORTAL	08.07.2022 at 09:00 Hrs. (IST)				
(K)	DUE DATE & TIME OF BID-SUBMISSION	Date : 14.07.2022 Time : 15:00 Hrs (IST)				
(L)	DATE AND TIME OF UN-PRICED BID OPENING (IN PRESENCE OF AUTHORIZED REPRESENTATIVE OF BIDDERS)	<p>Date: 15.07.2022</p> <p>Time :15:00 hrs (IST) Onwards</p> <p>Venue: M/s Projects &amp; Development India Limited, (Project Management Department) P.D.I.L Bhawan, A-14, Sector-1, Noida, (PIN 201301) Dist. Gautam Budh Nagar (UP). (India)</p>				

<b>(M)</b>	ADDRESS FOR COMMUNICATION WITH PDIL	Projects & Development India Limited, (Project Management Department) P.D.I.L Bhawan, A-14, Sector-1, Noida , (India) Fax no.:0120-2529801  Kind Attention: Mr. Kailash Joshi Project Manager Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 314 Mob. No. : 9718762091 Fax no. : +91-120-2529801 E-mail : <a href="mailto:kjoshi@pdilin.com">kjoshi@pdilin.com</a>	
	ADDRESS FOR COMMUNICATION WITH OWNER (TFL) AT PROJECT OFFICE	GAIL INDIA LIMITED, PLOT NO. 24, FILM CITY, SECTOR 16A, NOIDA- 201301  Kind Attention : Mr. Girindra Mohan DGM (P & E) E-mail : <a href="mailto:g.mohan@gail.co.in">g.mohan@gail.co.in</a>  Mob. No. : +91-8811079351	
<b>(O)</b>	ADDRESS FOR COMMUNICATION WITH OWNER (TFL) AT SITE FOR SITE VISIT	M/s Talcher Fertilizers Ltd. (TFL), Administrative Building, Talcher, Post: Vikrampur, Dist: Angul, Pincode-759106, Odisha  Mr. Satyabrata Mishra-GM (Projects) Mob No. : +91-9927339444 E-mail : <a href="mailto:smishra@gail.co.in">smishra@gail.co.in</a>	
<b>(P)</b>	Reverse Auction	APPLICABLE	<input type="checkbox"/>
		NOT APPLICABLE	<input checked="" type="checkbox"/>
		(Also refer Clause No. 52 of ITB)	
<b>(Q)</b>	Original Documents to be submitted at	Projects & Development India Limited, (Project Management Department) P.D.I.L Bhawan, A-14, Sector-1, Noida, (PIN 201301) Dist. Gautam Budh Nagar (UP). (India)  Kind Attention: Mr. Kailash Joshi, Project Manager Mob.no.: 9718762091	

In case the days specified above happens to be a holiday in TFL/PDIL, the next working day shall be implied.

- 3.0 Bids must be submitted strictly in accordance with Clause No. 11 of ITB depending upon Type of Tender as mentioned at Clause no. 2.0 (D) of IFB. The IFB is an integral and inseparable part of the bidding document.
- 4.0 Bid must be submitted only on CPP Portal (<https://eprocure.gov.in/eprocure/app>). Further, the following documents in addition to uploading the bid on CPPP's Portal shall also be submitted in Original (in physical form) within 7 (seven) days(\*) from the bid due date, provided the scanned copies of the same have been uploaded in e-tender by the bidder along with e-bid within the due date and time to the address mentioned in Clause no. 2.0 (Q) of IFB:-
- i) EMD (for all bidders except exempted category) /Declaration for Bid Security (for exempted bidders)
  - ii) Power of Attorney
  - iii) Integrity Pact
- 5.0 Bidder(s) are advised to quote strictly as per terms and conditions of the tender documents and not to stipulate any deviations/exceptions.
- 6.0 Any bidder, who meets the Bid Evaluation Criteria (BEC) and wishes to quote against this Tender Document, may download the complete Tender Document along with its amendment(s) if any from websites as mentioned at 2.0 (H) of IFB and submit their Bid complete in all respect as per terms & conditions of Tender Document on or before the Due Date & Time of Bid Submission.
- 7.0 Bid(s) received from bidders to whom tender/information regarding this Tender Document has been issued as well as offers received from the bidder(s) by downloading Tender Document from above mentioned website(s) shall be taken into consideration for evaluation & award provided that the Bidder is found responsive subject to provisions contained in Clause No. 2 of ITB (Section-III of tender).

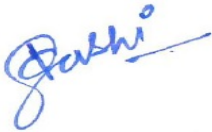
The Tender Document calls for offers on single point "Sole Bidder" responsibility basis (except where JV/Consortium bid is allowed pursuant to clause no. 3.0 of ITB) and in total compliance of Scope of Works as specified in Tender Document.

- 8.0 Any revision, clarification, corrigendum, time extension, etc. to this Tender Document will be hosted on the website(s) only as mentioned at 2.0 (H) of IFB. Bidders are requested to visit the CPP Portal regularly to keep themselves updated. No complaint/representation shall be entertained from bidders in case they do not see / download the amendments, etc. issued to the tender document by TFL from time to time on the CPP Portal.

- 9.0 All bidders who are willing to submit their bid are required to submit F-6 (Acknowledgement cum Consent letter) duly filled within 7 days from date of receipt of tender information.
- 10.0 The bidder shall submit the bid ONLINE through Central Public Procurement (CPP) Portal. Bids complete in all respects should be uploaded in the CPP portal on or before the Bid Due Date and time mentioned in at SI No. 2(K) above. Bids through Post/ Fax / E-mail /CD/ any other mode other than that specified in ITB will not be accepted.
- 11.0 TFL/PDIL reserves the right to reject any or all the bids received at its discretion without assigning any reason whatsoever.

**This is not an Order**

**Thanking You,**  
For and on behalf of  
Talcher Fertilizers limited



(Kailash Joshi)  
Project Manager  
**Projects & Development India Limited**  
E-mail ID : kjoshi@pdilin.com  
Contact No. :0120-2529842/ Ext. 314





**PHYSICAL DOCUMENTS (EMD/Declaration for Bid Security, POA, & Integrity Pact)**

**Tender Document No. : PNP/PC-183/E/206/NCB dated 15.06.2022**

**Description : SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA.**

**Due Date & Time : 14.07.2022 at 15:00 hrs.**

<b>From:</b> ..... ..... ..... .....	<b>To:</b>  Projects & Development India Limited, (Project Management Department) P.D.I.L Bhawan, A-14, Sector-1, Noida , (India) Fax no.:0120-2529801  Kind Attention: Mr. Kailash Joshi Project Manager Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 314 Mob. No. : 9718762091 Fax no. : +91-120-2529801 E-mail : <a href="mailto:kjoshi@pdilin.com">kjoshi@pdilin.com</a>
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**(To be pasted on the envelope containing Physical Document)**



**SECTION-II**

**BID EVALUATION CRITERIA**

**&**

**EVALUATION METHODOLOGY**

## SECTION-II

### BID EVALUATION CRITERIA (BEC) & EVALUATION METHODOLOGY

**Bidder shall submit bid subject to meeting the Bid Evaluation Criteria as stated here. Evaluation of Technical and Commercial offers shall be carried out for only those Bidders who shall meet the Bid Evaluation Criteria.**

#### **1.0 Technical Criteria**

- 1.1 The bidder must have completed one **“Similar work”**, having completed value not less than INR 30.09 Crore (including tax & duties), under a single contract during the last Seven (07) years reckoned from the original bid opening date.

**“Similar work”** shall mean the following:

- (i) Construction of Ash Pond/Ash Dyke works alongwith associated Civil/ Mechanical/ Electrical works (if any).**

**(OR)**

- (ii) Construction of water retaining structure like Dams, Barrage, Canals, reservoir and Tank. These structures must include excavation, embankment, lining and RCC works alongwith allied Civil/Mechanical works (if any).**

**Note:** To meet the Technical Criteria 1.1 above, only single contract is acceptable. In case bidder has executed and completed composite works which includes any of the qualifying works(s) stated above, then value of such qualifying works out of the total value of composite works shall be considered for the purpose of qualification.

#### **Additional Notes for 1.1 above:**

- I. Job completed by a Bidder for its own plant/ project cannot be considered as experience for the purpose of meeting BEC of the tender. However, jobs completed for Subsidiary/ Fellow subsidiary/ Holding company will be considered as experience for the purpose of meeting BEC subject to submission of tax paid invoice(s) duly certified by Statutory Auditor of the Bidder towards payments of statutory tax in support of the job completed for Subsidiary/ Fellow subsidiary/ Holding company. Such Bidders to submit these documents in addition to the documents specified to meet BEC.
- II. The bidder must submit the completion certificate/acceptance certificate issued by Order issuing authority/end user/ owner (or their consultant who has been duly authorized by them to issue such certificate) only after completion of work/ supply in all aspects.
- III. Only documents (Work order, completion certificate, execution certificate etc.) which have been referred /specified in the bid shall be considered in reply to the queries during evaluation of bids.

- IV. In case more than one contract/order/agreement/DLOA are emanating against same tender, these contracts are to be considered as single contract for evaluation of credentials of a bidder for meeting their experience criteria.
- V. Experience of bidder acquired as a subcontractor is acceptable against submission of certificate from End User/ Owner by such bidder along with other specified documents.
- VI. Bids from Consortium/ Joint Venture shall not be accepted
- VII. If a Bidder has executed "Similar work" in the capacity of Joint Venture/ Consortium partner, his experience shall be considered to the extent of scope of work defined under the Joint Venture/ Consortium Agreement.

## **1.2 Applicability of Policy for providing preference to Domestically Manufactured Iron & Steel (DMI & SP) products.**

Bidder should have minimum prescribed domestic value addition requirement in line with the Domestic Manufactured iron & Steel Policy (DMI & SP) for the Iron & Steel products involved in execution of the contract. Bidder shall submit affidavit from the domestic manufacturers of such Iron & steel products as per the Form-I mentioned in the policy document.

A bidder who is not manufacturer of Iron & Steel product and is unable to submit the Affidavit from domestic manufacturers at bidding stage, such bidder can submit the Affidavit issued by domestic manufacturers after placement of order. In this case bidder along with his bid shall submit an undertaking as per attached format in NIT.

If a bidder does not submit above affidavit/ undertaking as per format, the offer of bidder shall be rejected

## **2.0 Financial Criteria**

- 2.1** The Annual Turnover of the bidder in any one of the last three (03) preceding financial years should be at least **INR 24.07 Crore**.
- 2.2** Net Worth of the bidder should be positive as per last audited financial year.
- 2.3** The Bidder should have minimum working capital equal to **INR 4.81 Crore** as per last audited financial year. However, if the bidder's working capital is negative or inadequate, the bidder shall submit a letter from their Bank having Net worth of the bank not less than Rs. 100.0 Crore (or equivalent USD), confirming the availability of line of credit for **INR 4.81 Crore**. The line of credit from bank shall be submitted strictly as per prescribed format.

### **Note for 2 [(2.1), (2.2) and (2.3)]**

**Annual Turnover:** Preceding 3 financial years mentioned in aforesaid BEC refer to immediate 3 preceding financial years wherever the closing date of the bid is after 30<sup>th</sup> September of the relevant financial year. In case the tenders having the due date for

submission of bid up to 30<sup>th</sup> September of the relevant financial year, and audited financial results of the immediate 3 preceding financial years are not available, the audited financial results of the 3 years immediately prior to that will be considered. Further, in case bidder is meeting the Annual Turnover criteria of BEC based on Audited Financial Statement of any one of the preceding 3 financial years (as mentioned above), the same shall suffice and bidder may submit prescribed format accordingly.

**Net Worth/ Working Capital:** Immediate preceding financial year mentioned in aforesaid BEC refer to audited financial results for the immediate preceding financial year wherever the closing date of the bid is after 30<sup>th</sup> September of the relevant financial year. In case the tenders having the due date for submission of bid up to 30<sup>th</sup> September of the relevant financial year, and audited financial results of the immediate preceding financial year is not available, in such case the audited financial results of the year immediately prior to that year will be considered. Bidder is to submit Audited Financial Statement of immediate preceding financial years (as mentioned above) along with format F-10 accordingly for Net worth/ Working Capital.

Any shortfall information / documents on the Audited Annual Report / Financial Statement of the Bidder and/or line of credit for working capital issued on or before the final bid due date can only be sought against Commercial queries (CQs). Any information/ documents issued post final bid due date shall not be considered for evaluation.

### **3.0 General Notes (for both Technical BEC and Financial BEC):**

#### **Exchange rate for conversion of currency for evaluation of documents relating to BEC (if applicable):**

Exchange rate for Conversion of Currency for evaluation of documents submitted by bidders for BEC which are in a currency other than INR shall be as follows:

- a) **BEC (Technical):** Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the date of award of order / contract submitted by bidder.
- b) **BEC (Financial)**
  - (i) **For Annual Turnover:** The average of Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the First date and Last date of the respective Financial Year.
  - (ii) **For Net Worth & Working Capital:** The Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the Last date of the respective Financial Year.

- c) In case, the SBI Selling rate is not available as on the date of conversion as specified above for respective cases, the exchange rate for conversion of currency shall be taken from the internet, such as

<https://economictimes.indiatimes.com/markets/forex/currency-converter>

<https://www.oanda.com/currency/converter>

#### **4.0 BEC for START-UPS:**

The Technical and Financial BEC as stipulated above shall also be applicable for start-ups. However, the Startups are exempted from submission of EMD. For availing the relaxation of EMD, bidder is required to submit requisite certificate towards Startup enterprise registration issued by Department of Industrial Policy and Promotion, Ministry of Commerce & Industry and the certificate should be certified by the Chartered Accountant (not being an employee or a Director or not having any interest in the bidder's company/firm) and notary public with legible stamp."

## **5.0 Documents to be submitted for Compliance to BEC**

### **(i) Technical Criteria of BEC:**

To meet the criteria of **1.1**, above, Bidder must submit copy of Detailed Letter of Acceptance (DLOA) / Work Order /relevant extract of work Order/ Contract Agreement along with detailed scope of work and Completion / Acceptance Certificate. Such certificate shall be issued by order issuing authority Owner/End user.

The Detailed Letter of Acceptance (DLOA) / Work Order / Contract Agreement must *inter alia* include Scope of work, completion time, contract value, etc. Similarly, the Completion Certificate/ Acceptance Certificate must clearly indicate reference of relevant work order/DLOA/Contract Agreement, Name of Work, Completed order value and date of completion.

In cases where bidder has executed the "Similar work" as a sub-contractor, such Completion certificate and Operation certificates (for compliance to **1.1** above) issued by the "Order issuing Authority" is also acceptable, provided that a certificate or letter from the End User/Owner is submitted that the bidder has worked as a sub-contractor for that project.

To meet the criteria **1.2** above, Bidder shall submit affidavit from the domestic manufacturers of Iron & steel products as per the Form-I enclosed with the policy documents. A bidder who is not manufacturer of Iron & Steel product and is unable to submit the Affidavit from domestic manufacturers at bidding stage, such bidder can submit the Affidavit issued by domestic manufacturers after placement of order. In this case bidder along with his bid shall submit an undertaking as per prescribed format.

### **(ii) Financial Criteria of BEC:**

- a) To meet the criteria for Sr. No. **2.1**, Bidder shall submit the Audited Financial Statements of the company for any one of the preceding three (03) financial years whichever meets the annual turnover criteria.
- b) To meet the criteria for Sr. No. **2.2**, Bidder shall submit the Audited Financial Statements of the last (immediately preceding) financial year
- c) To meet the criteria for Sr. No. **2.3**, Bidder shall submit the Audited Financial Statements of last (immediately preceding) financial year along with (i) Bank's Letter (if applicable)
- d) If the bidder's working capital is negative or inadequate, the bidder shall submit a letter from their bank having net worth not less than Rs.100 Crores (or equivalent USD), confirming the availability of line of credit for working capital amount mentioned herein above. The line of credit letter from bank to be submitted strictly as per prescribed format.



**For 5.0 (ii) above, the "Note for 2[(2.1), (2.2) and (2.3)] under 2.0 (Financial Criteria of BEC) shall apply.**

- e) Bidder shall submit Checklist as per prescribed format in respect of documents to be submitted by bidder towards BEC.

## **6.0 Authentication of all documents submitted against BEC**

### **6.1 Technical BEC**

All documents in support of "Technical Criteria" of Bid Evaluation Criteria (BEC) furnished by the bidders shall be verified and certified by any one of the following independent third party inspection agency (as per prescribed format):

1. Société Générale de Surveillance (SGS)
2. Gulf Lloyds Industrial Services (India) Pvt. Ltd (GLISPL)
3. International Certification Services (ICS)
4. Bureau Veritas (Ind.) Pvt. Ltd (BVIS)
5. DNV GL
6. TÜV Rheinland (India) Pvt. Ltd.
7. TÜV SÜD South Asia Pvt. Ltd.
8. TÜV India Pvt. Ltd. (TÜV Nord Group)
9. Intertek India Pvt. Ltd.
10. Moody International (India) Pvt. Ltd.
11. RINA India Pvt. Ltd.
12. Tata Projects Ltd.
13. Competent Inspectorate and Consultants LLP
14. ABS Industrial Verification (India) Pvt. Ltd

Further, TPIA will provide in addition a certificate toward verification and certification of documents pertaining to Technical Bid Evaluation Criteria (BEC) as per prescribed proforma and the same will be submitted by bidder in their bid.

All charges of the Third party for verification and certification shall be borne by the Bidder.

If any above mentioned agency themselves are participating in bidding, then they shall authenticate the documents by a different agency from the list given above.

### **6.2 Financial BEC**

Bidder shall submit "Details of financial capability of Bidder" in prescribed format (F-10) duly signed and stamped by a chartered accountant/ Certified Public Accountant (CPA). The same shall be on Letter Head of Chartered Accountant/ Certified Public Accountant (CPA).

Further, copy of audited annual financial statements submitted in bid shall be duly certified/ attested by Notary Public with legible stamp.

## **7.0 Evaluation Methodology:**

The subject work is indivisible and complete work shall be awarded to successful overall lowest bidder as per evaluation methodology described below. In other words, evaluation of bids shall be done on overall L-1 basis considering all applicable taxes & duties including GST as under:

- (i) Total quoted price as per SOR inclusive of all taxes & duties including GST after arithmetic correction of errors (if any).
- (ii) In case any cess on GST is applicable, same shall also be considered in evaluation.
- (iii) In case any unregistered bidder is submitting their bid, their prices will be loaded with applicable GST (CGST & SGST/UTGST or IGST) while evaluation of bid (if applicable as per Govt. Act/Law in vogue).
- (iv) The Price Evaluation will be subject to applicability of Purchase Preference Policies as mentioned in the tender document.

Correction of error, if any shall be done as per clause no. 30.0 of ITB.

## **8.0 Applicability of Public Procurement (Make in India) Policy**

The said policy shall be applicable for this package. Further, as the work is non divisible/non-splittable, therefore, the relevant provisions of policy shall be applicable. The minimum local content and all other provisions shall be as per Public Procurement (Make in India) Policy latest policy no. P-45021/2/2017-PP (BE-II) dated 16th September, 2020 or as updated from time to time.

## **9.0 Applicability of purchase preference of MSE's**

Considering that the subject work falls under "Works Contract", Purchase preference to MSE Bidders shall not be applicable as per government guidelines.

**Format for Undertaking from TPIA**  
(On TPIA letter head duly stamped & signed)

Ref.:  
Date :

To,

Talcher Fertilizers Limited.  
.....  
.....  
.....

Dear Sir,

**Subject: Verification and certification of documents pertaining to Technical Bid Evaluation Criteria (BEC)**

**Ref : Tender no. .... for .....**

M/s. .... having Registered office at ..... intend to participate in above referred tender of Talcher Fertilizers Limited having its registered office at Plot 2/H, Kalpana Area, BJB Nagar, Khordha, Bhubaneswar-751014.

The tender conditions stipulates that the BIDDER shall submit Documents pertaining to Technical Bid Evaluation Criteria (BEC) duly verified and certified by designated independent Third Party Inspection Agency.

In this regard, this is to certify that copies of documents pertaining to Technical Bid Evaluation Criteria (BEC) submitted to us by the bidder have been verified and certified by us with the originals and found to be genuine. We have signed and stamped on the copies of all the verified and certified documents.

(Signature of a person duly authorized to

Sign on behalf of the TPIA)

(Seal of the Company)

Name: .....

Contact No.....

**POLICY FOR PROVIDING PREFERENCE TO DOMESTICALLY MANUFACTURED  
IRON & STEEL PRODUCTS IN GOVERNMENT PROCUREMENT**



# भारत का राजपत्र The Gazette of India

असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (i)

PART II—Section 3—Sub-section (i)

प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

सं. 324]

नई दिल्ली, बुधवार, मई 29, 2019/ज्येष्ठ 8, 1941

No. 324]

NEW DELHI, WEDNESDAY, MAY 29, 2019/JYAISTHA 8, 1941

इस्पात मंत्रालय

अधिसूचना

नई दिल्ली, 29 मई, 2019

**सा.का.नि. 385(अ).**—घरेलू रूप से उत्पादित किए जाने वाले लौह एवं स्टील उत्पाद की सरकारी खरीद को प्राथमिकता दिए जाने के लिए संशोधित नीति सामान्य सूचना हेतु प्रकाशित की जाती है।

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रसिका चौबे, अपर सचिव

**सरकारी खरीद में घरेलू स्तर पर निर्मित लौह एवं इस्पात उत्पादों को बरीयता देने के लिए नीति - संशोधित, 2019**

**1. भूमिका**

- 1.1 यह नीति सरकारी खरीद में घरेलू स्तर पर निर्मित लौह एवं इस्पात उत्पादों (डी एम आई एंड एस पी) को बरीयता देती है।
- 1.2 यह नीति यथा लागू निर्धारित गुणवत्ता मानदंडों के अनुपालन में उत्पादित लौह एवं इस्पात उत्पादों जिसे परिशिष्ट क में दिया गया है और परिशिष्ट ख में दिए गए लौह एवं इस्पात उत्पादों के लिए पूंजीगत माल पर लागू होती है।
- 1.3 यह नीति सरकार के प्रत्येक मंत्रालय अथवा विभाग और उनके प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/प्रतिष्ठानों तथा सरकारी परियोजनाओं के वास्ते लौह एवं इस्पात उत्पादों की खरीद के लिए इन एजेंसियों द्वारा वित्त पोषित परियोजनाओं पर लागू है। हालांकि, यह नीति वाणिज्यिक पुनः बिक्री के उद्देश्य से अथवा वाणिज्यिक बिक्री के लिए वस्तुओं के उत्पादन में उपयोग करने के उद्देश्य से लौह एवं इस्पात उत्पादों की खरीद पर लागू नहीं होगी।

**2. परिभाषाएं**

- 2.1 **बोली** लगाने वाला लौह एवं इस्पात का कोई घरेलू/विदेशी निर्माता अथवा उनके बिक्री एजेंट/अधिकृत वितरक/अधिकृत डीलर/अधिकृत आपूर्ति गृह अथवा सरकारी एजेंसियों द्वारा वित्त पोषित निधि परियोजनाओं की बोली लगाने में कार्यरत कोई अन्य कंपनी हो सकती है।

- 2.2 **घरेलू स्तर पर निर्मित लौह एवं इस्पात उत्पाद (डी एम आई एंड एस पी)** वे लौह एवं इस्पात उत्पाद हैं जिनका निर्माण उन प्रतिष्ठानों द्वारा किया जाता है जो भारत में पंजीकृत और स्थापित हैं, जिसमें विशेष आर्थिक क्षेत्र (एम ई ज़ेड) शामिल है। इसके अलावा, इस प्रकार के उत्पाद परिशिष्ट क में किये गये उल्लेख के अनुसार घरेलू न्यूनतम मूल्यवर्धन के मानदंडों को पूरा करेंगे।
- 2.3 **घरेलू निर्माता** खंड 7 में दिशा-निर्देशों और केंद्रीय उत्पाद शुल्क अधिनियम में दी गई 'निर्माता' की परिभाषा के अनुरूप लौह एवं इस्पात उत्पादों का एक निर्माता है।
- 2.4 इस नीति के प्रयोजन से **सरकार** का तात्पर्य भारत सरकार से है।
- 2.5 **सरकारी एजेंसियों** में सरकार के सार्वजनिक क्षेत्र के उपक्रम, सरकार द्वारा स्थापित सोसायटी, ट्रस्ट और सांविधिक निकाय शामिल हैं।
- 2.6 **एम ओ एस** का आशय इस्पात मंत्रालय, भारत सरकार से है।
- 2.7 **निवल बिक्री कीमत** बीजक कीमत होगी जिसमें निवल घरेलू कर और शुल्क शामिल नहीं होंगे।
- 2.8 **अर्ध तैयार इस्पात** का तात्पर्य इनगोट्स, बिलेट, ब्लूम और स्लेब्स से है, जिसे बाद में प्रसाधित कर तैयार इस्पात बनाया जा सकता है।
- 2.9 **तैयार इस्पात** का तात्पर्य सपाट और लंबे उत्पादों से होगा जिन्हें बाद में प्रसाधित कर निर्मित मद बनाया जा सकता है।
- 2.10 **एल1** का तात्पर्य निविदा अथवा अन्य खरीद संबंधी अनुरोध के अनुसार मूल्यांकन प्रक्रिया में यथाघोषित निविदा, बोली लगाने संबंधी प्रक्रिया अथवा अन्य खरीद संबंधी अनुरोधों में प्राप्त निम्नतम निविदा अथवा निम्नतम बोली अथवा निम्नतम भाव से होगा।
- 2.11 **खरीद वरीयता के मार्जिन** का तात्पर्य उस अधिकतम सीमा से है जिस सीमा तक किसी घरेलू आपूर्तिकर्ता द्वारा लगाई गई कीमत खरीद वरीयता के प्रयोजन से एल1 से अधिक हो। डी एम आई एंड एस पी नीति के मामले में, खरीद वरीयता का मार्जिन परिशिष्ट ख में मदों के लिए 20 प्रतिशत होगा।
- 2.12 **लौह एवं इस्पात उत्पाद** का तात्पर्य ऐसे लौह एवं इस्पात उत्पादों से होगा जिनका उल्लेख परिशिष्ट क में किया गया है।
- 2.13 **घरेलू मूल्यवर्धन** निवल बिक्री कीमत (निवल घरेलू करों और शुल्कों को छोड़कर बीजक कीमत) होगी जिससे प्रतिशत में निवल बिक्री कीमत के एक अनुपात के रूप में भारत में निर्माण संयंत्र (सभी सीमा शुल्कों सहित) में आयात की गई इनपुट सामग्री की पहुंच लागत घटाई गई हो, 'घरेलू मूल्यवर्धन' परिभाषा डी पी आई आई टी (पूर्व में डी आई पी पी) के दिशानिर्देशों के अनुरूप होगी और उसमें भविष्य में डी पी आई आई टी द्वारा परिवर्तन किये जाने की स्थिति में उपयुक्त रूप से संशोधन किया जाएगा। इस नीति दस्तावेज के प्रयोजन के लिए घरेलू मूल्यवर्धन और स्थानीय विषय वस्तु का उपयोग एक दूसरे के स्थान पर किया गया है।
- 3. अपवर्जन**
- 3.1 इस्पात मंत्रालय द्वारा इस प्रकार की सभी सरकारी खरीदों के लिये निम्नलिखित शर्तों के अधीन छूट प्रदान की जाएगी।
- 3.1.1 जहां विशिष्ट शेडों के इस्पात का निर्माण इस देश में नहीं किया जाता हो, अथवा
- 3.1.2 जहां परियोजना की मांग के अनुसार इन मात्राओं को घरेलू स्रोतों के माध्यम से पूरा नहीं किया जा सकता हो।
- अपवर्जन संबंधी अनुरोधों को घरेलू स्तर पर निर्मित लौह एवं इस्पात उत्पादों के उपलब्ध न होने के पर्याप्त प्रमाण के साथ स्थायी समिति को प्रस्तुत किया जाएगा।
- 4. स्थायी समिति**
- इस नीति के कार्यान्वयन का पर्यवेक्षण करने के लिए इस्पात मंत्रालय (एम ओ एस) के अधीन एक स्थायी समिति का गठन किया जाएगा। जिसके अध्यक्ष सचिव इस्पात होंगे। इस समिति में उद्योग/उद्योग संघ/सरकारी संस्था अथवा निकाय/इस्पात मंत्रालय (एम ओ एस) से लिए गए विशेषज्ञ होंगे। इस्पात मंत्रालय में उक्त समिति के पास निम्नलिखित के लिए अधिदेश होगा :
- 4.1 इस नीति के कार्यान्वयन की मॉनीटरिंग करना
- 4.2 परिशिष्ट क और परिशिष्ट ख में यथा उल्लिखित लौह एवं इस्पात उत्पादों की सूची और घरेलू बिक्री वर्धन की आवश्यकता से संबंधित मानदंडों की समीक्षा करना और उसे अधिसूचित।

- 4.3 खंड 3 के अनुसार खरीद एजेंसियों को अपवर्जन की स्वीकृति देने सहित इस नीति के कार्यान्वयन के लिए आवश्यक स्पष्टीकरण जारी करना।
- 4.4 शिक्कायत निवारण करने के लिए एक अलग समिति का गठन करना।
- 4.5 स्थायी समिति इस्पात मंत्रालय को अनुमोदन हेतु अपनी सिफारिशें प्रस्तुत करेगी।
- 5. सरकार द्वारा खरीदे जाने वाले लौह एवं इस्पात उत्पादों को अधिसूचित करना**
- 5.1 निम्नलिखित दिशानिर्देशों का उपयोग इस नीति के अंतर्गत उपरोक्त उत्पादों की पहचान करने और उमें अधिसूचित करने के लिए किया जा सकता है :
- 5.1.1 यह नीति परिशिष्ट क में दिए गए अनुसार लौह एवं इस्पात उत्पादों और परिशिष्ट ख में लौह एवं इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत माल पर लागू है।
- 5.1.2 परिशिष्ट क में लौह एवं इस्पात उत्पादों की सूची दी गई है जिसका निर्माण अनन्य रूप से घरेलू स्तर पर किया जाना है और उसका आयात इस्पात मंत्रालय के अनुमोदन के बिना नहीं किया जा सकता है।
- 5.1.3 परिशिष्ट ख में पूंजीगत माल की एक सूची (जो विस्तृत नहीं है) दी गई है जिसके लिए खरीद संबंधी बरीयता घरेलू स्तर पर निर्मित पूंजीगत माल को दी जाएगी, यदि उनकी दी गई कीमत सदृश्य आयात किये गये पूंजीगत माल के लिए दी गई कीमत के 20 प्रतिशत के अंदर आती हो।
- 5.1.4 इस नीति का उद्देश्य सभी लौह एवं इस्पात उत्पादों को अधिसूचित करना है जिसकी खरीद सरकारी एजेंसियों द्वारा सरकारी परियोजनाओं के लिए की जाती है और न कि वाणिज्यिक पुनः बिक्री के उद्देश्य से अथवा वाणिज्यिक बिक्री के लिए उत्पादों के उत्पादन में प्रयोग करने के उद्देश्य से की गई हो।
- 5.1.5 यह नीति सरकार के मंत्रालय अथवा विभाग के द्वारा निधि प्रदत्त सभी परियोजनाओं और उनके प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/प्रतिष्ठानों पर लौह एवं इस्पात उत्पादों की खरीद के लिए लागू है।
- 5.1.6 यह नीति उन परियोजनाओं पर लागू होगी जहां लौह एवं इस्पात उत्पादों का खरीद मूल्य 25 करोड़ रुपए से अधिक होता हो। यह नीति अन्य खरीद (गैर परियोजना) के लिए भी लागू होगी जहां उस सरकारी संगठन के लिए लौह एवं इस्पात उत्पादों का वार्षिक खरीद मूल्य 25 करोड़ रुपए से अधिक होता हो।
- 5.1.7 यह नीति सरकार के मंत्रालय अथवा विभाग अथवा उनके सार्वजनिक क्षेत्र के उपक्रमों की किसी अन्य आवश्यकता को पूरा करने के लिए और/अथवा ई पी सी संविदा को पूरा करने के लिए प्राइवेट एजेंसियों द्वारा लौह एवं इस्पातों की खरीद पर लागू है।
- 5.1.8 घरेलू लौह एवं इस्पात उत्पादों के विभिन्न ग्रेडों की उपलब्धता का विश्लेषण इस नीति के अंतर्गत अधिसूचित करने से पहले करना होगा। केवल उन लौह एवं इस्पात को उत्पादों को जिनके संबंध में कम से कम एक घरेलू निर्माता मौजूद हो, अधिसूचित किया जाएगा। स्थायी समिति से परामर्श किया जा सकता है।
- 5.1.9 यह नीति यथा लागू निर्धारित गुणवत्ता मानदंडों के अनुपालन में उत्पादित परिशिष्ट ख में दिए गए लौह एवं इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत माल के लिए लागू है।
- 5.1.10 लौह एवं इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत मालों की घरेलू खरीद के लिए नीति लौह एवं इस्पात उत्पादों का निर्माण करने के लिए और न कि वाणिज्यिक पुनः बिक्री के उद्देश्य से पूंजीगत मालों की खरीद के वास्ते और सार्वजनिक क्षेत्र के इस्पात विनिर्माताओं और उनके प्रशासनिक नियंत्रणाधीन सभी एजेंसियों/प्रतिष्ठानों पर लागू है।
- 5.1.11 यह नीति ई पी सी संविदा और/अथवा सार्वजनिक क्षेत्र से इस्पात निर्माताओं और उनके प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/प्रतिष्ठानों की किसी अन्य आवश्यकता को पूरा करने के लिए निजी एजेंसियों द्वारा लौह एवं इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत माल की खरीद पर लागू है।
- 5.1.12 सरकारी एजेंसियां जो लौह एवं इस्पात उत्पादों के निर्माण के लिए पूंजीगत माल और लौह एवं इस्पात उत्पादों की खरीद में उन स्थितियों में शामिल है जहां लौह एवं इस्पात उत्पादों का उल्लेख परिशिष्ट क और परिशिष्ट ख में नहीं किया गया हो, स्थायी समिति को निर्धारित मानदंडों के साथ इस उत्पाद के विवरण और तकनीकी विनिर्देशन उपलब्ध करायेगा। स्थायी समिति खंड 3 और खंड 4 में अधिदेश के अनुसार कार्य करेगी।

- 5.2 इस्पात मंत्रालय (एम ओ एम) परिशिष्ट क में दिए गए न्यूनतम निर्धारित घरेलू मूल्यवर्धन के साथ लौह एवं इस्पात उत्पादों को अधिसूचित करेगा।
- 5.3 लौह एवं इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत माल के संबंध में नीतिगत दिशानिर्देश, परियोजना के आकार पर विचार किये बिना परिशिष्ट ख में लौह एवं इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत माल की सभी खरीदों के लिए सार्वजनिक क्षेत्र के इस्पात निर्माताओं पर लागू होंगे।
- 5.4 परिशिष्ट क में लौह एवं इस्पात उत्पादों के लिए तथा परिशिष्ट ख में लौह एवं इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत माल के लिए सुझाव दिए गए न्यूनतम घरेलू मूल्यवर्धन आवश्यकता घरेलू आपूर्तिकर्ता का आधार, आपूर्तिकर्ताओं की संख्या और खपत की तुलना में आयात का अनुपात जैसे कारकों के आधार पर तय किया गया है।
- 5.5 घरेलू मूल्यवर्धन आवश्यकता संबंधी मानदंडों का इस प्रकार से निर्धारण किया जाएगा जिस से कि यह किमी दिए गए समय में लौह एवं इस्पात उत्पादों के लिए घरेलू उद्योग की औसत/औसत से अधिक निर्माण क्षमता दर्शाता हो। स्थायी समिति द्वारा समय समय पर उपयुक्त रूप से इसकी समीक्षा की जाएगी और आवश्यकता पड़ने पर इस्पात मंत्रालय के अनुमोदन से इसमें संशोधन किया जाएगा।
- 6. सरकार एवं सरकारी एजेंसियों द्वारा खरीद के लिए निविदा प्रक्रिया**
- 6.1 खरीद करने वाली/सरकारी एजेंसियां डी एम आई एंड एस पी का पालन करते समय वित्त मंत्रालय और सी वी सी के अनुदेशों के अनुसार मानक खरीद संबंधी प्रक्रियाओं का पालन करेगी। यह नीति सभी निविदाओं जहां कीमत बोली नहीं खोली गई है, में इसके अधिसूचना की तिथि से लागू होगी।
- 6.2 दोनों वस्तुओं की खरीद तथा ई पी सी संविदाओं के लिए निविदा दस्तावेज में लौह एवं इस्पात उत्पादों का निर्माण करने के लिए लौह एवं इस्पात उत्पादों तथा पूंजीगत माल (जैसा कि परिशिष्ट क और परिशिष्ट ख में दर्शाया गया है, के लिए बोली लगाने वाले द्वारा न्यूनतम निर्धारित घरेलू मूल्यवर्धन का पालन करने के लिए अर्हता मानदंडों का स्पष्ट उल्लेख होना चाहिए।
- 6.3 घरेलू उत्पादों के विकास का सहयोग करने में, लौह एवं इस्पात व्यापार क्रियाकलापों में घरेलू मूल्यवर्धन का लक्ष्य निर्धारित किया गया है जिसे परिशिष्ट क और परिशिष्ट ख में दिया गया है।
- 6.4 परिशिष्ट क में लौह और इस्पात उत्पादों के खरीद की प्रक्रिया केवल उन निर्माताओं/आपूर्तिकर्ताओं के लिए ही खुली रहेगी जिसमें घरेलू मूल्यवर्धन लक्ष्यों को पूरा करने/उमसे ज्यादा पूरा करने की क्षमता हो। घरेलू मूल्यवर्धन लक्ष्यों को पूरा न करने वाले निर्माता/आपूर्तिकर्ता बोली लगाने में भाग लेने के लिए पात्र नहीं हैं।
- 6.5 परिशिष्ट ख में दी गई मदों के मामलों में, यदि खरीद करने वाली कंपनी की राय में, निविदाओं (खरीदी गई मात्रा) को 50:50 के निर्धारित अनुपात में नहीं बांटा जा सकता है, तब उनके पास मात्रा जो 50 प्रतिशत से कम नहीं हो, जो कि विभाज्य हो, के लिए पात्र घरेलू निर्माता को संविदा देने का अधिकार होगा।
- 6.6 उपर्युक्त शर्त को जारी रखते हुए, परिशिष्ट ख की मदों के लिए, यदि निविदा दी गई मद विभाज्य न हो (खरीद करने वाली कंपनी द्वारा निविदा दस्तावेज में शामिल किए जाने के लिए) यह संविदा समग्र मात्रा के लिए पात्र घरेलू निर्माता को दी जा सकती है।
- 6.7 परिशिष्ट ख के मदों के मामलों में, यदि घरेलू मूल्यवर्धन की आवश्यकताओं को पूरा करने वाले पात्र निर्माताओं में से कोई भी एल1 की बोली के अनुरूप न हो, तब एल1 की बोली धारण करने वाले मूल बोली लगाने वाला खरीद के पूर्ण मूल्य के लिए आदेश प्राप्त करेंगे।
- 6.8 वे बोली लगाने वाले जो लौह एवं इस्पात उत्पादों के घरेलू निर्माताओं के बिक्री एजेंट/अधिकृत वितरक/अधिकृत डीलर/अधिकृत आपूर्ति गृह हैं इस नीति के अंतर्गत घरेलू निर्माताओं की ओर से बोली लगाने के लिए पात्र हैं। हालांकि, यह निम्नलिखित शर्तों के अध्वधीन होगा।
- 6.8.1 बोली लगाने वाले घरेलू स्तर पर निर्मित लौह एवं इस्पात उत्पादों की बिक्री करने के लिए घरेलू निर्माता द्वारा जारी किए गए अधिकार प्रमाण पत्र प्रस्तुत करेगा।



- 6.8.2 यदि खरीद को डी एम आई एंड एम पी नीति के परिशिष्ट क के अंतर्गत शामिल किया गया हो तब बोली लगाने वाला यह घोषणा करते हुए खरीद करने वाली एजेंसी को घरेलू निर्माता द्वारा जारी किया गया स्व-प्रमाणन का शपथ पत्र प्रस्तुत करेगा कि लौह और इस्पात उत्पादों का घरेलू स्तर पर निर्माण निर्धारित घरेलू मूल्यवर्धन के मामले में किया जाता है।
- 6.8.3 यदि खरीद को डी एम आई एंड एम पी नीति के परिशिष्ट ख के अंतर्गत शामिल किया गया हो तब बोली लगाने वाला यह घोषणा करते हुए घरेलू निर्माता को सांविधिक लेखा परीक्षक द्वारा जारी किया गया प्रमाणन प्रस्तुत करेगा कि लौह और इस्पात उद्योग में उपयोग किये जाने वाले पूंजीगत माल का घरेलू स्तर पर निर्माण निर्धारित घरेलू मूल्यवर्धन के मामले में किया जाता है।
- 6.8.4 बोली लगाने वाले की यह जिम्मेदारी होगी कि वह इस नीति के अनुसार खरीद करने वाली एजेंसी को घरेलू निर्माता द्वारा जारी किये जाने के लिए अपेक्षित अन्य आवश्यक दस्तावेज प्रस्तुत करे।

## 7. घरेलू मूल्यवर्धन आवश्यकता

- 7.1 घरेलू रूप में निर्मित लौह और इस्पात उत्पाद अथवा पूंजीगत माल के रूप में उत्पाद के रूप में पात्र होने के लिए न्यूनतम घरेलू मूल्यवर्धन आवश्यकता का उल्लेख परिशिष्ट क और परिशिष्ट ख में किया गया है।
- 7.2 घरेलू मूल्यवर्धन निवल बिक्री कीमत (निवल घरेलू करों और शुल्कों को छोड़कर बीजक कीमत) होगी जिसमें से प्रतिशत में निवल बिक्री कीमत के एक अनुपात के रूप में भारत में निर्माण करने वाले संयंत्र में आयात की गई इनपुट सामग्री की पहुंच लागत (सभी सीमा शुल्कों को शामिल करते हुए) घटाई जाएगी।
- 7.2.1 यदि लौह और इस्पात उत्पादों को घरेलू इनपुट इस्पात (अर्ध तैयार/तैयार इस्पात) का उपयोग करके निर्माण किया जाता हो, तब खरीदी गई मात्रा और अन्य संबंधित दस्तावेजों के साथ वास्तविक घरेलू उत्पादों से खरीद का बीजक खरीद करने वाली सरकारी एजेंसी को अवश्य प्रस्तुत किया जाना चाहिए।
- 7.2.2 यदि लौह एवं इस्पात उत्पादों ने इनपुट इस्पात का आयात किया हो तब खरीदी गई मात्रा और अन्य संबंधित दस्तावेजों के साथ वास्तविक उत्पादकों से खरीदों के बीजकों को अलग से प्रस्तुत किया जाना चाहिए। घरेलू मूल्यवर्धन की सीमा निकालने के लिए, दोनों इनपुट इस्पातों (आयात किये और घरेलू) की भारित औसत पर विचार यह सुनिश्चित करने के लिए किया जाएगा कि इस नीति की न्यूनतम निर्धारित घरेलू मूल्यवर्धन आवश्यकता का पालन किया गया है।
- 7.3 यह सिफारिश की जाती है कि निविदा की प्रक्रिया में भाग लेने वाले प्रत्येक बोली लगाने वाले को नीचे दिए गए सूत्र का उपयोग करते हुए घरेलू मूल्यवर्धन की गणना करनी चाहिए ताकि यह सुनिश्चित किया जा सके कि दावा किये गये घरेलू मूल्यवर्धन इस नीति के न्यूनतम निर्धारित घरेलू मूल्यवर्धन के अनुरूप है।

### लौह एवं इस्पात उत्पादों के लिए

% घरेलू मूल्यवर्धन

$$= \frac{\text{अंतिम उत्पाद की निवल बिक्री कीमत} - \text{संयंत्र में आयात किये गये लौह अथवा इस्पात की पहुंच लागत}}{\text{अंतिम उत्पाद की निवल बिक्री कीमत}} \times 100\%$$

### पूंजीगत माल के लिए

% घरेलू मूल्यवर्धन

$$= \frac{\text{अंतिम उत्पाद की निवल बिक्री कीमत} - \text{संयंत्र में आयात किये गये इनपुट सामग्री की पहुंच लागत}}{\text{अंतिम उत्पाद की निवल बिक्री कीमत}} \times 100\%$$

## 8. प्रमाणन और लेखा परीक्षण

- 8.1 परिशिष्ट क में दिए गए उत्पादों के लिए, प्रत्येक घरेलू निर्माता यह घोषणा करते हुए खरीद करने वाली सरकारी एजेंसी को स्व-प्रमाणन का शपथ पत्र प्रस्तुत करेगा कि लौह एवं इस्पात उत्पाद का निर्धारित घरेलू मूल्यवर्धन के संबंध में घरेलू स्तर पर निर्माण किया गया है। परिशिष्ट ख के पूंजीगत माल के लिए, बोली लगाने वाला यह घोषणा करते हुए घरेलू निर्माता को सांविधिक लेखा परीक्षक द्वारा जारी किया गया प्रमाणन प्रस्तुत करेगा कि पूंजीगत माल का निर्माण घरेलू स्तर पर निर्धारित घरेलू मूल्यवर्धन के संबंध में किया गया है। वे बोली लगाने वाले जो लौह एवं इस्पात उत्पादों के घरेलू निर्माताओं का एकमात्र बिक्री एजेंट/अधिकृत वितरक/अधिकृत डीलर/अधिकृत आपूर्ति गृह हैं, ई पी सी के अंतर्गत घरेलू निर्माताओं की ओर से बोली लगाने के लिए पात्र हैं।

बोली लगाने वाला घरेलू निर्माताओं के द्वारा जारी किए गए स्व-प्रमाणन और सांविधिक लेखा परीक्षकों द्वारा जारी किये गये प्रमाणनों को यह घोषणा करते हुए खरीद करने वाली एजेंसी को प्रस्तुत करेगा कि लौह एवं इस्पात उत्पादों का घरेलू स्तर पर निर्माण निर्धारित घरेलू मूल्यवर्धन के संबंध में किया गया है। स्व-प्रमाणन का शपथ पत्र इन दिशानिर्देशों से संलग्न **प्रपत्र 1** में प्रस्तुत किया जाएगा।

- 8.2 घरेलू निर्माता की यह जिम्मेदारी होगी कि वह यह सुनिश्चित करे कि इस प्रकार से दावा किये गये उत्पादों का घरेलू स्तर पर उम उत्पाद के लिए निर्धारित घरेलू मूल्यवर्धन के संबंध में किया गया है। बोली लगाने वाले से यह भी अपेक्षित होगा कि वह घरेलू निर्माता के सांविधिक लेखा परीक्षकों द्वारा विधिवत प्रमाणित अर्धवार्षिक (मिंतंबर 30 और मार्च 31) आधार पर घरेलू मूल्यवर्धन प्रमाणपत्र उपलब्ध कराये कि पहले 6 महीनों के दौरान इस उत्पाद के लिए किये गये घरेलू मूल्यवर्धन के दावे इस नीति के अनुसार हैं। इस प्रकार के प्रमाण पत्र को संबंधित सरकारी एजेंसियों को प्रत्येक छमाही के शुरू होने के 60 दिनों के भीतर प्रस्तुत किया जाएगा और उस उत्पादों की आपूर्ति को पूरा करने तक प्रस्तुत करता रहेगा।
- 8.3 खरीद करने वाली एजेंसी बोली लगाने वाले द्वारा प्रस्तुत किये गये इस्पात उत्पाद में घरेलू मूल्यवर्धन के संबंध में स्व-प्रमाणन का शपथ पत्र स्वीकार करेगा। सामान्य तौर पर खरीद करने वाली एजेंसी की यह जिम्मेदारी होगी कि वह इस दावे की सत्यता की जांच करे। इसकी सत्यता प्रदर्शित करने की जिम्मेदारी बोली लगाने वाले की होगी जब उसे ऐसा करने के लिए कहा जाए।
- 8.4 यदि खरीद करने वाली एजेंसी अथवा संबंधित सरकारी एजेंसी द्वारा लौह एवं इस्पात उत्पादों में घरेलू मूल्यवर्धन के संबंध में बोली लगाने वाले के दावे के विरुद्ध कोई शिकायत प्राप्त होती है तब खरीद करने वाली एजेंसी के पास सभी संबंधित दस्तावेजों का निरीक्षण करने और उसकी जांच करने तथा निर्णय लेने का पूर्ण अधिकार होगा। यदि कोई स्पष्टीकरण की आवश्यकता होती है तब मामले को तकनीकी सहायता के लिए अनुरोध के साथ इस्पात मंत्रालय को भेजा जा सकता है।
- 8.5 सरकारी एजेंसी को भेजे गए किसी शिकायत का निपटारा सभी आवश्यक दस्तावेजों को प्रस्तुत करने के साथ इसे भेजे जाने के 4 सप्ताह के भीतर किया जाएगा। बोली लगाने वाले से यह अपेक्षित होगा कि वह शिकायत दायर करने के 2 सप्ताह के भीतर सरकारी एजेंसी को लौह एवं इस्पात उत्पादों में दावा किये गये घरेलू मूल्यवर्धन के समर्थन में आवश्यक दस्तावेज प्रस्तुत करे।
- 8.6 यदि इस मामले को इस्पात मंत्रालय के पास भेजा जाता है तब इस्पात मंत्रालय के अधीन गठित शिकायत निवारण समिति सरकारी एजेंसी के दृष्टिकोण पर विचार करने के बाद बोली लगाने वाले से सभी दस्तावेजों के प्राप्त होने और उसका संदर्भ भेजे जाने के 4 सप्ताह के भीतर शिकायत का निपटारा करेगी। बोली लगाने वाले से यह अपेक्षित होगा कि वे इस मामले के संदर्भ के 2 सप्ताह के भीतर इस्पात मंत्रालय के अंतर्गत शिकायत निवारण समिति को लौह एवं इस्पात उत्पादों में दावा किए गए घरेलू मूल्यवर्धन के समर्थन में आवश्यक दस्तावेज प्रस्तुत करे। यदि बोली लगाने वाले द्वारा कोई सूचना प्रस्तुत नहीं की जाती है तब शिकायत निवारण समिति दावे की प्रमाणिकता अधिक करने के लिए सरकारी एजेंसी के परामर्श से आगे आवश्यक कार्रवाई कर सकती है।
- 8.7 घरेलू मूल्यवर्धन की निर्धारित सीमा का आकलन करने की लागत का वहन खरीद करने वाली एजेंसी द्वारा किया जाएगा यदि घरेलू मूल्यवर्धन प्रमाण पत्र के अनुसार सही पाया गया हो। हालांकि, यदि ऐसा पाया गया हो कि दावा किए गए अनुसार घरेलू मूल्यवर्धन सही नहीं है तब आकलन की लागत बोली लगाने वाले द्वारा भुगतान के योग्य होगी जिन्होंने एक गलत प्रमाण पत्र प्रस्तुत किया है। इसे लागू करने के तरीके को निविदा दस्तावेज में परिभाषित किया जाएगा।

## 9. प्रतिबंध

- 9.1 प्रत्येक सरकारी एजेंसी निविदा दस्तावेज में निर्धारित घरेलू मूल्यवर्धन का बोली लगाने वाले के द्वारा गलत घोषणा किए जाने की स्थिति में दण्ड को स्पष्ट रूप से परिभाषित करेगा। इस दण्ड में ऐसे निर्माता/सेवा प्रदाता की ई एम डी को जब्त करना, अन्य वित्तीय दंड लगाना और उसे काली सूची में डालना शामिल हो सकता है।
- 9.2 संबंधित बोली लगाने वाले के द्वारा इस्पात मंत्रालय को किसी प्रकार की शिकायत भेजे जाने की स्थिति में, 10 लाख रुपए अथवा खरीदी जा रही डी एम आई एंड एस पी के मूल्य का 0.2 प्रतिशत (अधिकतम 20 लाख के अध्येधीन) इसमें से जो भी अधिक हो, का शिकायत शुल्क होगा जिसका भुगतान शिकायतकर्ता द्वारा शिकायत के साथ इस्पात मंत्रालय के अधीन शिकायत निवारण समिति के पास जमा किए गए डिमाण्ड ड्राफ्ट के द्वारा किया जाएगा। यदि, शिकायत को सही नहीं पाया जाता है तब सरकारी एजेंसी के पास उक्त राशि को जब्त करने का अधिकार सुरक्षित है। यदि शिकायत पर्याप्त रूप से सही पाई जाती है तब शिकायतकर्ता द्वारा जमा किए गए शुल्क को बिना किसी ब्याज के वापिस किया जाएगा।

**10. इस्पात मंत्रालय द्वारा कार्यान्वयन की मॉनीटरिंग**

- 10.1 इस नीति के प्रावधान प्रकाशन की तिथि से 5 वर्षों की अवधि के लिए लागू रहेंगे। इस नीति की अवधि को इस्पात मंत्रालय के विवेक से और आगे बढ़ाया जा सकता है।
- 10.2 इस्पात मंत्रालय इस नीति के कार्यान्वयन की मानीटरिंग करने के लिए नोडल मंत्रालय होगा।
- 10.3 डी एम आई एंड एम पी नीति के अंतर्गत सभी लागू एजेंसियां इस नीति का कार्यान्वयन मुनिश्चित करेंगी और वार्षिक रूप से जून के महीने में एक घोषणा भेजेगी जिसमें इस नीति के अनुपालन की सीमा और पिछले वित्तीय वर्ष के दौरान उसके अनुपालन न किए जाने के कारणों को दर्शाया जाएगा।

**इस्पात मंत्रालय को संदर्भ**

किमी ऐसे प्रश्न की स्थिति में कि क्या खरीदी जा रही मद इस नीति के अंतर्गत शामिल किए जाने वाले डी एम आई एंड एम पी है, इस मामले को स्पष्टीकरण के लिए इस्पात मंत्रालय के पास भेजा जाएगा।

**परिशिष्ट क - धरेलू स्तर पर निर्मित उत्पादों के लिए अनन्य**

क्र. सं.	लौह एवं इस्पात उत्पादों की सांकेतिक सूची	लागू एच एस कोड	न्यूनतम धरेलू मूल्यवर्धन आवश्यकता
1	600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, हॉट रोल, न ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7208	50%
2	600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, कोल्ड रोल (कोल्ड - कम किया हुआ), न ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7209	50%
3	600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7210	50%
4	600 मि. मी. से कम की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, न ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7211	35%
5	600 मि. मी. से कम की चौड़ाई का लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7212	35%
6	लौह एवं गैर एलॉय इस्पात का अनियमित रूप से षंठा हुआ क्वाडल में बार्स और रॉड, हॉट रोल	7213	35%
7	लौह अथवा गैर एलॉय इस्पात के अन्य बार्स और रॉड्स जिसे फोर्ज किए जाने की तुलना में आगे अधिक वर्क नहीं किया हुआ, हॉट रोल, हॉट ड्रॉन अथवा हॉट एक्सट्रूडेड परंतु रोलिंग के बाद उसे टिबिस्ट किये जाने सहित	7214	35%
8	लौह अथवा गैर एलॉय इस्पात का अन्य बार्स एंड रोड्स	7215	35%
9	लौह अथवा गैर एलॉय इस्पात का एंगल, शेप और सेक्शन	7216	35%
10	लौह अथवा गैर एलॉय इस्पात का तार	7217	50%
11	600 मि. मी. अथवा उससे अधिक की चौड़ाई का स्टेनलैस इस्पात का फ्लेट रोल इस्पात	7219	50%
12	600 मि. मी. से कम की चौड़ाई का स्टेनलैस इस्पात का फ्लेट रोल इस्पात	7220	50%
13	स्टेनलैस स्टील का अन्य बार्स और रोड्स; स्टेनलैस स्टील का एंगल शेप और सेक्शन	7222	50%
14	अन्य एलॉय इस्पात का तार	7229	35%
15	लौह अथवा इस्पात को रेल, रेलवे अथवा ट्रामवे ट्रेक निर्माण सामग्री	7302	50%

16	कास्ट लौह का ढूब, पाइप और होलो पाइप	7303	35%
17	लौह (कास्ट आयरन को छोड़कर) अथवा इस्पात का ढूब पाइप और होलो प्रोफाइल, मीमलैस	7304	35%
18	लौह अथवा इस्पात का सर्कुलर क्रॉस सेक्शन वाले अन्य ढूब और पाइप (उदाहरण के लिए, वेल्ड किया हुआ, रिबेट किया हुआ अथवा समान रूप से बंद किया गया हुआ), जिमकी बाहरी त्रिज्या 406.4 मि. मी. से अधिक हो	7305	35%
19	लौह अथवा इस्पात के अन्य ढूब, पाइप और होलो प्रोफाइल (उदाहरण के लिए ओपन मीन अथवा वेल्ड किया हुआ, रिबेट किया हुआ अथवा समान रूप से बंद किया गया हुआ)	7306	35%
20	लौह अथवा इस्पात का ढूब अथवा पाइप फिटिंग (उदाहरण के लिए, कनेक्टर/कप्लिंग, एल्बो स्लीव्स)	7307	35%
21	स्टेनलैस स्टील का अनियमित रूप से ँंठा हुआ क्वाइल में बार्स और रॉड, हॉट रोल्ड	7221	35%
22	स्टेनलैस स्टील का वायर	7223	35%
23	इलेक्ट्रिकल स्टील सहित 600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले अन्य एलॉय स्टील का फ्लेट रोल्ड इस्पात	7225	35%
24	इलेक्ट्रिकल स्टील सहित 600 मि. मी. से कम की चौड़ाई वाले अन्य एलॉय स्टील का फ्लेट रोल्ड इस्पात	7226	35%
25	अन्य एलॉय स्टील का अनियमित रूप से ँंठा हुआ क्वाइल में बार्स और रोड, हॉट रोल्ड	7227	15%
26	अन्य एलॉय स्टील का अन्य बार्स और रोड्स; अन्य एलॉय स्टील का एंगल, शेप्स और सेक्शन्स; एलॉय अथवा नॉन एलॉय स्टील का होलो ड्रिल बार्स और रोड्स	7228	35%
27	लौह अथवा इस्पात की शीट पाइलिंग, चाहे ड्रिल किया हुआ हो अथवा नहीं, चाहे पंच किया हुआ हो अथवा नहीं, चाहे असेम्बल किये हुए तत्वों से बना हुआ हो अथवा नहीं; लौह अथवा इस्पात का वेल्ड किया हुआ एंगल, शेप और सेक्शन्स	7301	15%
28	स्ट्रक्चर्स (9406 के शीर्ष का प्रीफैब्रिकेटेड भवनों को छोड़कर) और स्ट्रक्चर्स का हिस्सा	7308	15%
29	300 लीटर से अधिक क्षमता का लौह अथवा इस्पात का किसी सामग्री (कम्प्रेस किए हुए अथवा सरलीकृत गैस को छोड़कर) के लिए भंडार, टैंक, वैट और समान कन्टेनर चाहे उसे लाइन किया गया हो अथवा नहीं या उसे हीट से इन्सुलेट किया गया हो अथवा नहीं लेकिन यांत्रिक अथवा तापीय उपक्रम से युक्त न हो	7309	15%
30	अधिकतम 300 लीटर की क्षमता का लौह अथवा इस्पात का किसी सामग्री (कम्प्रेस किए हुए अथवा सरलीकृत गैस को छोड़कर) के लिए टैंक, कास्ट, ड्रम, केन, बॉक्स और समान कन्टेनर चाहे उसे लाइन किया गया हो अथवा नहीं या उसे हीट से इन्सुलेट किया गया हो अथवा नहीं लेकिन यांत्रिक अथवा तापीय उपक्रम से युक्त न हो	7310	15%
31	लौह अथवा इस्पात का कम्प्रेस किया हुआ अथवा सरलीकृत गैस के लिए कन्टेनर	7311	15%
32	लौह अथवा इस्पात का स्टेंडिड वायर, रोप, केबल, प्लेटिड बैंड, स्लिंग और उसके समान वस्तु जिसे त्रिचूतीय रूप से इन्सुलेट न किया गया	7312	15%
33	लौह अथवा इस्पात का फेनसिंग के लिए उपयोग किये जाने वाला बार किया हुआ वायर; ट्रिवस्ट किया हुआ हूप अथवा सिंगल प्लेट वायर, बार्स किया हुआ अथवा नहीं और लूज तरीके से ट्रिवस्ट किया हुआ डबल वायर	7313	15%
34	लौह अथवा इस्पात तार का ड्रिल, नेटिंग और फेनसिंग; लौह अथवा इस्पात का विस्तार किया हुआ धातु	7314	15%

35	लौह अथवा इस्पात का चैन और उसका हिस्सा	7315	15%
36	लौह अथवा इस्पात का टैंकर, ग्रेपनेल्म और उसका हिस्सा	7316	15%
37	लौह एवं इस्पात की वस्तुएं	7317	15%
38	लौह एवं इस्पात की वस्तुएं	7318	15%
39	लौह एवं इस्पात की वस्तुएं	7319	15%
40	लौह अथवा इस्पात का स्प्रिंग और स्प्रिंग के लिए लीन्स	7320	15%
41	लौह अथवा इस्पात का स्टोव्स, रेंज, ग्रेड, कूकर (केंद्रीय हिटिंग के लिए सहायक बायलरों के साथ उन वस्तुओं सहित), वारवेक्यूज, ब्रेजियर्स, गैस रिंग, प्लेट वामर्स और समान गैर-विद्युतीय घरेलू उपकरण और उसका हिस्सा	7321	15%
42	लौह अथवा इस्पात का केंद्रीय हिटिंग के लिए रेडियेटर जिसे विद्युतीय रूप से हीट न किया गया हो और उसका हिस्सा; लौह अथवा इस्पात का हेयर हीटर और हॉट एयर वितरक जिसे विद्युतीय रूप से हीट न किया गया हो, फेन अथवा ब्लोअर जो मोटर से चलती हो और उसके हिस्से को शामिल करते हुए	7322	15%
43	लौह अथवा इस्पात का टेबल और समान घरेलू वस्तुएं और उसका हिस्सा	7323	15%
44	लौह अथवा इस्पात का सेनेटरी वेयर और उसको पार्ट्स	7324	15%
45	लौह अथवा इस्पात का अन्य कास्ट सामान	7325	15%
46	लौह अथवा इस्पात का विद्युतीय इस्पात और अन्य वस्तु	7326	15%
47	रेलवे अथवा ट्रामवे पेसेंजर कोच जो स्वयं आगे नहीं बढ़ता हो	8605	50%
48	रेलवे अथवा ट्रामवे माल वेन और वेगेन जो स्वयं आगे नहीं बढ़ता हो	8606	50%
49	रेलवे अथवा ट्रामवे लोकोमोटिव का हिस्सा अथवा रोलिंग स्टॉक जैसे बोगिज, बिसल बोगिज, एक्सेल और फोज्ड किया हुआ पहिया और उसका हिस्सा	8607	50%

विवरणों में शामिल किए गए उत्पाद सांकेतिक हैं, विनिर्दिष्ट एच एम कोड के अंतर्गत सभी उत्पादों को परिशिष्ट के भाग के रूप में शामिल किया गया है।

## परिशिष्ट ख

## लौह और इस्पात उत्पादों का निर्माण करने के लिए पूंजीगत माल की सांकेतिक सूची (जो विस्तृत नहीं है)

क्र. सं.	संयंत्र शॉप	पूंजीगत माल	न्यूनतम घरेलू मूल्यवर्धन आवश्यकता
1	कच्चा माल संभाल प्रणाली	चूर्ण की हुई सामग्री के लिए एप्रोन फीडर, बेरल कप्लिंग, हैवी ड्यूटी वियेरिंग, हाइड्रोलिक डिक्स ब्रेक्स, टैंकर एंड कंटेनर, पाइप कंवेयर के लिए कंवेयर बेल्ट, हार्ड एंगल कंवेयर प्रणाली, क्रशर्स, क्रेन रेल लुब्रिकेशन, चार गरडर ग्राइडर ई ओ टी क्रेन, क्रेन वेइंग प्रणाली, क्रेन एयर कंडीशनिंग, फ्यूड कप्लिंग, 4 लिफ्ट ट्रक्स, हाइड्रोलिक मोटर्स, हाइड्रोलिक सिस्टम, लॉकिंग एसेम्बली (फ्रिक्शन ग्रिप), लोड सेल्स, लेवल सेन्सर्स, पाइप कंवेयर प्रणाली, प्लग/पाडेल फीडर, न्यूमेटिक हुलाई - धना एवं लिन फेस, रिक्लेमर्स, रेडियो रिमोट कंट्रोल, रेल फिक्सिंग व्यवस्था (विशेष), रेपिड/फ्लेड लोडिंग प्रणाली, स्टेर्स, स्पेशल स्क्रीन, स्लिव रिंग वियेरिंग, ट्रिप्लर्स, ट्रांसफर कार, टॉर्स (स्पेशल), वाइब्रेशन, आइसोलेशन प्रणाली (स्प्रिंग डम्पर) वेगन टिप्लर्स, वेगन लोडर	50%
2	मिनिरल बेनिफिकेशन (लौह अयस्क और कोयला) उपकरण	इंडस्ट्रीयल क्रशर्स, ग्राइनिंग मिल, परम्परागत स्क्रीन, स्लूरी पम्पस, हिरेट थिकनर्स, फिल्टर्स, हाइड्रोक्लोन्स	50%

3	कोक अवेन	कोक ओवन मिलिका रिफेक्टरी, एन्क्रेज सिस्टम, ब्रंच तरडन के साथ वेस्ट गैस वाल, फ्लेस प्लेट, डोर फ्रेम, डोर बॉडी, माइनर कास्टिंग: गुजनेक, बाल बॉक्स, ए पी लिड, चार्जिंग और इन्स्पेक्शन होल लिड एंड फ्रेम रिचर्सिंग मंकेनिजम, केंद्रीकृत लूत्रिकेशन प्रणाली हाइड्रोजेट डोर क्लीनिंग तंत्र, कोड कंवेयर सिस्टम, स्क्रिप होइस्ट, डोर लोवरिंग रैक, आइसोलेशन/रिचर्सिंग कॉक्स, II ऑटोमेशन, अवेन मशीन	50%
4	उप-उत्पाद संयंत्र	प्राथमिक गैस कूलर, इलेक्ट्रोस्टैटिक तार प्रेसिपिटेटर, H <sub>2</sub> S, NH <sub>3</sub> और नपथलिन स्कूब्वर, कोम्बी स्ट्रीप्पर, फ्लेशिंग लिक्व पम्प, क्लास किन, क्लाक रियेक्टर, वेस्ट हीट बायलर, डिक्लेटर्स	50%
5	सिंटर संयंत्र उपकरण	पेलेट कार, ड्राइव/डिस्चार्ज इंड स्पोकेट एंसेम्बली कब्ड रेल, स्लाइड रेल, हॉट सिंटर ब्रेकर और गिजली, डिप रेल एंड रनिंग रेल, प्रोसेस फेन के लिए इम्पेलर एंसेम्बली, सिंटर मशीन का ड्राइव एंसेम्बली, उच्च तीव्रता वाला मिक्सर और नोडूलाइजर	50%
6	पेलेट संयंत्र उपकरण	पेलेट कार, ड्राइव/डिस्चार्ज इंड स्पोकेट एंसेम्बली कब्ड रेल, स्लाइड रेल, रनिंग रेल बरटिकल रोलर मिल, प्रोसेस फेन के लिए इम्पेलर एंसेम्बली, इनडूरेटिंग मशीन का ड्राइव एंसेम्बली, उच्च तीव्रता वाला मिक्सर, बालिंग डिक्स, सिंगल डेक्स रोलर स्क्रीन एंड डबल डेक्स रोलर स्क्रीन	50%
7	ब्लास्ट फरनेस उपकरण	ब्लेडर बाल के साथ बेल रहित टॉप प्रणाली, एस जी आयरन स्टेव कूलर, कोपर स्टेव कूलर, स्टॉक लेवल इंडिकेटर (रडार टाइप), मड गन, ड्रिलिंग मशीन एंड मेनिपुलेटर, गैस किल्लिंग प्लांट प्रणाली, इसके बाइस-पास वाल सहित टॉप रिक्वरी टूबाइन सिस्टम, डि-ब्रिक्किंग मशीन, रि-रेलिंग उपकरण, पी सी आई प्रणाली, पी सी आई के लिए ग्राइनिंग मिल, स्टॉक लेवल इंडिकेटर, टूयेरे स्टाक एंसेम्बली, वेस्ट हीट रिक्वरी प्रणाली, बी एफ एवं हॉट ब्लास्ट स्टोव प्रौद्योगिकीय वाल, एन्व ब्रंडन प्रोब्स, स्लग ग्रेन्यूलेशन यूनिट, टूयेरे एंड टूयेरे कूलर, टोरपेडो लेडल कार, बी एफ हरथ रिफेक्ट्री	50%
8	डायरेक्ट रिडक्शन प्लांट उपकरण	चार्ज डिस्चार्ज, अपर एंड लोअर सील लेग, रिफोमर एंड रि-क्यूरेटर सिस्टम, बर्डन फिडर्स, टूबो-एक्सपेंडर, प्रोसेस गैस कम्प्रेसर, सील गैस कम्प्रेसर एवं बोटम सील गैस कम्प्रेसर, सील गैस जेनरेटर एवं डायर्स, प्रोसेस गैस हीटर, CO <sub>2</sub> रिमूवल प्लांट	50%
9	वेमिक ऑक्सीजन फर्नेस उपकरण	मुख्य और अनुरक्षण उपकरण जिसमें कंवेटर, गनिंग मशीन, रिफेक्ट्री/स्लग मॉनीटरिंग उपकरण, कंवेटर वेसेल, ट्रनिअन रिंग एंड सम्पेशन प्रणाली, ट्रनिअन बियरिंग और हाउसिंग, कंवेटर बुल गियर यूनिट और टिल्ट ड्राइव सिस्टम, कंवेटर के रोटेरी ज्वाइंट, बोटम स्ट्रिंग सिस्टम, क्लपिंग के साथ लांस बाडी, लांस कोपर टिप्स, ऑक्सीजन ब्लोबिंग/बोटम स्टीरिंग के लिए बाल स्टेशन, सब-लान सिस्टम, प्रोसेस मॉड्यूल अर्थात् प्रोसेस साफ्टवेयर/हार्डवेयर के साथ ऑफ गैस एनेलाइजर, कंटेनर लैब मेजरमेंट प्रोब, स्विच ओवर स्टेशन, प्राइमरी गैस के लिए आई डी फेन, हॉट मेटल और स्टील लेडल, लेडल ट्रांसफर कार, लेडल अनुरक्षण उपकरण, स्लेग पोट, स्लग पोट ट्रांसफर कार, स्क्रैप बॉक्स क्रेप ट्रांसफर कार, लांस करेज, लांस गाइड, क्रेन एंड हाइस्ट, लांस होइस्ट एंड ट्राली, लांस टिल्टिंग उपकरण, लांस को लिफ्ट करने के लिए ट्रेवस, विभिन्न आकर के बंकर, बिन बाइब्रेटर, वेइंग हूपर, अनुरक्षण स्टेण्ड, डी इस्टिंग सक्शन हूड, टीमिंग/एच एम, लेडल रिलाइनिंग स्टैंड, स्टैंड कूलिंग स्टेक इन्स्पेक्शन उपकरण, हूड ट्रेवर्स करेज, रिफेक्ट्री, बाइपास एवं आइसोलेशन वाल्व, फ्लेयर स्टेक एवं इगनिशन सिस्टम, स्क्रबिंग टोवर सेल - चेट गैस क्लीनिंग सिस्टम, डॉंग हाउस लेडल डायर, लेडल	50%

		प्री-हीटर, लेडल कूलर, फ्यूम कोलेक्शन हूड्स, क्लीन गैस स्टेक, डस्ट सिलो, वेग ब्रिज, म्लग रिट्रैनिंग उपकरण	
10	इलेक्ट्रिक आर्क फर्नेस	फर्नेस प्रोपर (जिसमें फर्नेस लोवर सेल, अपर सेल और रूफ, टिल्टिंग प्लेटफार्म, फर्नेस गेन्ट्री शामिल है) और ट्रांसफार्मर, इलेक्ट्रोड रेगुलेशन प्रणाली, हाइड्रोलिक सिस्टम, रिफैक्ट्री, लेवल I एंड II आटोमेशन सिस्टम के पार्ट्स। एल एफ - वाटर कूल्ड लेडल रूफ, इलेक्ट्रोड मास्ट एंड आमर्स, इलेक्ट्रोड रेगुलेशन सिस्टम, वायर फिडिंग सिस्टम, बोटम इनडरट गैस स्टिरिंग बाल सिस्टम पोरुस प्लग और टॉप लांस के लिए, इमरजेंसी लांसतंत्र, ड्राइव यूनिट के साथ लांस केरेजि सिस्टम, स्वचालित तापक्रम, सेम्पलिंग और बाथ लेबल/ओ2 मेजरमेंट, तापक्रम और आक्सीजन इम्मजन लांस, ड्राइव यूनिट के साथ लांस केरेज सिस्टम, हाइड्रोलिक सिस्टम, रिफैक्ट्री, लेडल रूफ डेल्टा पोरशन, आर एच प्रोपर (जिसमें लेडल ट्रांसफर कार, बेक्यूम वेमेल, वेमेल लिफ्टिंग और लोवरिंग सिस्टम शामिल है, हाइड्रोलिंग सिस्टम, मल्टी फंक्शन लांस, वाल्व रेक्स/स्टेशन, इलेक्ट्रोड क्लेप यूनिट, इलेक्ट्रोड आमर्स का कंडक्टर, वाटर कूल्ड केबल, ए आर स्टेरिंग वाल्व रेक, लांस ट्रांसपोर्ट कार, रिफैक्ट्री लांस, हाइड्रोलिक सिलेंडर, लेडल रूफ लिफ्टिंग सिलेंडर, लूत्रिकेशन प्रणाली, सक्शन हूड, डम्पर, वाइब्रो फीडर, वेडंग होपर, वायर फिडिंग प्रणाली, इलेक्ट्रोड निपिलिंग स्टेड, क्रेन, होइस्ट, तापमान और सेम्पलिंग टिप्स, लेडल स्टैंड, ई एस पी, डिडिक्टिंग हूड, रिफैक्ट्री, वेग फिल्टर, क्रेन इत्यादि।	50%
11	सतत कास्टिंग उपकरण	लाइले टरेट, लेडल कवर मेनिपुलेटर, लेडल शारउड मेनिपुलेटर, टनडिस कार, कंटिन्यूअस टनडिस टेम्पेचर मेजरमेंट सिस्टम, टनडिस स्टोपर रूड मेकेनिजम, इमरजेंसी कट-आफ गेट, मोल्ड एसेम्बली, नोजल क्लिक चेंज डिवाइस, मोल्ड ओसीलेटर एंड ई एम एस सिस्टम, इलेक्ट्रो-मेगेनेटिक ब्रेकिंग सिस्टम, स्ट्रेड गाइड सेगमेंट, विदड्रावल एंड स्ट्रेघटेनिंग यूनिट (डब्ल्यू एस यू), रोल गेप चेकर इमरजेंसी टार्च कटर, टार्च कटिंग मशीन, डेबरर, मार्किंग मशीन, टेकेनोलोजी कंट्रोल सिस्टम एंड प्रोसेस मोडल, ब्लेक रिफैक्ट्रीज, स्ट्रेड गन्डे सेगमेंट, टनडिश, लाइले कवर, रोलर टेबल एंड आक्सीलिरीज, माल्ड एंड सेगमेंट मेनटेनेस इक्यूपमेंट टनडिस मेनटेनेस इक्यूपमेंट, ई एम बी आर सिस्टम	50%
12	फ्लेट मिल	लार्ज कास्टिंग एंड फाजिग लाइक मिल हाउसिंग, बेड प्लेट्स वर्क्स रोल, बेकअप रोल, इंड स्पिडल्स; रोलर टेबल, बेकअप रोल एंड वर्क रोल चक्स क्वाडलर/टेनशन रिल/अनक्वाइलर, ए जी सी सिलेंडर, शेयर्स, लेवेलेर्स, लाजेर वेल्डर, पेकेजिंग मशीन, नॉन कान्टेक्ट, गेज/प्रोफाइल गेज, एंटी-फ्रिक्शन रोल नेक बियरिंग, आयल फिल्म बियरिंग, गियर बॉक्स, मिल मोटर्स	50%
13	लॉग मिल	मिलम हाउसिंग, बेड प्लेट, वर्क रोल, बेकअप रोल, स्पिनडेल्स; रोलर टेबल, कॉयलर /टेंशन रिल /अनकॉयलर, शेयर्स, बिल्डट वेल्डर, पेकेजिंग मशीन, नान-कान्टेक्ट गॉज/प्रोफाइल गॉज, एंटी-फ्रिक्शन रोल नेक बियरिंग, आयल फिल्म बियरिंग, फिनिशिंग ब्लाक्स, गियर बॉक्स, मिल मोटर	50%

\* परिशिष्ट ख में मर्दे निर्माण करने वाले इस्पात के लिए पूंजीगत सामानों की एक सांकेतिक सूची है। यह सूची विस्तृत नहीं है। इस्पात के निर्माण के लिए सभी पूंजीगत मालों पर 50% की न्यूनतम घरेलू मूल्यवर्धन आवश्यकता के साथ इस नीति के अंतर्गत खरीद बरीयता के लिए विचार किया जाएगा।

**फार्म - 1**

100/- रुपए के स्टाम्प पेपर पर दिए जाने के लिए लौह एवं इस्पात उत्पादों/पूँजीगत मालों में घरेलू मूल्यवर्धन के संबंध में स्व-प्रमाणन शपथ के लिए प्रपत्र :

मैं \_\_\_\_\_ सुपुत्र, सुपुत्री, पत्नी, \_\_\_\_\_ का निवासी \_\_\_\_\_  
एतद् द्वारा निष्ठापूर्वक नीचे दिए गए अनुसार वचन देता हूँ और घोषण करता हूँ :

कि मैं अधिसूचना सं. : \_\_\_\_\_ के माध्यम से जारी किए गए भारत सरकार की नीति के नियम और शर्तों का पालन करने के लिए सहमत होऊंगा।

कि यहां नीचे दी गई सूचना मेरे सर्वोत्तम ज्ञान और विश्वास के अनुसार सही है और मैं घरेलू मूल्यवर्धन का आकलन करने के प्रयोजन से खरीद करने वाली एजेंसी के समक्ष संगत रिकार्ड प्रस्तुत करने का वचन देता हूँ।

कि सभी इनपुट्स के लिए घरेलू मूल्यवर्धन जिसमें उक्त लौह एवं इस्पात उत्पाद शामिल हैं का सत्यापन मेरे द्वारा कर लिया गया है और मैं उसमें किये गये दावों की सत्यता के लिए जिम्मेदार हूँ।

कि इसमें उल्लिखित उत्पाद घरेलू मूल्यवर्धन सही नहीं पाये जाने और मूल्यवर्धन के लिए निर्धारित मानदंडों को पूरा नहीं किये जाने की स्थिति में, घरेलू मूल्यवर्धन का आकलन करने के उद्देश्य से खरीद करने वाली एजेंसी के आकलन के आधार पर मैं 36 महीनों की अवधि के लिए किसी सरकारी निविदा से अयोग्य ठहराया जाऊंगा। इसके अलावा मैं इस प्रकार के आकलन की सभी लागतों का वहन करूंगा।

कि मैंने अधिसूचना संख्या \_\_\_\_\_ जिसमें सरकारी खरीद में घरेलू स्तर पर निर्मित लौह एवं इस्पात उत्पादों को बरीयता दी गई है, में संदर्भित सभी शर्तों का पालन किया है और यह कि खरीद करने वाली एजेंसी को एतद् द्वारा अधिकार दिया जाता है कि वह मेरे ई एम डी को जप्त करे। मैं यह भी वचन देता हूँ कि आकलन की लागत का भुगतान करूंगा और निविदा दस्तावेज में यथा उल्लिखित सभी दण्ड राशि का भुगतान करूंगा।

मैं 8 वर्षों की अवधि के लिए कम्पनी के रिकॉर्ड में निम्नलिखित सूचना रखने के लिए सहमत हूँ और किसी सांविधिक प्राधिकारी को सत्यापन के लिए इसे उपलब्ध कराऊंगा।

- i. बोली लगाने वाले का नाम और ब्यौरा (पंजीकृत कार्यालय, विनिर्माण इकाई का स्थान, कानूनी प्रतिष्ठान की प्रकृति)
- ii. वह तिथि जब यह प्रमाण पत्र जारी किया गया है।
- iii. लौह एवं इस्पात उत्पाद जिसके लिए इस प्रमाण पत्र को प्रस्तुत किया जाता है।
- iv. खरीद करने वाली एजेंसी जिसे यह प्रमाण पत्र प्रस्तुत किया जाता है।
- v. दावा की गई घरेलू मूल्यवर्धन की प्रतिशतता और क्या यह निर्धारित घरेलू मूल्यवर्धन के आरंभिक मूल्य को पूरा करता है।
- vi. विनिर्माता की इकाई का नाम और संपर्क विवरण
- vii. लौह और इस्पात उत्पादों की निवल बिक्री कीमत
- viii. संयंत्र तक भाड़ा, बीमा और रखरखाव
- ix. लौह एवं इस्पात उत्पादों का निर्माण करने के लिए उपयोग की जाने वाली इनपुट इस्पात (आयात किया गया) की सूची और कुल लागत मूल्य।
- x. इनपुट इस्पात जिसकी आपूर्ति घरेलू स्तर पर की जाती है की सूची और कुल लागत
- xi. कृपया यदि इनपुट इन हाऊस नहीं हो तब आपूर्तिकर्ताओं से प्राप्त घरेलू मूल्यवर्धन प्रमाणपत्र संलग्न करें।
- xii. आयात किये गये इनपुट इस्पात के लिए, सी आई एफ मूल्य, शुल्क और करों, पोर्ट पर उतारने से संबंधित प्रभारों और अंतर्देशीय भाड़े की लागत के ब्यौरे के साथ भारतीय पोर्ट पर पहुंच कीमत।

(प्रतिष्ठान/कंपनी का नाम) के लिए और उसकी ओर से

अधिकृत हस्ताक्षरकर्ता (निदेशक बोर्ड द्वारा विधिवत अधिकृत किये जाने के लिए)

<नाम, पदनाम और संपर्क सं. की प्रविष्टि करें>



## MINISTRY OF STEEL

## NOTIFICATION

New Delhi, the 29th May, 2019

**G.S.R. 385(E).**—The revised Policy for providing preference to domestically manufactured Iron & Steel Products in Government procurement is hereby published for general information.

[F. No.3(2)/2018-IDD]

RASIKA CHAUBE, Addl. Secy.

**POLICY FOR PROVIDING PREFERENCE TO DOMESTICALLY MANUFACTURED IRON & STEEL PRODUCTS IN GOVERNMENT PROCUREMENT- REVISED, 2019**

**1 Background**

- 1.1 This policy provides preference to Domestically Manufactured Iron and Steel Products (DMI&SP) in Government procurement.
- 1.2 The policy is applicable to iron & steel products as provided in Appendix A and capital goods for manufacturing iron & steel products in Appendix B, produced in compliance to prescribed quality standards, as applicable.
- 1.3 The policy is applicable to every Ministry or Department of Government and all agencies/entities under their administrative control and to projects funded by these agencies for purchase of iron & steel products for government projects. However, this policy shall not apply for purchase of iron & steel products with a view to commercial resale or with a view to use in the production of goods for commercial sale.

**2 Definitions**

- 2.1 **Bidder** may be a domestic/ foreign manufacturer of iron & steel or their selling agents/ authorized distributors/ authorized dealers/ authorized supply houses or any other company engaged in the bidding of projects funded by Government agencies.
- 2.2 **Domestically Manufactured Iron & Steel Products (DMI&SP)** are those iron and steel products which are manufactured by entities that are registered and established in India, including in Special Economic Zones (SEZs). In addition, such products shall meet the criteria of domestic minimum value-addition as mentioned in Appendix A.
- 2.3 **Domestic Manufacturer** is a manufacturer of iron & steel products conforming to guidelines in section 7 and confirming to the definition of 'manufacturer' as per Central Excise Act.
- 2.4 **Government** for the purpose of the Policy means Government of India.
- 2.5 **Government agencies** include Government PSUs, Societies, Trusts and Statutory bodies set up by the Government.
- 2.6 **MoS** shall mean Ministry of Steel, Government of India.
- 2.7 **Net Selling Price** shall be the invoiced price excluding net domestic taxes and duties
- 2.8 **Semi-Finished Steel** shall mean Ingots, billet, blooms and slabs, which can be subsequently processed to finished steel.
- 2.9 **Finished Steel** shall mean Flat and Long products, which can be subsequently processed into manufactured items.
- 2.10 **L1** means the lowest tender or the lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.
- 2.11 **Margin of purchase preference** means the maximum extent to which the price quoted by a domestic supplier may be above L1 for the purpose of purchase preference. In case of DMI&SP policy, the margin of purchase preference shall be 20% for items in Appendix B.
- 2.12 **Iron & Steel Product(s)** shall mean such iron and steel product(s) which are mentioned in Appendix A.
- 2.13 **Domestic value addition** shall be the net selling price (invoiced price excluding net domestic taxes and duties) minus the landed cost of imported input materials at the manufacturing plant in India (including all customs duties) as a proportion of the net selling price, in percent. The 'domestic value addition' definition shall be in line with the DPIIT (formerly DIPP) guidelines, and shall be suitably amended in case of any changes by DPIIT in the future. For the purpose of this policy document, domestic value addition and local content have been used interchangeably.

### 3 Exclusions

3.1 Waivers shall be granted by the Ministry of Steel to all such Government procurements subject to the below conditions.

3.1.1 Where specific grades of steel are not manufactured in the country, or

3.1.2 Where the quantities as per the demand of the project cannot be met through domestic sources

The exclusion requests shall be submitted to the Standing Committee along with sufficient proof of unavailability of domestically manufactured iron & steel products

### 4 Standing Committee

A Standing Committee under the Ministry of Steel (MoS) to be chaired by the Secretary (Steel), shall be constituted to oversee the implementation of the policy. The Committee shall comprise of experts drawn from Industry / Industry Association / Government Institution or Body / Ministry of Steel (MoS). The said Committee in MoS shall have the mandate for the following:

4.1 Monitoring the implementation of the policy

4.2 Review and notify the list of Iron & Steel products and the domestic value addition requirement criteria as mentioned at Appendix A and Appendix B.

4.3 Issue necessary clarifications for implementation of the policy including grant of exclusions to procuring agencies as per section 3

4.4 Constitute a separate committee to carry out grievance redressal

4.5 The Standing Committee shall submit its recommendations for approval to Ministry of Steel.

### 5 Notifying Iron & Steel Products Procured by Government

5.1 The following guidelines may be used for identifying and notifying the aforementioned products under the policy:

5.1.1 The policy is applicable to iron & steel products as provided in Appendix A and to capital goods for manufacturing iron & steel products in Appendix B.

5.1.2 Appendix A contains list of iron & steel products which are to be exclusively domestically manufactured and cannot be imported without the approval of the Ministry of Steel

5.1.3 Appendix B contains a list (non-exhaustive) of capital goods for which purchase preference shall be provided to domestically manufactured capital goods, if their quoted price falls within 20% of the price quoted for corresponding imported capital good.

5.1.4 The objective of the policy is to notify all iron & steel products which are procured by Government Agencies for government projects and not with a view to commercial resale or with a view to use in the production of products for commercial sale.

5.1.5 The policy is applicable to all projects funded by Ministry or Department of Government and all agencies/entities under their administrative control for purchase of iron & steel products.

5.1.6 The policy shall be applicable to projects where the procurement value of iron and steel products is greater than Rs. 25 crores. The policy shall also be applicable for other procurement (non-project), where annual procurement value of iron and steel products for that Government organization is greater than Rs. 25 crores.

5.1.7 The policy is applicable to purchase of iron & steel products by private agencies for fulfilling an EPC contract and/or any other requirement of Ministry or Department of Government or their PSUs.

5.1.8 Analysis of the availability of various grades of domestic iron and steel products needs to precede for notification under the policy. Only those iron & steel products, in respect of which at least one domestic manufacturer exists, shall be notified. Consultation may be carried out by the Standing Committee.

5.1.9 The policy is applicable to capital goods for manufacturing iron & steel products in Appendix B produced in compliance to prescribed quality standards, as applicable.

5.1.10 Policy for domestic procurement of capital goods for manufacturing iron and steel products is applicable to all public sector steel manufacturers and all agencies/entities under their administrative control for purchase of capital goods for manufacturing iron & steel products, not with a view to commercial resale.

5.1.11 The policy is applicable to purchase of capital goods for manufacturing iron & steel products by private agencies for fulfilling an EPC contract and/or any other requirement of public sector steel manufacturers and all agencies/entities under their administrative control

- 5.1.12 Government agencies which are involved in procurement of iron and steel products, and capital goods for manufacturing of iron and steel products, in cases where the iron and steel products are not mentioned in Appendix A and Appendix B, shall provide description and technical specifications of the product along with prescribed standards to the Standing Committee. The Standing Committee will act as per mandate in section 3 and section 4.
- 5.2 The Ministry of Steel (MoS) would notify iron & steel products along with the minimum prescribed domestic value addition, furnished at Appendix A.
- 5.3 The policy guidelines on capital goods for manufacturing iron & steel products shall be applicable to public sector steel manufacturers for all purchases of capital goods for manufacturing iron & steel products in Appendix B, irrespective of the project size.
- 5.4 Minimum domestic value addition requirement suggested for iron and steel products in Appendix A, and for capital goods for manufacturing iron and steel products in Appendix B have been decided on the basis of factors such as domestic supplier base, number of suppliers and import to consumption ratio.
- 5.5 The domestic value addition requirement norm shall be so calibrated that it reflects the average/above average manufacturing capability of the domestic industry for the iron & steel products at a point of time. This shall be suitably reviewed by the Standing Committee from time to time and amended, if required with the approval of Ministry of Steel.

#### **6 Tender procedure for procurement by government and government agencies**

- 6.1 The procuring/ Government agencies shall follow standard procurement procedures, in accordance with instructions of Ministry of Finance and CVC while adhering to DMI&SP. The policy shall come into effect from the date of its notification in all tenders where price bid have not been opened.
- 6.2 The tender document, for procurement of both Goods as well as for EPC contracts, should explicitly outline the qualification criteria for adherence to minimum prescribed domestic value addition by the bidder for iron and steel products and capital goods for manufacturing iron & steel products(as indicated in Appendix A and Appendix B)
- 6.3 In supporting the growth of domestic products, the target of domestic value addition in iron and steel business activities has been set as contained in **Appendix A and Appendix B**.
- 6.4 For iron and steel products in Appendix A, the procurement process shall be open only to the manufacturers / suppliers having the capability of meeting / exceeding the domestic value addition targets. Manufacturers / suppliers not meeting the domestic value addition targets are not eligible to participate in the bidding.
- 6.5 In case of Appendix B items, if in the opinion of the procuring company, the tenders (procured quantity) cannot be divided in the prescribed ratio of 50:50, then they shall have the right to award contract to the eligible domestic manufacturer for quantity not less than 50%, as may be divisible.
- 6.6 In continuation to the above clause, for Appendix B items, if the tendered item is non divisible, (to be included in the tender document by procuring company) the contract can be awarded to the eligible domestic manufacturer for the entire quantity.
- 6.7 In case of Appendix B items, if none of the eligible manufacturers meeting domestic value addition requirements match the L1 bid, the original bidder holding L1 bid shall secure the order for full value of procurement.
- 6.8 The bidders who are selling agents/ authorized distributors/ authorized dealers/ authorized supply houses of the domestic manufacturers of iron & steel products are eligible to bid on behalf of the domestic manufacturers under the policy. However, this shall be subject to the following conditions:
- 6.8.1 The bidder shall furnish the authorization certificate issued by the domestic manufacturer for selling domestically manufactured iron & steel products.
- 6.8.2 In case the procurement is covered under Appendix A of the DMI&SP policy, the bidder shall furnish the Affidavit of self-certification issued by the domestic manufacturer to the procuring agency declaring that the iron & steel products is domestically manufactured in terms of the domestic value addition prescribed.
- 6.8.3 In case the procurement is covered under Appendix B of the DMI&SP policy, the bidder shall furnish the certification issued by the statutory auditor to domestic manufacturer declaring that the capital goods to be used in Iron & Steel industry are domestically manufactured in terms of the domestic value addition prescribed.
- 6.8.4 It shall be the responsibility of the bidder to furnish other requisite documents required to be issued by the domestic manufacturer to the procuring agency as per the policy.

**7 Domestic value addition requirement**

- 7.1 Minimum domestic value addition requirement to qualify the product as a domestically manufactured iron & steel product or a Capital good are mentioned in Appendix A and B.
- 7.2 Domestic value addition shall be the net selling price (invoiced price excluding net domestic taxes and duties) minus the landed cost of imported input materials at the manufacturing plant in India (including all customs duties) as a proportion of the net selling price, in per cent.
- 7.2.1 In case the iron & steel products are made using domestic input steel (semi-finished/ finished steel), invoices of purchases from the actual domestic producers along with quantities purchased and the other related documents must be furnished to the procuring Government agency.
- 7.2.2 In case the iron & steel products have imported input steel, the invoices of purchases from the actual producers along with quantities purchased and the other related documents must be furnished separately. To derive the extent of domestic value addition, the weighted average of both (imported & domestic) input steel shall be considered to ensure that the minimum stipulated domestic value addition requirement of the policy is complied with.
- 7.3 It is recommended that each bidder participating in the tender process should calculate the domestic value addition using the below formula below so as to ensure the domestic value addition claimed is consistent with the minimum stipulated domestic value addition requirement of the policy.

**For Iron and Steel products**

*% Domestic value addition*

$$= \frac{\text{Net selling price of final product} - \text{Landed cost of imported iron or steel at plant}}{\text{Net selling price of final product}} \times 100\%$$

**For Capital Goods**

*% Domestic value addition*

$$= \frac{\text{Net selling price of final product} - \text{Landed cost of imported input materials at plant}}{\text{Net selling price of final product}} \times 100\%$$

**8 Certification and audit**

- 8.1 For products in Appendix A, each domestic manufacturer shall furnish the Affidavit of self-certification to the procuring Government agency declaring that the iron & steel products are domestically manufactured in terms of the domestic value addition prescribed. For capital goods in Appendix B, the bidder shall furnish the certification issued by the statutory auditor to the domestic manufacturer declaring that the capital goods are domestically manufactured in terms of the domestic value addition prescribed. The bidders who are sole selling agents / authorized distributors / authorized dealers / authorized supply houses of the domestic manufacturers of iron & steel products are eligible to bid on behalf of domestic manufacturers under the policy. The bidder shall furnish the Affidavits of self-certification issued by the domestic manufacturers and the certifications issued by the statutory auditors, to the procuring agency declaring that the iron & steel products are domestically manufactured in terms of the domestic value addition prescribed. The Affidavit of self-certification shall be furnished in **Form I** attached to these guidelines.
- 8.2 It shall be the responsibility of the domestic manufacturer to ensure that the products so claimed are domestically manufactured in terms of the domestic value addition prescribed for the product. The bidder shall also be required to provide a domestic value addition certificate on half-yearly basis (Sep 30 and Mar 31), duly certified by the Statutory Auditors of the domestic manufacturer, that the claims of domestic value addition made for the product during the preceding 6 months are in accordance with the Policy. Such certificate shall be filed within 60 days of commencement of each half year, to the concerned Government agencies and shall continue to be filed till the completion of supply of the said products.
- 8.3 The procuring agency shall accept the Affidavit of self-certification regarding domestic value addition in a steel product submitted by a bidder. It shall not normally be the responsibility of procuring agency to verify the correctness of the claim. The onus of demonstrating the correctness of the same shall be on the bidder when asked to do so.
- 8.4 In case a complaint is received by the procuring agency or the concerned Government Agency against the claim

of a bidder regarding domestic value addition in iron & steel products, the procuring agency shall have full rights to inspect and examine all the related documents and take a decision. In case any clarification is needed, matter may be referred to MoS with a request for technical assistance.

- 8.5 Any complaint referred to the Government Agency shall be disposed off within 4 weeks of the reference along with submission of all necessary documents. The bidder shall be required to furnish the necessary documentation in support of the domestic value addition claimed in iron & steel products to the Government Agency within 2 weeks of filing the complaint.
- 8.6 In case, the matter is referred to the Ministry of Steel, the grievance redressal committee setup under the MoS shall dispose of the complaint within 4 weeks of its reference and receipt of all documents from the bidder after taking in consideration, the view of the Government Agency. The bidder shall be required to furnish the necessary documentation in support of domestic value addition claimed in iron & steel products to the grievance redressal committee under MoS within 2 weeks of the reference of the matter. If no information is furnished by the bidder, the grievance redressal committee may take further necessary action, in consultation with Government Agency to establish bonafides of claim.
- 8.7 The cost of assessing the prescribed extent of domestic value addition shall be borne by the procuring agency if the domestic value addition is found to be correct as per the certificate. However, if it is found that the domestic value addition as claimed is incorrect, the cost of assessment will be payable by the bidder who has furnished an incorrect certificate. The manner of enforcing the same shall be defined in the tender document.

#### 9 Sanctions

- 9.1 Each Government Agency shall clearly define the penalties, in case of wrong declaration by the bidder of the prescribed domestic value addition, in the tender document. The penalties may include forfeiting of the EMD, other financial penalties and blacklisting of such manufacturer/ service provider.
- 9.2 In case of reference of any complaint to MoS by the concerned bidder, there would be a complaint fee of Rs. 10 Lakh or 0.2 % of the value of the DMI&SP being procured (subject to a maximum of Rs. 20 Lakh), whichever is higher, to be paid by Demand Draft deposited with the grievance redressal committee under MoS along with the complaint by the complainant. In case, the complaint is found to be incorrect, the Government Agency reserves the right to forfeit the said amount. In case, the complaint is found to be substantially correct, deposited fee of the complainant would be refunded without any interest.

#### 10 Implementation monitoring by Ministry of Steel

- 10.1 The policy provisions shall be applicable for a period of 5 years from the date of publication. The policy period may further be extended at the discretion of Ministry of Steel.
- 10.2 MoS shall be the nodal ministry to monitor the implementation of the policy.
- 10.3 All applicable agencies under DMI&SP policy shall ensure implementation of the policy and shall annually, in the month of June, send a declaration indicating the extent of compliance to the policy and reasons for noncompliance thereof, during the preceding financial year.

#### Reference to Ministry of Steel

In case of a question whether an item being procured is a DMI&SP to be covered under the policy, the matter would be referred to the Ministry of Steel for clarification.

#### Appendix A - Exclusive for domestically manufactured products

Sl. No.	Indicative list of Iron & Steel Products	Applicable HS code	Minimum domestic value addition requirement
1	Flat-rolled products of iron or non alloy steel, of a width of 600 mm or more, hot rolled, not clad, plated or coated	7208	50%
2	Flat-rolled products of iron or non alloy steel, of a width of 600 mm or more, cold rolled (cold-reduced), not clad, plated or coated	7209	50%
3	Flat-rolled products of iron or non alloy steel, of a width of 600 mm or more, clad, plated or coated	7210	50%

4	Flat-rolled products of iron or non alloy steel, of a width of less than 600 mm, not clad, plated or coated	7211	35%
5	Flat-rolled products of iron or non alloy steel, of a width of less than 600 mm, clad, plated or coated	7212	35%
6	Bars and rods, hot-rolled, in irregularly wound coils, of iron or non-alloy steel	7213	35%
7	Other bars and rods of iron or non alloy steel, not further worked than forged, hot rolled, hot-drawn or hot-extruded, but including those twisted after rolling	7214	35%
8	Other bars and rods of iron or non alloy steel	7215	35%
9	Angles, shapes and sections of iron or non-alloy steel	7216	35%
10	Wire of iron or non-alloy steel	7217	50%
11	Flat-rolled products of stainless steel, of a width of 600 mm or more	7219	50%
12	Flat-rolled products of stainless steel, of a width of less than 600 mm	7220	50%
13	Other bars and rods of stainless steel; angles, shapes and sections of stainless steel	7222	50%
14	Wire of other alloy steel	7229	35%
15	Rails, railway or tramway track construction material of iron or steel	7302	50%
16	Tubes, pipes and hollow profiles, of cast iron	7303	35%
17	Tubes, pipes and hollow profiles, seamless, of iron (other than cast iron) or steel	7304	35%
18	Other tubes and pipes (for example, welded, riveted or similarly closed), having circular cross-sections, the external diameter of which exceeds 406.4 mm, of iron or steel	7305	35%
19	Other tubes, pipes and hollow profiles (for example, open seam or welded, riveted or similarly closed), of iron or steel	7306	35%
20	Tube or pipe fittings (for example, connectors/couplings, elbow sleeves), of iron or steel	7307	35%
21	Bars and rods, hot-rolled, in irregularly wound coils, of stainless steel	7221	35%
22	Wire of stainless steel	7223	35%
23	Flat-rolled products of other alloy steel, of a width of 600 mm or more, including electrical steel	7225	35%
24	Flat-rolled products of other alloy steel, of a width of less than 600 mm, including electrical steel	7226	35%
25	Bars and rods, hot-rolled, in irregularly wound coils, of other alloy steel	7227	15%
26	Other bars and rods of other alloy steel; angles, shapes and sections, of other alloy steel; hollow drill bars and rods, of alloy or nonalloy steel	7228	35%
27	Sheet piling of iron or steel, whether or not drilled, punched or made from assembled elements; welded angles, shapes and sections, of iron or steel	7301	15%
28	Structures (excluding prefabricated buildings of heading 9406) and parts of structures	7308	15%
29	Reservoirs, tanks, vats and similar containers for any material (other than compressed or liquefied gas), of iron or steel, of a capacity exceeding 300 whether or not lined or heatinsulated, but not fitted with mechanical or Thermal equipment	7309	15%

30	Tanks, casks, drums, cans, boxes and similar containers, for any material (other than compressed or liquefied gas), of iron or steel, of a capacity not exceeding 300 L, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment	7310	15%
31	Containers for compressed or liquefied gas, of iron or steel	7311	15%
32	Stranded wire, ropes, cables, plaited bands, slings and the like, of iron or steel, not electrically insulated	7312	15%
33	Barbed wire of iron or steel; twisted hoop or single flat wire, barbed or not, and loosely twisted double wire, of a kind used for fencing, of iron or steel	7313	15%
34	Grill, netting and fencing, of iron or steel wire; expanded metal of iron or steel	7314	15%
35	Chain and parts thereof, of iron or steel	7315	15%
36	Anchors, grapnels and parts thereof, of iron or steel	7316	15%
37	Articles of iron and steel	7317	15%
38	Articles of iron and steel	7318	15%
39	Articles of iron and steel	7319	15%
40	Springs and leaves for springs, of iron or steel	7320	15%
41	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas-rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel	7321	15%
42	Radiators for central heating, not electrically heated, and parts thereof, of iron or steel; air heaters and hot air distributors, not electrically heated, incorporating a motor-driven fan or blower, and parts thereof, of iron or steel	7322	15%
43	Tables and similar household articles and parts thereof, of iron or steel	7323	15%
44	Sanitary ware and parts thereof, of iron or steel	7324	15%
45	Other cast articles of iron or steel	7325	15%
46	Electrical steel and other articles of iron or steel	7326	15%
47	Railway or tramway passenger coaches, not self-propelled	8605	50%
48	Railway or tramway goods vans and wagons, not self-propelled	8606	50%
49	Parts of railway or tramway locomotives or rolling-stock; such as bogies, bissel-bogies, axles and forged wheels, and parts thereof	8607	50%

Products included in descriptions are indicative; all products under the specified HS codes are included as part of the appendix

#### **Appendix B**

##### **Indicative list of capital goods(non-exhaustive) for manufacturing iron & steel products**

Sl. No.	Plant shop	Capital goods	Minimum domestic value addition requirement
1	Raw material handling system	Apron feeder, barrel couplings, heavy duty bearings, hydraulic disc brakes, tanker & container for powdered materials, conveyor belt for pipe conveyors, high angle conveyor system, crushers, crane rail lubrication system, four girder EOT Crane, crane weighing system, crane air conditioning, fluid couplings, fork lift trucks, hydraulic motors, hydraulic system, locking assembly (friction grip), load cells, level sensors, pipe	50%

		conveyor system, plough/ paddle feeder, pneumatic transportation - dense & lean phase, reclaimers, radio remote control, rail fixing arrangements (special), rapid/ flood loading system, stackers, special screen, slew ring bearings, tipplers, transfer cars, tongs (special), vibration, isolation system (spring damper), wagon tipplers, wagon loaders	
2	Mineral beneficiation (iron ore and coal) equipment	Industrial crushers, grinding mills, conventional screens, slurry pumps, hire thickeners, filters, hydroclones	50%
3	Coke oven	Coke Oven Silica Refractory, Anchorage System, Waste gas valve with branch pipe, Flash Plate, Door Frame, door body, Minor Casting: Gooseneck, Valve box, AP Lid, Charging & inspection hole lid and frame Reversing mechanism, Centralised lubrication system, Hydrojet Door Cleaning Mechanism, Spillage code conveyor system, skip hoist, Door Lowering Rack, Isolation/ Reversing Cocks, Level II automation, Oven machines	50%
4	By-product plant	Primary Gas Cooler, Electrostatic Tar Precipitator, H <sub>2</sub> S, NH <sub>3</sub> & Naphthalene Scrubber, Combi Stripper, Flushing Liquor Pump, Claus Kiln, Claus reactors, Waste Heat Boilers, Decanters	50%
5	Sinter plant equipment	Pallet car, Drive/discharge end Sprocket assembly, Curved rail, Slide rails, Hot sinter breaker and Grizzly, Dip rail & running rail, Impeller assembly for Process fan, Drive assembly of Sinter machine, Hi-intensity Mixer & Noduliser	50%
6	Pellet plant equipment	Pallet car, Drive/discharge end Sprocket assembly, Curved rail, Slide rails, running rail, Vertical roller mill, Impeller assembly for Process fan, Drive assembly of Indurating machine, Hi-intensity Mixer, Balling disc, Single deck roller screen and Double deck roller screen	50%
7	Blast furnace equipment	Bell less top system with Bleeder valve, SG Iron stove coolers, Copper stove coolers, Stock level indicator (Radar Type), Mud gun, Drilling machine and Manipulator, Gas Cleaning Plant system, Top Recovery Turbine system including its by-pass valve, De-bricking Machine, Re-railing equipment, PCI system, Grinding mill for PCI, Stock level indicator, Tuyere Stock assembly, Waste Heat Recovery system, BF & Hot Blast Stoves Technological Valves, Above Burden probes, Slag granulation unit, Tuyere & Tuyere cooler, Torpedo Ladle Car, BF hearth refractory	50%
8	Direct reduction plant equipment	Charge distributor, Upper & lower seal leg, Reformer & Re-cuperator system, Burden feeders, Turbo-expander, Process Gas Compressor, Seal gas compressors & bottom seal gas compressors, Seal gas generators & driers, Process Gas Heater, CO <sub>2</sub> removal plant	50%
9	Basic oxygen furnace equipment	Main and Maintenance equipment comprising of converter, gunning machine, Refractory/ slag monitoring device, converter vessel, trunnion ring and suspension system, trunnion bearings and housing, Converter bull gear unit and tilt drive system, Rotary joint for converter, bottom stirring system, Lance body with clamping, Lance copper tips, Valve stations for oxygen blowing/ bottom stirring, Sub-lance system, Off gas analyzer with process module i.e. Process software/ hardware, container lab Measurement probes, Switch over station, ID fan for primary gas, Hot metal and steel ladle, Ladle Transfer car, Ladle maintenance equipment, Slag pot, Slag pot transfer car, Scrap boxes, Scrap Transfer car, Lance carriage, Lance guide, Crane & hoist, Lance hoist & trolley, Lance tilting device, Traverse for lifting lances, Bunker of various sizes, Bin Vibrator, Weighing Hopper, Maintenance stands, De dusting suction hood, Teeming/HM, ladle relining stands, Stand Cooling stack inspection device, Hood traverse carriage, Refractories, Bypass & isolation valves, Flare stack & ignition system, Scrubbing tower	50%



		shell - Wet gas cleaning system, Dog house, Ladle drier, ladle pre-heater, ladle cooler, Fume collection hoods, Clean gas stack, Dust silo, Weigh Bridge, Slag retaining device	
10	Electric arc furnace	Furnace proper (includes furnace lower shell, upper shell and roof, Tilting platform, Furnace Gantry) and transformer, Electrode regulation system, Hydraulic system, Refractories, Parts of Level I & Level II Automation system. LF - water cooled ladle roof, electrode mast and arms, electrode regulating system, wire feeding system, Bottom inert gas stirring Valve stand for porous plug and top lance, Emergency lance mechanism, Lance carriage system with drive unit, Automatic temperature, sampling & bath level / O <sub>2</sub> measurement, Temp. & oxygen immersion lance, lance carriage system with drive unit, Hydraulic system, Refractories, Ladle roof Delta portion, RH proper (includes Ladle transfer car, vacuum vessel, Vessel lifting & lowering system. Hydraulic system, Multi Function lance, Valve racks/station, Electrode clamp unit, conductor of electrode arms, water cooled cable, A R stirring valve rack, lance transport car, Refractory lance, Hydraulic cylinder, Ladle roof lifting cylinder, Lubrication system, Suction hood, damper, Vibro feeder, weighing hopper, wire feeding system, Electrode nipping stand, Cranes, hoist, Temperature & sampling tips, ladle stands, ESP, Deducing hoods, Refractories, bag filter, Cranes etc.	50%
11	Continuous casting equipment	Ladle turret, ladle cover manipulator, Ladle Shroud manipulator, tundish car, Continuous tundish temperature measurement system, Tundish stopper rod mechanism, emergency cut-off gate, mould assembly, Nozzle quick change device, mould oscillator and EMS system. Electro-Magnetic braking system, Strand guide segment, Withdrawal & Straightening unit (WSU), Roll gap checker, Emergency torch cutter, Torch cutting machine, Deburrer, Marking machine, Technological control system & process models, Black Refractories, strand gunde segment, tundish, ladle cover, roller tables & auxiliaries, mould& segment maintenance equipments, tundish maintenance equipments, EMBR system	50%
12	Flat product mills	Large castings and forgings like mill housing, bed plates, work rolls, backup rolls, end spindles; roller tables, backup roll and work roll chucks, coilers / tension reels / uncoilers, AGC cylinders, shears, levelers, lazer welders, packaging machines, non-contact gauges / profile gauges, anti-friction roll neck bearings, oil film bearings, gear boxes, mill motors	50%
13	Long product mills	Mill housing, bed plates, work rolls, backup rolls, spindles; roller tables, coilers / tension reels / uncoilers, shears, billet welder, packaging machines, non-contact gauges / profile gauges, anti-friction roll neck bearings, oil film bearings, finishing blocks, gear boxes, mill motors	50%

*\*Items in appendix B are an indicative list of capital goods for manufacturing steel, the list is not exhaustive. All capital goods for steel manufacturing shall be considered for purchase preference under the policy with a minimum domestic value addition requirement of 50%*

#### Form-1

**Format for Affidavit of Self Certification regarding Domestic Value Addition in Iron & Steel Products/capital goods to be provided on Rs.100/- Stamp Paper Date:**

I \_\_\_\_\_ S/o, D/o, W/o, \_\_\_\_\_ Resident of \_\_\_\_\_ hereby solemnly affirm and declare as under:

That I will agree to abide by the terms and conditions of the policy of Government of India issued vide Notification No: \_\_\_\_\_.

That the information furnished hereinafter is correct to the best of my knowledge and belief and I undertake to produce relevant records before the procuring agency (ies) for the purpose of assessing the domestic value addition.

That the domestic value addition for all inputs which constitute the said iron & steel products has been verified by me and I am responsible for the correctness of the claims made therein.

That in the event of the domestic value addition of the product mentioned herein is found to be incorrect and not meeting the prescribed value-addition criteria, based on the assessment of procuring agency (ies) for the purpose of assessing the domestic value-addition, I will be disqualified from any Government tender for a period of 36 months. In addition, I will bear all costs of such an assessment.

That I have complied with all conditions referred to in the Notification No. \_\_\_\_\_ wherein preference to domestically manufactured iron & steel products in Government procurement is provided and that the procuring agency (ies) is hereby authorized to forfeit and my EMD. I also undertake to pay the assessment cost and pay all penalties as specified in the tender document.

I agree to maintain the following information in the Company's record for a period of 8 years and shall make this available for verification to any statutory authority.

- i. Name and details of the Bidder (Registered Office, Manufacturing unit location, nature of legal entity)
- ii. Date on which this certificate is issued
- iii. Iron & Steel Products for which the certificate is produced
- iv. Procuring agency to whom the certificate is furnished
- v. Percentage of domestic value addition claimed and whether it meets the threshold value of domestic value addition prescribed
- vi. Name and contact details of the unit of the manufacturer (s)
- vii. Net Selling Price of the iron & steel products
- viii. Freight, insurance and handling till plant
- ix. List and total cost value of input steel (imported) used to manufacture the iron & steel products
- x. List and total cost of input steel which are domestically sourced.
- xi. Please attach domestic value addition certificates from suppliers, if the input is not in house.
- xii. For imported input steel, landed cost at Indian port with break-up of CIF value, duties & taxes, port handling charges and inland freight cost.

**For and on behalf of (Name of firm / entity)**

Authorized signatory (To be duly authorized by the Board of Directors)

<Insert Name, Designation and Contact No.>



भारत का राजपत्र  
The Gazette of India

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असाधारण  
EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (i)  
PART II—Section 3—Sub-section (i)

प्राधिकार से प्रकाशित  
PUBLISHED BY AUTHORITY

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No. 1]

नई दिल्ली, शुक्रवार, जनवरी 1, 2021/पौष 11, 1942  
NEW DELHI, FRIDAY, JANUARY 1, 2021/PAUSHA 11, 1942

इस्पात मंत्रालय

अधिसूचना

नई दिल्ली, 31 दिसम्बर, 2020

सा.का.नि. 1(अ).—सरकारी प्रापण में देशी निर्मित लोहा और इस्पात उत्पादों को प्राथमिकता प्रदान करने हेतु नीति (डीएमआई एंड एसपी नीति) - परिशोधित, 2019 में संशोधनों को आम सूचना के लिए एतद्वारा प्रकाशित किया जाता है:

"सं. S-13026/1/-2020-आईडीडी

इस्पात मंत्रालय

आईडीडी प्रभाग

उद्योग भवन,

नई दिल्ली 31 दिसंबर, 2020

**विषय :** सरकारी खरीद में घरेलू निर्मित लोहा और इस्पात उत्पादों को प्राथमिकता प्रदान करने की नीति-परिशोधित, 2019-में संशोधन/परिवर्धन

सरकारी खरीदमें स्वदेशी निर्मित लोहा और इस्पात उत्पादों को प्राथमिकता प्रदान करने की नीति-परिशोधित, 2019-(डीएमआईएंडएसपी परिशोधित, 2019) में निम्नलिखित संशोधन/ परिवर्धन तत्काल प्रभाव से लागू हैं। ये संशोधन/

परिवर्धन ऐसी निविदा या खरीद पर लागू नहीं होंगे जिनके लिए निविदा आमंत्रित करने वाला नोटिस अथवा अन्य प्रकार का खरीद अध्याचन इस अधिसूचना के जारी होने से पूर्व जारी हुआ है।

**1 – संशोधन:तालिका 1**

क्रम सं.	डीएमआईएंडएसपी परिशोधित 2019 ,में मौजूदा खंड	डीएमआईएंडएसपी परिशोधित 2019 ,में संशोधित खंड
1	<p><b>खंड 1.3:</b></p> <p>यह नीति सरकार के प्रत्येक मंत्रालय अथवा विभाग और उनके प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/ प्रतिष्ठानों तथा सरकारी परियोजनाओं के वास्ते लौह एवं इस्पात उत्पादों की खरीद के लिए इन एजेंसियों द्वारा वित्तपोषित परियोजनाओं पर लागू है। हालांकि, यह नीति वाणिज्यिक पुनः बिक्री के उद्देश्य से अथवा वाणिज्यिक बिक्री के लिए वस्तुओं के उत्पादन में उपयोग करने के उद्देश्य से लौह एवं इस्पात उत्पादों की खरीद पर लागू नहीं होगी।</p>	<p><b>खंड 1.3:</b></p> <p>यह नीति सरकार के प्रत्येक मंत्रालय अथवा विभाग और उनके प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/ प्रतिष्ठानों तथा सरकारी परियोजनाओं के वास्ते लौह एवं इस्पात उत्पादों की खरीद के लिए इन एजेंसियों द्वारा वित्त पोषित परियोजनाओं पर लागू है। केन्द्रीय क्षेत्र की सभी योजनाएं (सीएस)/ केन्द्रीय प्रायोजित योजनाएं (सीएसएस) जिनके लिए राज्यों और स्थानीय निकायों द्वारा खरीद की जाती है, इस नीति की परिधि में आएंगी यदि उस परियोजना/योजना को भारत सरकार द्वारा पूर्णतया/ अंशतः वित्तपोषित किया जाता है।</p> <p>हालांकि, यह नीति वाणिज्यिक पुनः बिक्री के उद्देश्य से अथवा वाणिज्यिक बिक्री के लिए वस्तुओं के उत्पादन में उपयोग करने के उद्देश्य से लौह एवं इस्पात उत्पादों की खरीद पर लागू नहीं होगी।</p>
2	<p><b>खंड 2.13:</b></p> <p>घरेलू मूल्यवर्धन निवल बिक्री कीमत(निवलघरेलू करों और शुल्कों को छोड़कर बीजक कीमत) होगी जिससे प्रतिशत में निवल बिक्री कीमत के एक अनुपात के रूप में भारत में निर्माण संयंत्र(सभी सीमा शुल्कों सहित) में आयात की गई इनपुट सामग्री की पहुंच लागत घटाई गई हो, 'घरेलू मूल्यवर्धन'परिभाषा डी पी आई आई टी (पूर्व में डी आई पी पी) के दिशानिर्देशों के अनुरूपहोगी और उसमें भविष्य में डी पी आई आई टी द्वारा परिवर्तन किये जाने की स्थिति में उपयुक्त रूप से संशोधन किया जायेगा। इस नीति दस्तावेज के प्रयोजन के लिए घरेलूमूल्यवर्धन और स्थानीय विषय वस्तु का उपयोग एक दूसरे के स्थान पर किया गया है।</p>	<p><b>खंड 2.13:</b></p> <p>घरेलू मूल्यवर्धन का तात्पर्य है- भारत में वर्धित मूल्य की राशि जो खरीदी/बेची जाने वाली वस्तुओं का कुल मूल्य होगा (निवल घरेलू अप्रत्यक्ष करों को छोड़कर)- खरीदी/बेची जाने वाली वस्तुओं के कुल मूल्य के समानुपात के रूप में प्रतिशत में मद में आयातित सामग्री का मूल्य (सभी सीमा शुल्कों सहित)। घरेलू मूल्यवर्धन निवल बिक्री कीमत (निवल घरेलू करों और शुल्कों को छोड़कर बीजक कीमत) होगी जिससे प्रतिशत में निवल बिक्री कीमत के एक अनुपात के रूप में भारत में निर्माण संयंत्र (सभी सीमा शुल्कों सहित) में आयात की गई इनपुट सामग्री की पहुंच लागत घटाई गई हो, 'घरेलू मूल्यवर्धन'परिभाषा डी पी आई आई टी (पूर्व में डी आई पी पी) के दिशानिर्देशों के अनुरूप होगी और उसमें भविष्य में डी पी आई आई टी द्वारा परिवर्तन किये जाने की स्थिति में उपयुक्त रूप से संशोधन किया जायेगा। इस नीति दस्तावेज के प्रयोजन के लिए घरेलू मूल्यवर्धन और स्थानीय विषय वस्तु का उपयोग एक दूसरे के स्थान पर किया गया है।</p>

<p><b>3 खंड 5.1.5</b></p> <p>यह नीति सरकार के मंत्रालय अथवा विभाग के द्वारा वित्त-पोषित सभी परियोजनाओं और उनके प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/ प्रतिष्ठानों पर लौह एवं इस्पात उत्पादों की खरीद के लिए लागू है।</p>	<p><b>खंड 5.1.5</b></p> <p>यह नीति सरकार के मंत्रालय अथवा विभाग के द्वारा वित्त पोषित सभी परियोजनाओं और उनके प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/ प्रतिष्ठानों पर लौह एवं इस्पात उत्पादों की खरीद के लिए लागू है। केन्द्रीय क्षेत्र की सभी योजनाएं (सीएस)/ केन्द्रीय प्रायोजित योजनाएं (सीएसएस) जिनके लिए राज्यों और स्थानीय निकायों द्वारा खरीद की जाती है, इस नीति की परिधि में आएंगी यदि उस परियोजना/योजना को भारत सरकार द्वारा पूर्णतया/अंशतः वित्तपोषित किया जाता है</p>
<p><b>4 खंड 5.1.6</b></p> <p>यह नीति उन परियोजनाओं पर लागू होगी जहां लौह एवं इस्पात उत्पादों का खरीद मूल्य 25 करोड़ रुपए से अधिक होता हो। यह नीति अन्य खरीद (गैर परियोजना) के लिए भी लागू होगी जहां उस सरकारी संगठन के लिए लौह एवं इस्पात उत्पादों का वार्षिक खरीद मूल्य 25 करोड़ रुपए से अधिक होता हो।</p>	<p><b>खंड 5.1.6</b></p> <p>यह नीति उन परियोजनाओं पर लागू होगी जहां लौह एवं इस्पात उत्पादों (डीएमआई एंड एसपी नीति का परिशिष्ट-क) का खरीद मूल्य 5लाख रुपए से अधिक होता हो। यह नीति अन्य खरीद (गैर परियोजना) के लिए भी लागू होगी जहां उस सरकारी संगठन के लिए लौह एवं इस्पात उत्पादों का वार्षिक खरीद मूल्य 5 लाख करोड़ रुपए से अधिक होता हो। तथापि, प्रापण इकाइयों द्वारा इस बात को सुनिश्चित किया जाएगा कि इस नीति के प्रावधानों से बचने के प्रयोजनार्थ खरीद का विभाजन न किया जाए।</p>
<p><b>5 खंड 7.2</b></p> <p>घरेलू मूल्यवर्धन निवल बिक्री कीमत (निवल घरेलू करों और शुल्कों को छोड़कर बीजककीमत) होगी जिसमें से प्रतिशत में निवल बिक्री कीमत के एक अनुपात के रूप में भारत में निर्माण करने वाले संयंत्र में आयात की गई इनपुट सामग्री की पहुंच लागत (सभी सीमा शुल्कों को शामिल करते हुए) घटाई जायेगी।</p>	<p><b>खंड 7.2</b></p> <p>घरेलू मूल्यवर्धन का तात्पर्य है- भारत में वर्धित मूल्य की राशि जो खरीदी/बेची जाने वाली वस्तुओं का कुल मूल्य होगा (निवल घरेलू अप्रत्यक्ष करों को छोड़कर)- खरीदी/बेची जाने वाली वस्तुओं के कुल मूल्य के समानुपात के रूप में प्रतिशत में मद में आयातित सामग्री का मूल्य (सभी सीमा शुल्कों सहित)।</p>
<p><b>6 खंड 7.3</b></p> <p>यह सिफारिश की जाती है कि निविदा की प्रक्रिया में भाग लेने वाले प्रत्येक बोली लगाने वाले को नीचे दिए गए सूत्र का उपयोग करते हुए घरेलू मूल्यवर्धन की गणना करनी चाहिए ताकि यह सुनिश्चित किया जा सके कि दावा किये गये घरेलू मूल्यवर्धन इस नीति के न्यूनतम निर्धारित घरेलू मूल्यवर्धन के अनुरूप है।</p> <p>लौह एवं इस्पात उत्पादों के लिए % घरेलू मूल्यवर्धन</p> <p>अंतिम उत्पाद की निवल बिक्री कीमत- संयंत्र में आयात किये गये लौह अथवा इस्पात की पहुंच लागत----- X100%</p>	<p><b>खंड 7.3</b></p> <p>यह सिफारिश की जाती है कि प्रापण करने वाली सरकारी एजेंसी/ निविदा की प्रक्रिया में भाग लेने वाले प्रत्येक बोली लगाने वाले को नीचे दिए गए सूत्र का उपयोग करते हुए घरेलू मूल्यवर्धन की गणना करनी चाहिए ताकि यह सुनिश्चित किया जा सके कि दावा किये गये घरेलू मूल्यवर्धन इस नीति के न्यूनतम निर्धारित घरेलू मूल्यवर्धन के अनुरूप है।</p> <p>लौह एवं इस्पात उत्पादों तथा पूंजीगत माल के लिए % घरेलू मूल्यवर्धन</p> <p>खरीदी/बेची जाने वाली वस्तु का कुल मूल्य (निवल घरेलू अप्रत्यक्ष करों को छोड़कर - मद में आयातित सामग्री का मूल्य (सभी सीमा शुल्कों सहित) ----- -----X100%</p>

अंतिम उत्पाद की निवल ब्रिकी कीमत पूँजीगत माल के लिए % घरेलू मूल्यवर्धन अंतिम उत्पाद की निवल ब्रिकी कीमत- संयंत्र में आयात किये गये इनपुट सामग्री की पहुंच लागत-----X 100% अंतिम उत्पाद की निवल ब्रिकी कीमत	खरीदी/बेची जाने वाली वस्तु का कुल मूल्य
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II डीएमआईएंडएसपी परिशोधित, 2019 के परिशिष्ट क में निम्नलिखित संशोधन किया जाता है:- जहां कहीं न्यूनतम घरेलू मूल्य वर्धन आवश्यकता कॉलम के अंतर्गत डीएमआईएंडएसपी परिशोधित, 2019 के परिशिष्ट क में 15% का न्यूनतम घरेलू मूल्य वर्धन विनिर्दिष्ट होगा, वहां उसे 20% न्यूनतम घरेलू मूल्यवर्धन से प्रतिस्थापित कर दिया जाएगा (परिशोधित परिशिष्ट-क संलग्न है)

### III- परिवर्धन/सन्निवेशन: तालिका 2

क्रम सं	डीएमआईएंडएसपी परिशोधित, 2019 में शामिल/जोड़े गये खंड
1	<p><b>खण्ड 5.1.13 को खण्ड 5.1.12 के नीचे निम्नवत जोड़ा जाता है:</b></p> <p>खण्ड 5.1.13: लोहे और इस्पात उत्पादों की खरीद से संबंधित निविदाओं के लिए कोई वैश्विक निविदा इन्क्वायरी (जीटीई) आमंत्रित नहीं की जाएगी (डीएमआई और एसपी नीति का परिशिष्ट-क)। लोहे और इस्पात उत्पादों के विनिर्माण जिनका अनुमानित मूल्य 200 करोड़ रु तक हो, (डीएमआई और एसपी नीति के परिशिष्ट- ख) के लिए पूँजीगत सामानों की खरीद से संबंधित निविदाओं के लिए कोई वैश्विक निविदा इन्क्वायरी (जीटीई) व्यय विभाग द्वारा यथा नाम-निर्दिष्ट सक्षम प्राधिकारी के अनुमोदन के अलावा आमंत्रित नहीं की जाएगी,</p>
2	<p><b>खंड 6.9 को खंड 6.8 के नीचे निम्नवत जोड़ा जाता है:</b></p> <p><b>खंड 6.9: निविदाओं और अन्य खरीद अधियाचनों में विनिर्देशन:</b></p> <p><b>6.9.1</b> प्रत्येक क्रय इकाई यह सुनिश्चित करेगी कि किसी भी निविदा या अधियाचन में निर्धारित पिछले अनुभव के संबंध में पात्रता की शर्तों हेतु अन्य देशों में आपूर्ति के प्रमाण या निर्यात के प्रमाण की आवश्यकता नहीं है।</p> <p><b>6.9.2</b> क्रय इकाईयाँ यह देखने का प्रयास करेंगी कि पात्रता की शर्तों, जैसे टर्नओवर, उत्पादन क्षमता और वित्तीय ताकत जैसे मामलों में वैसे स्थानीय आपूर्तिकर्ता का अनुचित अपवर्जन नहीं होता है 'जो आपूर्तिकर्ता की गुणवत्ता या साख संबंधी पात्रता सुनिश्चित करने के लिए जो आवश्यक है, उससे परे अन्यथा पात्र होंगे।</p> <p><b>6.9.3</b> क्रय इकाईयाँ, इस नीति के जारी होने के 2 महीने के भीतर ऊपर उप-पैराग्राफ 6.9.1 और 6.9.2 के संदर्भ में सभी मौजूदा पात्रता मानदंडों और शर्तों की समीक्षा करेंगी।</p> <p><b>6.9.4</b> यदि इस्पात मंत्रालय इस बात से संतुष्ट है कि लौह और इस्पात उत्पादों के भारतीय आपूर्तिकर्ताओं को प्रतिबंधात्मक निविदा शर्तों के कारण किसी भी विदेशी सरकार द्वारा खरीद में भाग लेने और / या प्रतिस्पर्धा करने की अनुमति नहीं है, जिसका भारतीय कंपनियों को प्रतिबंधित करने पर प्रत्यक्ष या अप्रत्यक्ष प्रभाव पड़ता है, जैसे कि प्रापण देश में पंजीकरण, प्रापण देश इत्यादि में विशिष्ट मूल्य की परियोजना का निष्पादन इत्यादि। यदि उपयुक्त समझा जाएगा तो उस देश के बोलीदाताओं को इस्पात मंत्रालय से संबंधित उस वस्तु तथा/ या अन्य वस्तुओं की खरीद के लिए पात्रता से प्रतिबंधित या अपवर्जित किया जा सकता है।</p> <p><b>6.9.5</b> ऊपर उप-पैरा 6.9.4 के प्रयोजन से, किसी आपूर्तिकर्ता या बोलीदाता को उस देश से माना जाएगा यदि (i) इकाई को उस देश में निगमित किया गया है, या (ii) उसकी शेयरधारिता या इकाई का प्रभावी नियंत्रण उस देश से किया जाता है; या (iii) आपूर्ति की जा रही वस्तु के मूल्य का 50% से अधिक उस देश में शामिल किया गया है। भारतीय आपूर्तिकर्ताओं का अर्थ उन संस्थाओं से होगा जो भारत के संबंध में इनमें से किसी भी मानदंड को पूरा करते हैं। किसी देश की 'इकाई' (एन्टिटी) शब्द का अर्थ वहीं होगा जो डीपीआईआईटी की एफडीआई नीति के तहत समय-समय पर यथा संशोधित के अंतर्गत है।</p>

3	<p>खंड 6.10 को खंड 6.9 के नीचे निम्नवत जोड़ा जाता है:</p> <p><b>खंड 6.10:</b> यदि घरेलू आपूर्तिकर्ताओं के खिलाफ प्रतिबंधात्मक या भेदभावपूर्ण शर्तों को बोली दस्तावेजों में शामिल किया जाता है, तो उस के लिए जिम्मेदारी तय करने के लिए खरीद (इसके प्रशासनिक नियंत्रणाधीन किसी ईकाई द्वारा खरीद सहित) करने वाले प्रशासनिक विभाग द्वारा जांच शुरू की जाएगी। तत्पश्चात्, संबंधित प्रावधानों के तहत खरीद संस्थाओं के अधिकारियों के खिलाफ उचित, प्रशासनिक या अन्यथा कार्रवाई की जाएगी। ऐसी सभी कार्रवाई की सूचना डीएमआई और एसपी नीति के तहत स्थायी समिति को भेजी जाएगी।</p>
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संशोधित परिशिष्ट क - घरेलू स्तर पर निर्मित उत्पादों के लिए विशिष्ट रूप से

क्र. सं.	लौह एवं इस्पात उत्पादों की सांकेतिक सूची	लागू एच एस कोड	न्यूनतम घरेलू मूल्यवर्धन आवश्यकता
1	600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, हॉट रोल, न ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7208	50%
2	600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, कोल्ड रोल (कोल्ड - कम किया हुआ), न ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7209	50%
3	600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7210	50%
4	600 मि. मी. से कम की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, न ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7211	35%
5	600 मि. मी. कम की चौड़ाई का लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, ढका हुआ, प्लेट लगाया हुआ अथवा कोट किया हुआ	7212	35%
6	लौह एवं गैर एलॉय इस्पात का अनियमित रूप से ऎंठा हुआ क्वाइल में बार्स और रॉड, हॉट रोल	7213	35%
7	लौह अथवा गैर एलॉय इस्पात के अन्य बार्स और रॉड्स जिसे फोर्ज किए जाने की तुलना में आगे अधिक वर्क नहीं किया हुआ, हॉट रोल, हॉट ड्रॉन अथवा हॉट एक्सट्रूडेड परंतु रोलिंग के बाद उसे टिविस्ट किये जाने सहित	7214	35%
8	लौह अथवा गैर एलॉय इस्पात का अन्य बार्स एंड रॉड्स	7215	35%
9	लौह अथवा गैर एलॉय इस्पात का एंगल, शेष और सेक्शन्स	7216	35%
10	लौह अथवा गैर एलॉय इस्पात का तार	7217	50%
11	600 मि. मी. अथवा उससे अधिक की चौड़ाई का स्टेनलैस इस्पातका फ्लेट रोल इस्पात	7219	50%
12	600 मि. मी. से कम की चौड़ाई का स्टेनलैस इस्पातका फ्लेट रोल इस्पात	7220	50%
13	स्टेनलैस स्टील का अन्य बार्स और रॉड्स; स्टेनलैस स्टील का एंगल शेष और सेक्शन्स	7222	50%
14	अन्य एलॉय इस्पात का तार	7229	35%
15	लौह अथवा इस्पात को रेल, रेलवे अथवा ट्रामवे ट्रेक निर्माण सामग्री	7302	50%

16	कास्ट लौह का ट्यूब, पाइप और होलो पाइप	7303	35%
17	लौह (कास्ट आयरन को छोड़कर) अथवा इस्पात का ट्यूब पाइप और होलो प्रोफाइल, सीमलैस	7304	35%
18	लौह अथवा इस्पात का सर्कुलर क्रॉस सेक्शन वाले अन्य ट्यूब और पाइप (उदाहरण के लिए, वेल्ड किया हुआ, रिबेट किया हुआ अथवा समान रूप से बंद किया गया हुआ), जिसकी बाहरी त्रिज्या 406.4 मि. मी. से अधिक हो	7305	35%
19	लौह अथवा इस्पात के अन्य ट्यूब, पाइप और होलो प्रोफाइल (उदाहरण के लिए ओपन सीन अथवा वेल्ड किया हुआ, रिबेट किया हुआ अथवा समान रूप से बंद किया गया हुआ)	7306	35%
20	लौह अथवा इस्पात का ट्यूब अथवा पाइप फिटिंग (उदाहरण के लिए, कनेक्टर/ कप्लिंग, एल्बो स्लीव्स)	7307	35%
21	स्टेनलैस स्टील का अनियमित रूप से ऎंठा हुआ क्वाइल में बार्स और रॉड, हॉट रोल्ड	7221	35%
22	स्टेनलैस स्टील का वायर	7223	35%
23	इलेक्ट्रिकल स्टील सहित 600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले अन्य एलॉय स्टील का फ्लेट रोल्ड इस्पात	7225	35%
24	इलेक्ट्रिकल स्टील सहित 600 मि. मी. से कम की चौड़ाई वाले अन्य एलॉय स्टील का फ्लेट रोल्ड इस्पात	7226	35%
25	अन्य एलॉय स्टील का अनियमित रूप से ऎंठा हुआ क्वाइल में बार्स और रोड, हॉट रोल्ड	7227	20%
26	अन्य एलॉय स्टील का अन्य बार्स और रोड्स; अन्य एलॉय स्टील का एंगल, शेप्स और सेक्शन्स; एलॉय अथवा नॉन एलॉय स्टील का होलो ड्रिल बार्स और रोड्स	7228	35%
27	लौह अथवा इस्पात की शीट पाइलिंग, चाहे ड्रिल किया हुआ हो अथवा नहीं, चाहे पंच किया हुआ हो अथवा नहीं, चाहे असेम्बल किये हुए तत्वों से बना हुआ हो अथवा नहीं; लौह अथवा इस्पात का वेल्ड किया हुआ एंगल, शेप और सेक्शन्स	7301	20%
28	स्ट्रक्चर्स (9406 के शीर्ष का प्रीफेब्रिकेटिड भवनों को छोड़कर) और स्ट्रक्चर्स का हिस्सा	7308	20%
29	300 से अधिक क्षमता का लौह अथवा इस्पात का किसी सामग्री (कम्प्रेस किए हुए अथवा सरलीकृत गैस को छोड़कर) के लिए भंडार, टैंक, वैट और समान कन्टेनर चाहे उसे लाइन किया गया हो अथवा नहीं या उसे हीट से इन्सुलेट किया गया हो अथवा नहीं लेकिन यांत्रिक अथवा तापीय उपक्रम से युक्त न हो	7309	20%
30	अधिकतम 300 लीटर की क्षमता का लौह अथवा इस्पात का किसी सामग्री (कम्प्रेस किए हुए अथवा सरलीकृत गैस को छोड़कर) के लिए टैंक, कास्ट, ड्रम, केन, बॉक्स और समान कन्टेनर चाहे उसे लाइन किया गया हो अथवा नहीं या उसे हीट से इन्सुलेट किया गया हो अथवा नहीं लेकिन यांत्रिक अथवा तापीय उपक्रम से युक्त न हो	7310	20%
31	लौह अथवा इस्पात का कम्प्रेस किया हुआ अथवा सरलीकृत गैस के लिए कन्टेनर	7311	20%



32	लौह अथवा इस्पात का स्टैंडिड वायर, रोप, केबल, प्लेटिड बैंड, स्लिंग और उसके समान वस्तु जिसे विद्युतीय रूप से इन्सुलेट न किया गया	7312	20%
33	लौह अथवा इस्पात का फेनसिंग के लिए उपयोग किये जाने वाला बार किया हुआ वायर; ट्विस्ट किया हुआ हूप अथवा सिंगल फ्लेट वायर, बार्स किया हुआ अथवा नहीं और लूज तरीके से ट्विस्ट किया हुआ डबल वायर	7313	20%
34	लौह अथवा इस्पात तार का ड्रील, नेटिंग और फेनसिंग; लौह अथवा इस्पात का विस्तार किया हुआ धातु	7314	20%
35	लौह अथवा इस्पात का चैन और उसका हिस्सा	7315	20%
36	लौह अथवा इस्पात का टैंकर, ग्रेपनेल्स और उसका हिस्सा	7316	20%
37	लौह एवं इस्पात की वस्तुएं	7317	20%
38	लौह एवं इस्पात की वस्तुएं	7318	20%
39	लौह एवं इस्पात की वस्तुएं	7319	20%
40	लौह अथवा इस्पात का स्प्रिंग और स्प्रिंग के लिए लीव्स	7320	20%
41	लौह अथवा इस्पात का स्टोव्स, रेंज, ग्रेड, कूकर (केंद्रीय हिटिंग के लिए सहायक बायलरों के साथ उन वस्तुओं सहित), बारबेक्यूज, ब्रेजियर्स, गैस रिंग, प्लेट वामर्स और समान गैर-विद्युतीय घरेलू उपकरण और उसका हिस्सा	7321	20%
42	लौह अथवा इस्पात का केंद्रीय हिटिंग के लिए रेडियेटर जिसे विद्युतीय रूप से हीट न किया गया हो और उसका हिस्सा; लौह अथवा इस्पात का हेयर हीटर और हॉट एयर वितरक जिसे विद्युतीय रूप से हीट न किया गया हो, फेन अथवा ब्लोअर जो मोटर से चलती हो और उसके हिस्से को शामिल करते हुए	7322	20%
43	लौह अथवा इस्पात का टेबल और समान घरेलू वस्तुएं और उसका हिस्सा	7323	20%
44	लौह अथवा इस्पात का सेनेटरी वेयर और उसकेपार्ट्स	7324	20%
45	लौह अथवा इस्पात का अन्य कास्ट सामान	7325	20%
46	लौह अथवा इस्पात का विद्युतीय इस्पात और अन्य वस्तु	7326	20%
47	रेलवे अथवा ट्रामवे पेसेंजर कोच जो स्वयं आगे नहीं बढ़ता हो	8605	50%
48	रेलवे अथवा ट्रामवे माल वेन और वेगेन जो स्वयं आगे नहीं बढ़ता हो	8606	50%
49	रेलवे अथवा ट्रामवे लोकोमोटिव का हिस्सा अथवा रोलिंग स्टॉक जैसे बोगिज, बिसल बोगिज, एक्सेल और फोज्ड किया हुआ पहिया और उसका हिस्सा	8607	50%

विवरणों में शामिल किए गए उत्पाद सांकेतिक हैं; विनिर्दिष्ट एच एस कोड के अंतर्गत सभी उत्पादों को परिशिष्ट के भाग के रूप में शामिल किया गया है।"

[फा. सं. एस-13026/1/2020-आईडीडी]

रसिका चौबे, अपर सचिव

**MINISTRY OF STEEL**  
**NOTIFICATION**

New Delhi, the 31st December, 2020

**G.S.R. 1(E).**—The amendments in the Policy for providing preference to domestically manufactured Iron & Steel products in Government procurement (DMI&SP Policy)—Revised, 2019 is hereby published for general information.

"No. S-13026/1/2020- IDD

Ministry of Steel

ID Division

Udyog Bhawan,

New Delhi 31<sup>st</sup> December, 2020

**Sub.: Amendments / additions to the Policy for Providing Preference to Domestically Manufactured Iron & Steel Products in Government Procurement - revised, 2019**

The following amendments / additions to the Policy for Providing Preference to Domestically Manufactured Iron & Steel Products in Government Procurement - revised, 2019 (DMI&SP revised, 2019) are applicable with immediate effect. These amendments / additions shall not apply to any tender or procurement for which notice inviting tender or other form of procurement solicitation has been issued before the issue of this notification.

**I - Amendments: Table 1**

Sl. No.	Existing Clause in DMI&SP revised, 2019	Amended Clause in DMI&SP revised, 2019
1	<p><b><u>Clause 1.3:</u></b> The policy is applicable to every Ministry or Department of Government and all agencies/entities under their administrative control and to projects funded by these agencies for purchase of iron &amp; steel products for government projects. However, this policy shall not apply for purchase of iron &amp; steel products with a view to commercial resale or with a view to use in the production of goods for commercial sale.</p>	<p><b><u>Clause 1.3:</u></b> The policy is applicable to every Ministry or Department of Government and all agencies/entities under their administrative control and to projects funded by these agencies for purchase of iron &amp; steel products for government projects. <u>All Central Sector Schemes (CS)/Centrally Sponsored Schemes (CSS) for which procurement is made by States and Local Bodies, would come within the purview of this Policy, if that project / scheme is fully / partly funded by Government of India.</u> However, this policy shall not apply for purchase of iron &amp; steel products with a view to commercial resale or with a view to use in the production of goods for commercial sale.</p>
2	<p><b><u>Clause 2.13:</u></b> Domestic value addition shall be the net selling price (invoiced price excluding net domestic taxes and duties) minus the landed cost of imported input materials at the manufacturing plant in India (including all customs duties) as a proportion of the net selling price, in percent. The 'domestic value addition' definition shall be in line with the DPIIT (formerly DIPP) guidelines, and shall be suitably amended in case of any changes by DPIIT in the future. For the purpose of this policy document, domestic value addition and local content have been used interchangeably.</p>	<p><b><u>Clause 2.13:</u></b> Domestic value addition means - <u>amount of value added in India which shall be the total value of the item to be procured / sold (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value of the item to be procured / sold, in percent.</u> The 'domestic value addition' definition shall be in line with the DPIIT (formerly DIPP) guidelines, and shall be suitably amended in case of any changes by DPIIT in the future. For the purpose of this policy document, domestic value addition and local content have been used interchangeably.</p>

3	<p><b>Clause 5.1.5</b> The policy is applicable to all projects funded by Ministry or Department of Government and all agencies/ entities under their administrative control for purchase of iron &amp; steel products.</p>	<p><b>Clause 5.1.5:</b> The policy is applicable to all projects funded by Ministry or Department of Government and all agencies/ entities under their administrative control for purchase of iron &amp; steel products. <u>All Central Sector Schemes (CS)/Centrally Sponsored Schemes (CSS) for which procurement is made by States and Local Bodies, would come within the purview of this Policy, if that project / scheme is fully / partly funded by Government of India.</u></p>
4	<p><b>Clause 5.1.6:</b> The policy shall be applicable to projects where the procurement value of iron and steel products is greater than Rs. 25 crores. The policy shall also be applicable for other procurement (non-project), where annual procurement value of iron and steel products for that Government organization is greater than Rs. 25 crores.</p>	<p><b>Clause 5.1.6</b> The policy shall be applicable to projects where the procurement value of iron and steel products (Appendix - A of the DMI&amp;SP Policy) is greater than Rs. 5 lakhs. The policy shall also be applicable for other procurements (non-project), where annual procurement value of iron and steel products for that Government organization is greater than Rs. 5 lakhs. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this policy.</p>
5	<p><b>Clause 7.2:</b> Domestic value addition shall be the net selling price (invoiced price excluding net domestic taxes and duties) minus the landed cost of imported input materials at the manufacturing plant in India (including all customs duties) as a proportion of the net selling price, in per cent.</p>	<p><b>Clause 7.2:</b> Domestic value addition means - amount of value added in India which shall be the total value of the item to be procured / sold (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value of the item to be procured / sold, in percent.</p>
6	<p><b>Clause 7.3:</b> It is recommended that each bidder participating in the tender process should calculate the domestic value addition using the below formula below so as to ensure the domestic value addition claimed is consistent with the minimum stipulated domestic value addition requirement of the policy.</p> <p><b>For iron and steel products</b></p> <p><b><u>% domestic value addition</u></b></p> <p><i>Net selling price of final product - landed cost of imported iron or steel at the plant-----</i> <i>----- X 100 %</i></p> <p><i>Net selling price of final product</i></p> <p><b>For capital goods</b></p> <p><b><u>% domestic value addition</u></b></p> <p><i>Net selling price of final product - landed cost of imported iron or steel at the plant</i> <i>----- X 100 %</i></p> <p><i>Net selling price of final product</i></p>	<p><b>Clause 7.3:</b> It is recommended that procuring Government agency / bidder participating in the tender process should calculate the domestic value addition using the below formula so as to ensure that the domestic value addition claimed is consistent with the minimum stipulated domestic value addition requirement of the policy.</p> <p><b>For iron and steel products &amp; capital goods</b></p> <p><b><u>% domestic value addition</u></b></p> <p><i>Total value of the item to be procured / sold (excluding net domestic indirect taxes) - the value of imported content in the item (including all customs duties)</i> <i>----- X 100 %</i></p> <p><i>Total value of the item to be procured / sold</i></p>

**II - Following amendment is made to the Appendix A of the DMI&SP revised, 2019 :-** Wherever minimum domestic value addition of **15%** is specified in the Appendix - A of the DMI&SP revised, 2019 under the column Minimum domestic value addition requirement, same shall be replaced with **20%** minimum domestic value addition). (Revised Appendix - A is attached)

**III - Additions / Insertions: Table 2**

Sl. No.	Added / Inserted Clause in DMI&SP revised, 2019
1	<p>Clause 5.1.13 is inserted below Clause 5.1.12 as:</p> <p><b>Clause 5.1.13:</b> No Global Tender Enquiry (GTE) shall be invited for tenders related to procurement of iron and steel products (Appendix-A of the DMI&amp;SP Policy). No Global Tender Enquiry (GTE) shall be invited for tenders related to procurement of Capital Goods for manufacturing iron &amp; steel products (Appendix- B of the DMI&amp;SP Policy) having estimated value upto Rs. 200 Crore except with the approval of competent authority as designated by Department of Expenditure.</p>
2	<p>Clause 6.9 is inserted below Clause 6.8 as:</p> <p><b>Clause 6.9: Specifications in Tenders and other procurement solicitations:</b></p> <p><b>6.9.1</b> Every procuring entity shall ensure that the eligibility conditions in respect of previous experience fixed in any tender or solicitation do not require proof of supply in other countries or proof of exports.</p> <p><b>6.9.2</b> Procuring entities shall endeavour to see that eligibility conditions, including on matters like turnover, production capability and financial strength do not result in unreasonable exclusion of local supplier' who would otherwise be eligible, beyond what is essential for ensuring quality or creditworthiness of the supplier.</p> <p><b>6.9.3</b> Procuring entities shall, within 2 months of the issue of this policy review all existing eligibility norms and conditions with reference to sub-paragraphs 6.9.1 and 6.9.2 above.</p> <p><b>6.9.4</b> If Ministry of Steel is satisfied that Indian suppliers of iron and steel products are not allowed to participate and/ or compete in procurement by any foreign government due to restrictive tender conditions which have direct or indirect effect of barring Indian companies such as registration in the procuring country, execution of project of specific value in the procuring country etc., it may, if deemed appropriate, restrict or exclude bidders from that country from eligibility for procurement of that item and/ or other items relating to Ministry of Steel.</p> <p><b>6.9.5</b> For the purpose of sub-paragraph 6.9.4 above, a supplier or bidder shall be considered to be from a country if (i) the entity is incorporated in that country, or (ii) a majority of its shareholding or effective control of the entity is exercised from that country; or (iii) more than 50% of the value of the item being supplied has been added in that country. Indian suppliers shall mean those entities which meet any of these tests with respect to India. The term 'entity' of a country shall have the same meaning as under the FDI Policy of DPIIT as amended from time to time.</p>
3	<p>Clause 6.10 is inserted below Clause 6.9 as:</p> <p><b>Clause 6.10:</b> In case restrictive or discriminatory conditions against domestic suppliers are included in bid documents, an inquiry shall be conducted by the Administrative Department undertaking the procurement (including procurement by any entity under its administrative control) to fix responsibility for same. Thereafter, appropriate action, administrative or otherwise, shall be taken against erring officials of procurement entities under relevant provisions. Intimation on all such action shall be sent to the Standing Committee under the DMI&amp;SP Policy.</p>

**IV - Revised Appendix A - Exclusive for domestically manufactured products**

Sl. No	Indicative list of Iron & Steel Products	Applicable HS code	Minimum domestic value addition requirement
1	Flat-rolled products of iron or non alloy steel, of a width of 600 mm or more, hot rolled, not clad, plated or coated	7208	50%
2	Flat-rolled products of iron or non alloy steel, of a width of 600	7209	50%

	mm or more, cold rolled (cold-reduced), not clad, plated or coated		
3	Flat-rolled products of iron or non alloy steel, of a width of 600 mm or more, clad, plated or coated	7210	50%
4	Flat-rolled products of iron or non alloy steel, of a width of less than 600 mm, not clad, plated or coated	7211	35%
5	Flat-rolled products of iron or non alloy steel, of a width of less than 600 mm, clad, plated or coated	7212	35%
6	Bars and rods, hot-rolled, in irregularly wound coils, of iron or non-alloy steel	7213	35%
7	Other bars and rods of iron or non alloy steel, not further worked than forged, hot rolled, hot-drawn or hot-extruded, but including those twisted after rolling	7214	35%
8	Other bars and rods of iron or non alloy steel	7215	35%
9	Angles, shapes and sections of iron or non-alloy steel	7216	35%
10	Wire of iron or non-alloy steel	7217	50%
11	Flat-rolled products of stainless steel, of a width of 600 mm or more	7219	50%
12	Flat-rolled products of stainless steel, of a width of less than 600 mm	7220	50%
13	Other bars and rods of stainless steel; angles, shapes and sections of stainless steel	7222	50%
14	Wire of other alloy steel	7229	35%
15	Rails, railway or tramway track construction material of iron or steel	7302	50%
16	Tubes, pipes and hollow profiles, of cast iron	7303	35%
17	Tubes, pipes and hollow profiles, seamless, of iron (other than cast iron) or steel	7304	35%
18	Other tubes and pipes (for example, welded, riveted or similarly closed), having circular cross-sections, the external diameter of which exceeds 406.4 mm, of iron or steel	7305	35%
19	Other tubes, pipes and hollow profiles (for example, open seam or welded, riveted or similarly closed), of iron or steel	7306	35%
20	Tube or pipe fittings (for example, connectors/couplings, elbow sleeves), of iron or steel	7307	35%
21	Bars and rods, hot-rolled, in irregularly wound coils, of stainless steel	7221	35%
22	Wire of stainless steel	7223	35%
23	Flat-rolled products of other alloy steel, of a width of 600 mm or more, including electrical steel	7225	35%
24	Flat-rolled products of other alloy steel, of a width of less than 600 mm, including electrical steel	7226	35%
25	Bars and rods, hot-rolled, in irregularly wound coils, of other alloy steel	7227	20%

26	Other bars and rods of other alloy steel; angles, shapes and sections, of other alloy steel; hollow drill bars and rods, of alloy or nonalloy steel	7228	35%
27	Sheet piling of iron or steel, whether or not drilled, punched or made from assembled elements; welded angles, shapes and sections, of iron or steel	7301	20%
28	Structures (excluding prefabricated buildings of heading 9406) and parts of structures	7308	20%
29	Reservoirs, tanks, vats and similar containers for any material (other than compressed or liquefied gas), of iron or steel, of a capacity exceeding 300 whether or not lined or heatinsulated, but not fitted with mechanical or Thermal equipment	7309	20%
30	Tanks, casks, drums, cans, boxes and similar containers, for any material (other than compressed or liquefied gas), of iron or steel, of a capacity not exceeding 300 L, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment	7310	20%
31	Containers for compressed or liquefied gas, of iron or steel	7311	20%
32	Stranded wire, ropes, cables, plaited bands, slings and the like, of iron or steel, not electrically insulated	7312	20%
33	Barbed wire of iron or steel; twisted hoop or single flat wire, barbed or not, and loosely twisted double wire, of a kind used for fencing, of iron or steel	7313	20%
34	Grill, netting and fencing, of iron or steel wire; expanded metal of iron or steel	7314	20%
35	Chain and parts thereof, of iron or steel	7315	20%
36	Anchors, grapnels and parts thereof, of iron or steel	7316	20%
37	Articles of iron and steel	7317	20%
38	Articles of iron and steel	7318	20%
39	Articles of iron and steel	7319	20%
40	Springs and leaves for springs, of iron or steel	7320	20%
41	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas-rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel	7321	20%
42	Radiators for central heating, not electrically heated, and parts thereof, of iron or steel; air heaters and hot air distributors, not electrically heated, incorporating a motor-driven fan or blower, and parts thereof, of iron or steel	7322	20%
43	Tables and similar household articles and parts thereof, of iron or steel	7323	20%
44	Sanitary ware and parts thereof, of iron or steel	7324	20%
45	Other cast articles of iron or steel	7325	20%

46	Electrical steel and other articles of iron or steel	7326	20%
47	Railway or tramway passenger coaches, not self-propelled	8605	50%
48	Railway or tramway goods vans and wagons, not self-propelled	8606	50%
49	Parts of railway or tramway locomotives or rolling-stock, such as bogies, bissel-bogies, axles and forged wheels, and parts thereof	8607	50%

*Products included in descriptions are indicative; all products under the specified HS codes are included as part of the appendix."*

[F. No. S-13026/1/2020-IDD]  
RASIKA CHAUBE, Addl. Secy.

**POLICY FOR PROVIDING PREFERENCE TO DOMESTICALLY MANUFACTURED IRON  
& STEEL PRODUCTS IN GOVERNMENT PROCUREMENT (TO BE SUBMITTED ON BIDDER'S  
LETTERHEAD) SELF-CERTIFICATE**

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To,  
M/s Talcher Fertilizers Limited

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SUB:  
TENDER NO:

Dear Sir,

This has reference to "Policy for providing Preference to Domestically Manufactured Iron & Steel Products in Government Procurement" issued by Ministry of Steel, Govt. of India, vide their revised notification "The Gazette of India, Notification No. 385 (E) dated 29.05.2019".

We confirm that we will obtain Affidavit of Self Certification of Domestic value addition in Iron & Steel Products from manufacturer before supply of iron and steel products required under the tender/bidding document.

Sign & Stamp of bidder



**CHECKLIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING  
DOCUMENTS FOR BIDDER**

BEC Clause No.	Description	Documents required for qualification	Documents Submitted by Bidder
<b>Technical BEC</b>			
1.	<b>Experience</b>	(a) ..... (b) ..... (c) .....  <i>(Dealing Officer to specify the details of documents above).</i>	
2.	<b>Job executed for Subsidiary / Fellow subsidiary/ Holding company.</b>	Tax paid invoice(s) duly certified by statutory auditor of the bidder towards payment of statutory tax in support of the job executed for Subsidiary / Fellow subsidiary/ Holding company.	
3.	<b>Any other technical criteria in BEC</b>	(a) ..... (b) ..... (c) .....  <i>(Dealing Officer to specify the details of documents above).</i>	
<b>Financial BEC</b>			
1.	<b>Annual Turn Over</b>	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for any of the last three preceding financial years, whichever meets the Annual Turnover Criteria	Submitted  <i>(Mention specific year.....)</i>

2.	<b>Net Worth</b>	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for last Audited Financial Year.	Submitted  (Mention specific year .....)
3.	<b>Working Capital</b>	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for last Audited Financial Year.  If the bidder's working capital is negative or inadequate, the bidder shall submit a letter (in prescribed format) from their bank having net worth not less than Rs.100 Crores, confirming the availability of line of credit for at least working capital requirement as stated above.	Submitted  (Mention specific year.....)  Submitted/ Not Applicable (Bidder to tick appropriate option)
4.	<b>Format for Details of financial capability of Bidder</b>	Bidder shall submit "Details of financial capability of Bidder" in prescribed format duly signed and stamped by a chartered accountant / Certified Public Accountant (CPA).	Submitted

Place:  
Date:

[Signature of Authorized Signatory of Bidder]  
Name:  
Designation:  
Seal:

**SECTION-III**

**INSTRUCTION TO BIDDERS**

**[TO BE READ IN CONJUNCTION WITH BIDDING DATA SHEET (BDS)]**

**SECTION-III**

**INSTRUCTION TO BIDDERS**

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**INSTRUCTION TO BIDDERS [ITB]**  
**(TO BE READ IN CONJUNCTION WITH BIDDING DATA SHEET (BDS))**

**[A] – GENERAL**

**1 SCOPE OF BID**

- 1.1 The Employer as defined in the "General Conditions of Contract [GCC]", wishes to receive Bids as described in the Invitation For Bid (the "**Tender Document /Bid Document**") issued by Employer.. Employer/Owner/TFL occurring herein under shall be considered synonymous.
- 1.1 SCOPE OF BID: The scope of work/ Services shall be as defined in Section-VI of the Tender documents.
- 1.2 The successful bidder will be expected to complete the scope of Bid within the period stated in Special Conditions of Contract.
- 1.3 Throughout the Tender Documents, the terms 'Bid', 'Tender' & 'Offer' and their derivatives [Bidder/Tenderer,Bid/Tender/Offer etc.] are synonymous. Further, 'Day' means 'Calendar Day' and 'Singular' also means 'Plural'.

**2 ELIGIBLE BIDDERS**

- 2.1 Provision for procurement from a bidder which shares a land border with India has been attached as **Annexure-VII** herewith.
- 2.2 The Bidder shall not be under a declaration of ineligibility by Employer for Corrupt/ Fraudulent/ Collusive/ Coercive practices, as defined in "Instructions to Bidders [ITB], Clause No. 39" (Action in case Corrupt/ Fraudulent/ Collusive/ Coercive Practices).
- 2.3 The Bidder is not put on 'Holiday' by TFL or any of the JV partner of OWNER (viz. GAIL, RCF, CIL) or Public-Sector Project Management Consultant (like PDIL,EIL, MECON only due to "poor performance" or "corrupt and fraudulent practices") or banned/blacklisted by Government department/ Public Sector on due date of submission of bid.. Further, neither bidder nor their allied agency/(ies) (as defined in the Procedure for Action in case of Corrupt/Fraudulent/Collusive/ Coercive Practices)are on banning list of TFL or any of the JV partner of OWNER viz. GAIL, RCF, CIL.

If the Bidding documents were issued inadvertently/ downloaded from website, offers submitted by such bidders shall not be considered for opening/ evaluation/Award and will be returned immediately to such bidders.

In case there is any change in status of the declaration prior to award of contract, the same has to be promptly informed to TFL/PDIL by the bidder.

It shall be the sole responsibility of the bidder to inform about their status regarding para 1 of clause 2.2 herein above on due date of submission of bid and during the course of finalization of the tender. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders as per clause 39 of ITB.

- 2.4 The Bidder should not be under any liquidation court receivership or similar proceedings on due date of submission of bid. In case there is any change in status of the declaration prior to award of contract, the same has to be promptly informed to TFL/PDIL by the bidder.

It shall be the sole responsibility of the bidder to inform TFL there status on above on due date of submission of bid and during the course of finalization of the tender. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders as per clause no. 39 of ITB.

- 2.5 Bidder shall not be affiliated with a firm or entity:

- (i) that has provided consulting services related to the work to the Employer during the preparatory stages of the work or of the project of which the works/services forms a part of or
- (ii) that has been hired (proposed to be hired) by the Employer as an Engineer/ Consultant for the contract.

- 2.6 Neither the firm/entity appointed as the Project Management Consultant (PMC) for a contract nor its affiliates/ JV'S/ Subsidiaries shall be allowed to participate in the tendering process unless it is the sole Licensor/Licensor nominated agent/ vendor.

- 2.7 Pursuant to qualification criteria set forth in the bidding document, the Bidder shall furnish all necessary supporting documentary evidence to establish Bidder's claim of meeting qualification criteria.

2.8 **Power of Attorney:**

Power of Attorney (PoA) to be issued by the bidder in favour of the authorised employee(s), in respect of the particular tender, for purpose of signing the documents including bid, all subsequent communications, agreements, documents etc. pertaining to the tender and act and take any and all decision on behalf of the bidder (including Consortium). Any consequence resulting due to such signing shall be binding on the Bidder (including Consortium).

- (l) In case of a Single Bidder, the Power of Attorney shall be issued as per the constitution of the bidder as below:
  - a) **In case of Proprietorship:** By Proprietor
  - b) **In case of Partnership:** by all Partners or Managing Partner.
  - c) **In case of Limited Liability Partnership:** by any bidder's employee authorized in terms of Deed of LLP.
  - d) **In case of Public /Limited Company:** PoA in favour of authorized employee(s) by Board of Directors through Board Resolution or by the designated officer authorized by Board to do so. Such Board Resolution should be duly countersigned by Company Secretary / MD / CMD / CEO.



The Power of Attorney should be valid till award of contract/order to successful bidder.

- (II) In case of a Consortium, Power of Attorney shall be issued both by Leader as well as Consortium Member(s) of the Consortium as per procedure defined herein above in favour of employee of Leader of Consortium.

### **3 BIDS FROM "CONSORTIUM"**

Not applicable.

### **4 ONE BID PER BIDDER**

4.1 A Bidder shall submit only 'one [01] Bid' in the same Bidding Process either as single entity or as a member of any consortium (wherever consortium bid is allowed). A Bidder who submits or participates in more than 'one [01] Bid' will cause all the proposals in which the Bidder has participated to be disqualified.

4.2 More than one bid means bid(s) by bidder(s) having same Proprietor / Partners / Limited Liability Partner in any other Bidder (s). Further, more than one bids shall also include two or more bidders having common power of attorney holder.

Failure to comply this clause during tendering process will disqualify all such bidders from process of evaluation of bids.

4.3 Alternative Bids shall not be considered.

4.4 The provisions mentioned at sl. no. 4.1 and 4.2 shall not be applicable wherein bidders are quoting for different Items / Sections / Parts / Groups/ SOR items of the same tender which specifies evaluation on Items / Sections / Parts / Groups/ SOR items basis.

### **5 COST OF BIDDING**

The Bidder shall bear all costs associated with the preparation and submission of the Bid including but not limited to Documentation Charges, Bank charges all courier charges translation charges, authentication charges and any associated charges including taxes & duties thereon. Further, TFL/PDIL will in no case, be responsible or liable for these costs, regardless of the outcome of the bidding process.

### **6 SITE VISIT**

6.1 The Bidder is advised to visit and examine the site of works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for the required job. The costs of visiting the site shall be borne by the Bidder.

6.2 The Bidder or any of its personnel or agents shall be granted permission by the Employer to enter upon its premises and land for the purpose of such visits, but only upon the express conditions that the Bidder, its personnel and agents will release and indemnify the Employer and its personnel, agents from and against all liabilities in respect thereof, and will be responsible for death or injury, loss or damage to property, and any other loss, damage, costs, and expenses incurred as a result of inspection.

- 6.3 The Bidder shall not be entitled to hold any claim against TALCHER FERTILIZERS LIMITED for non-compliance due to lack of any kind of pre-requisite information as it is the sole responsibility of the Bidder to obtain all the necessary information with regard to site, surrounding, working conditions, weather etc. on its own before submission of the bid.
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## **[B] –BIDDING DOCUMENTS**

### **7 CONTENTS OF BIDDING DOCUMENTS**

- 7.1 The contents of Bidding Documents /Tender documents are those stated below, and should be read in conjunction with any 'Addendum / Corrigendum and Clarification(s)' issued in accordance with "ITB: Clause-8 & 9":

- Section-I : Invitation for Bid [IFB]
- Section-II : BID EVALUATION CRITERIA [BEC] & Evaluation methodology
- Section-III : Instructions to Bidders [ITB], Annexure, Forms & Formats
- Section-IV : General Conditions of Contract [GCC]
- Section-V : Special Conditions of Contract [SCC]
- Section-VI : Scope of Work & Technical Specifications
- Section-VII : Price Schedule/ Schedule of Rates

\*'Request for Quotation', wherever applicable, shall also form part of the Bidding document.

For participation in e-tender, instructions are mentioned at Annexure-III to Section-III.

- 7.2 The Bidder is expected to examine all instructions, forms, terms & conditions in the Bidding Documents. The "Request for Quotation [RFQ] & Invitation for Bid (IFB)" together with all its attachments thereto, shall be considered to be read, understood and accepted by the Bidders. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will be at Bidder's risk and may result in the rejection of his Bid.

### **8 CLARIFICATION OF TENDER DOCUMENTS**

- 8.1 A prospective Bidder requiring any clarification(s) of the Bidding Documents may notify TFL in writing or through CPP Portal (<https://eprocure.gov.in/eprocure/app>) or email at PDIL's mailing address indicated in the BDS no later than 02 (two) days prior to pre-bid meeting (in cases where pre-bid meeting is scheduled) or 05 (five) days prior to the due date of submission of bid in cases where pre-bid meeting is not scheduled. TFL/PDIL reserves the right to ignore the bidders request for clarification if received after the aforesaid period. TFL/PDIL may respond in writing to the request for clarification. TFL/PDIL's response including an explanation of the query, but without identifying the source of the query will be uploaded on the websites mentioned at Clause No. 2.0 (G) of IFB. Hence, bidders are requested to regularly visit the said websites for updates.
- 8.2 Any clarification or information required by the Bidder but same not received by the Employer at clause 8.1 (refer BDS for address) above is liable to be considered as "no clarification / information required".

## **9 AMENDMENT OF BIDDING DOCUMENTS**

- 9.1 At any time prior to the 'Bid Due Date', Employer for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by addenda / corrigendum.
- 9.2 Any corrigendum thus issued shall be integral part of the Tender Document and shall be hosted only on the websites as provided at clause no. 2.0 (H) of IFB. Bidders, in their own interest, are advised to regularly check the websites for any amendment/Corrigendum/Addendum. Bidders have to take into account all such amendment / corrigendum before submitting their Bid. TFL/PDIL will not take any responsibility or entertain any representation whatsoever, in case bidders have not checked/seen/downloaded such amendment/Corrigendum/Addendum or reply to pre-bid queries uploaded on the said websites.
- 9.3 The Employer, if it considers necessary, may extend the Bid Due Date in order to allow the Bidders a reasonable time to furnish their most competitive bid taking into account the addenda / corrigendum issued thereof.

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## **[C] – PREPARATION OF BIDS**

### **10 LANGUAGE OF BID:**

The bid prepared by the Bidder and all correspondence, drawing(s), document(s), certificate(s) etc. relating to the Bid exchanged by Bidder and TFL shall be written in English language only. In case a document, certificate, printed literature etc. furnished by the Bidder in a language other than English, the same should be accompanied by an English translation duly authenticated by the Indian Chamber of Commerce , in which case, for the purpose of interpretation of the Bid, the English translation shall govern.

### **11. DOCUMENTS COMPRISING THE BID**

- 11.1 Bidders are requested to refer instructions for participating in e-Tendering (Annexure-I to Section III), Ready Reckoner for Bidders and FAQs available in e-portal and bids submitted manually shall be rejected. All pages of the Bid must be digitally signed by the "authorized signatory" of the Bidder holding Power of Attorney. The bids must be submitted on e-tendering website of CPP portal (<https://eprocure.gov.in/eprocure/app> ) comprising following documents:-

#### **11.1.1 PART-I: "TECHNO-COMMERCIAL / UN-PRICED BID" shall contain the following:**

- (a) 'Covering Letter' on Bidder's 'Letterhead' clearly specifying the enclosed Contents with index.
- (b) 'Bidder's General Information', as per 'Form F-1'.
- (c) Copies of documents, as specified in tender document
- (d) Copy of Schedule of Rate (SOR) with prices blanked out mentioning quoted / not quoted (as applicable) written against each item as a confirmation that the prices are quoted in requisite format.
- (e) 'Letter of Authority' on the Letter Head, as per 'Form F-3'
- (f) 'Agreed Terms and Conditions', as per 'Form F-5'

- (g) 'ACKNOWLEDGEMENT CUM CONSENT LETTER', as per 'Form F-6'
- (h) Duly attested documents in accordance with the "BID EVALUATION CRITERIA [BEC]" establishing the qualification.
- (i) Copy of Power of Attorney as per 'F-20'/copy of Board Resolution, in favour of the authorized signatory of the Bid, as per clause no. 2.8 of ITB (Original to be submitted physically).
- (j) Copy of Declaration for Bid Security in original as per Clause 16 of ITB (Original to be submitted physically)
- (k) Certification from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of other than companies) as per Form-I to Annexure-V and Declaration by bidder towards Minimum Local Content as per Form-II of Annexure-V.
- (l) Undertaking as per Form-I to Annexure VII regarding Provisions for Procurement from a bidder which shares a land border with India.
- (m) All forms and Formats including Annexures
- (n) 'Integrity Pact' as per 'Form F-14'
- (o) 'Indemnity Bond' as per 'Form F-15'
- (p) Checklist for Bid Evaluation Criteria (BEC) qualifying documents for bidder as per 'Form F-8 & F-8B.
- (q) Tender Document, its Corrigendum/Amendment/Clarification(s) duly signed on each page (in case of manual tendering)/ digitally signed (in case of e-Tender) by the Authorized Signatory holding POA.
- (r) Additional document specified in BDS, SCC, Scope of Supply or mentioned elsewhere in the Tender Document, its Corrigendum/Amendment/Clarification(s).
- (s) Any other information/details required as per Tender Document

**Note:**

1. All the pages of the Bid must be signed/ digitally signed by the "Authorized Signatory" of the Bidder holding POA.

**11.1.2 PART-II: Price Bid**

The Prices are to be filled strictly in the Schedule of Rate of the bidding documents and provision mentioned at para 11.1.2 hereinabove and to uploaded in SOR attachment/Conditions of CPP portal.

- 11.3 In case of bids invited under *single bid system*, a single envelope containing all documents specified at Clause 11.1.1 & 11.1.2 of ITB above form the BID. All corresponding conditions specified at Clause 11.1.1 & 11.1.2 of ITB shall become applicable in such a case.

**12 BID PRICES**

- 12.1 Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole works as described in Bidding Documents, based on the rates and prices submitted by the Bidder and accepted by the Employer. The prices quoted by the Bidders will be inclusive of all taxes except **GST (CGST & SGST/UTGST or IGST)**. Applicable rate of **GST (CGST & SGST/ UTGST or IGST)** on the contract value shall be indicated in SOR under column for GST.
- 12.2 Prices must be filled in format for "Schedule of Rates [SOR]" enclosed as part of Tender document. If quoted in separate typed sheets and any variation in item description, unit or

quantity is noticed; the Bid is liable to be rejected.

- 12.3 Bidder shall quote for all the items of "SOR" after careful analysis of cost involved for the performance of the completed item considering all parts of the Bidding Document. In case any activity though specifically not covered in description of item under "SOR" but is required to complete the works as per Specifications, Scope of Work / Service, Standards, General Conditions of Contract ("GCC"), Special Conditions of Contract ("SCC") or any other part of Bidding Document, the prices quoted shall be deemed to be inclusive of cost incurred for such activity.
- 12.4 All duties, taxes and other levies [if any] payable by the Contractor under the Contract, or for any other cause except final **GST (CGST & SGST/ UTGST or IGST)** shall be included in the rates / prices and the total bid-price submitted by the Bidder.
- 12.5 Prices quoted by the Bidder, shall remain firm and fixed and valid till completion of the Contract and will not be subject to variation on any account unless any price escalation/variation is allowed elsewhere in Tender Document.
- 12.6 Deleted
- 12.7 Bidder shall also mention the **Service Accounting Codes (SAC) / Harmonized System of Nomenclature (HSN)** at the designated place in Techno-Commercial / Un-Priced bid.

### **13 GST (CGST & SGST/ UTGST or IGST)**

- 13.1 Bidders are required to submit a copy of the GST Registration Certificate, while submitting the bids wherever **GST (CGST & SGST/UTGST or IGST)** is applicable
- 13.2 Please note that the responsibility of payment of **GST (CGST & SGST or IGST or UTGST)** lies with the Contractor only. Contractor providing taxable service shall issue an e- Invoice/ Invoice / Bill, as the case may be as per rules/ regulation of GST. Further, returns and details required to be filled under GST laws & rules should be timely filed by Contractor with requisite details.

Payments to Contractor for claiming **GST (CGST & SGST/UTGST or IGST)** amount will be made provided the above formalities are fulfilled. Further, TFL may seek copies of challan and certificate from Chartered Accountant for deposit of **GST (CGST & SGST/UTGST or IGST)** collected from Owner.

- 13.3 In case CBIC (Central Board of Indirect Taxes and Customs)/ any tax authority / any equivalent Government agency brings to the notice of TFL that the Contractor has not remitted the amount towards **GST (CGST & SGST/UTGST or IGST)** collected from TFL to the government exchequer, then, that Contractor shall be put under Holiday list of TFL for period of six months after following the due procedure. This action will be in addition to the right of recovery of financial implication arising on TFL.
- 13.4 For statutory variation in **GST (CGST & SGST/UTGST or IGST)**, please refer clause no. **48.0 of SCC (Section V of NIT)**

13.5 Where TFL is entitled to avail the input tax credit of **GST (CGST & SGST/UTGST or IGST)**:-

13.5.1 Owner/TFL will reimburse the **GST (CGST & SGST/UTGST or IGST)** to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/regulation of GST, to enable Owner/TFL to claim input tax credit of **GST (CGST & SGST/UTGST or IGST)** paid. In case of any variation in the executed quantities, the amount on which the **GST (CGST & SGST/UTGST or IGST)** is applicable shall be modified in same proportion. Returns and details required to be filled under GST laws & rules should be timely filed by supplier with requisite details.

13.6 Where TFL is not entitled to avail/take the full input tax credit of **GST (CGST & SGST/UTGST or IGST)**:

13.6.1 Owner/TFL will reimburse **GST (CGST & SGST/UTGST or IGST)** to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/regulation of GST subject to the ceiling amount of **GST (CGST & SGST/UTGST or IGST)** as quoted by the bidder, subject to any statutory variations, except variations arising due to change in turnover. In case of any variation in the executed quantities (If directed and/or certified by the Engineer-In-Charge) the ceiling amount on which **GST (CGST & SGST/UTGST or IGST)** is applicable will be modified on pro-rata basis.

13.7 TFL will prefer to deal with registered supplier of goods/ services under GST. Therefore, bidders are requested to get themselves registered under GST, if not registered yet.

However, in case any unregistered bidder is submitting their bid, their prices will be loaded with applicable GST (**CGST & SGST/UTGST or IGST**) while evaluation of bid (if applicable as per Govt. Act/ Law in vogue). Where TFL is entitled for input credit of **GST (CGST & SGST/UTGST or IGST)**, the same will be considered for evaluation of bid as per evaluation methodology of tender document. Further, an unregistered bidder is required to mention its Income Tax PAN in bid document.

13.8 In case TFL is required to pay entire/certain portion of applicable **GST (CGST & SGST/UTGST or IGST)** and remaining portion, if any, is to be deposited by Bidder directly as per **GST (CGST & SGST/UTGST or IGST)** laws, entire applicable rate/amount of **GST (CGST & SGST/UTGST or IGST)** to be indicated by bidder in the SOR.

Where TFL has the obligation to discharge **GST (CGST & SGST/UTGST or IGST)** liability under reverse charge mechanism and TFL has paid or is /liable to pay **GST (CGST & SGST/UTGST or IGST)** to the Government on which interest or penalties becomes payable as per GST laws for any reason which is not attributable to TFL or ITC with respect to such payments is not available to TFL for any reason which is not attributable to TFL, then TFL shall be entitled to deduct/ setoff / recover such amounts against any amounts paid or payable by TFL to Contractor /Supplier..

13.9 Contractor shall ensure timely submission of correct invoice(s)/e-invoice(s), as per GST rules/ regulation, with all required supporting document(s) within a period specified in Contract to enable TFL to avail input credit of GST (CGST & SGST/UTGST or IGST). Further, returns and details required to be filled under GST laws & rules should be timely filed by Contractor with requisite details.

If input tax credit is not available to TFL for any reason not attributable to TFL, then TFL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct/ setoff/ recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, against any amounts paid or becomes payable by TFL in future to the Contractor under this contract or under any other contract

#### 13.10 **Anti-profiteering clause**

As per Clause 171 of GST Act it is mandatory to pass on the benefit due to reduction in rate of tax or from input tax credit to the consumer by way of commensurate reduction in prices. The Contractor may note the above and quote their prices accordingly.

13.11 In case the GST rating of Contractor on the GST portal / Govt. official website is negative / black listed, then the bids may be rejected by TFL. Further, in case rating of bidder is negative / black listed after award of work, then TFL shall not be obligated or liable to pay or reimburse GST to such Contractor and shall also be entitled to deduct / recover such GST along with all penalties / interest, if any, incurred by TFL.

13.12 GST (CGST & SGST/UTGST or IGST) is implemented w.e.f. 01.07.2017 which subsumed various indirect taxes and duties applicable before 01.07.2017. Accordingly, the provisions of General Condition of Contract relating to taxes and duties which are subsumed in GST are modified to aforesaid provisions mentioned in clause no. 12 and 13 of ITB.

13.13 GST, as quoted by the bidder in Schedule of Rates, shall be deemed as final and binding for the purpose of bid evaluation (applicable for tenders where bidder quotes the GST rates). In case a bidder enters "zero/blank" GST or an erroneous GST, the bid evaluation for finalizing the L1 bidder will be done considering the "Zero" or quoted GST rate GST rate, as the case may be. No request for change in GST will be entertained after submission of bids. In case GST column is left blank in the SOR, the quoted prices shall be considered as "Inclusive of GST" and evaluation shall be done accordingly.

In cases where the successful bidder quotes a wrong GST rate, for releasing the order, the following methodology will be followed:

- In case the actual GST rate applicable is lower than the quoted GST rate, the actual GST rate will be added to the quoted basic prices. The final cash outflow will be based on actual GST rate.
- In case the actual GST rate applicable is more than the quoted GST rate, the basic prices quoted will be reduced proportionately, keeping the final cash outflow the same as the overall quoted amount.

Based on the Total Cash Outflow calculated as above, TFL shall place orders.

13.14 Wherever TDS under GST Laws has been deducted from the invoices raised / payments made to the Contractors, as per the provisions of the GST law / Rules, Contractors should accept the corresponding GST-TDS amount populated in the relevant screen on GST common portal ([www.gst.gov.in](http://www.gst.gov.in)). Further, Vendors should also download the GST TDS certificate from GST common portal (reference path: Services>User Services> View/Download Certificates option).

**13.15 Provision w.r.t. E- Invoicing requirement as per GST laws:**

Supplier who is required to comply with the requirements of E-invoice for B2B transactions as per the requirement of GST Law will ensure the compliance of requirement of E Invoicing under GST law. If the invoice issued without following this process, such invoice can-not be processed for payment by TFL as no ITC is allowed on such invoices.

Therefore, all the payments to such supplier who is liable to comply with e-invoice as per GST Laws shall be made against the proper e-invoice(s) only. Further, returns and details required to be filled under GST laws & rules against such e-invoices should be timely filed by Supplier of Goods with requisite details.

If input tax credit is not available to TFL for any reason attributable to supplier (both for E-invoicing cases and non-E-invoicing cases), then TFL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, by adjusting against any amounts paid or becomes payable in future to the contractor under this contract or under any other supplier .

To ensure compliance, undertaking in requisite format is to be submitted by supplier as per format enclosed at Form F-21 along with documents for release of payment.

**13.16 New Taxes & duties:** Any new taxes & duties, if imposed by the State/ Central Govt. of India after the due date of bid submission but before the Contractual Completion Date, shall be reimbursed to the Service Provider on submission of copy of notification(s) issued from State/ Central Govt. Authorities along with documentary evidence for proof of payment of such taxes & duties, but only after ascertaining it's applicability with respect to the Contract.

**13.17** The amount of statutory levies like, CGST, SGST & IGST will be released when the same will appear in the GSTR-2A of OWNER, in the common portal of GST and Bidder has filed the valid return in accordance with the provisions of the GST act and the rules made thereunder. If, input tax credit is not available to OWNER for any reason attributable to the bidder, then OWNER shall not be obligatory or liable to pay or reimburse GST claimed in invoice and shall be entitled to deduct /setoff/ recover such GST together with all the penalty and interest if any, against any amount paid or payable to bidder. Further in this case, OWNER reserves the right to upload the name of such defaulter on the Company website and may also consider for putting under Holiday list of OWNER for period of six months as mentioned in Procedure for Evaluation of Performance of Vendors/ Suppliers/ Contractors/Bidders.

**14 BID CURRENCIES:**

Bidders must submit bid in Indian Rupees only.

**15 BID VALIDITY**

**15.1** Bids shall be kept valid for period specified in BDS from the Due date of Technical Bid Opening. A Bid valid for a shorter period may be rejected by TFL as 'non-responsive'.



- 15.2 In exceptional circumstances, prior to expiry of the original 'Bid Validity Period', the Employer may request the Bidders to extend the 'Period of Bid Validity' for a specified additional period. The request and the responses thereto shall be made in writing or by email. A Bidder may refuse the request without forfeiture of his EMD / Bid Security.

A Bidder agreeing to the request will not be required or permitted to modify his Bid, but will be required to extend the validity of its EMD for the period of the extension and in accordance with "ITB: Clause-16" in all respects.

## **16 EARNEST MONEY DEPOSIT**

- 16.1 Bid must be accompanied with earnest money [i.e. **Earnest Money Deposit (EMD)** also known as **Bid Security**] in the form of '**Demand Draft**' / '**Banker's Cheque**' [in favour of **TALCHER FERTILIZERS LIMITED** payable at place mentioned in **BDS**] or '**Bank Guarantee**' strictly as per the format given in form F -2A (as the case may be) of the **Tender Document**. Bidder shall ensure that EMD submitted in the form of '**Bank Guarantee**' should have a validity of at least 'two [02] months' beyond the validity of the Bid. EMD submitted in the form of '**Demand Draft**' or '**Banker's Cheque**' should be valid for three months.

Bid not accompanied with EMD, or EMD not in requisite format shall be liable for rejection. The EMD shall be submitted in Indian Rupees only.

- 16.2 EMD shall not be accepted in case the same has reference of "remitter" / "financer" other than bidder on the aforementioned financial instrument of EMD submitted by the bidder and bid of such bidder will be summarily rejected.
- 16.3 OWNER shall not be liable to pay any documentation charges, Bank charges, commission, interest etc. on the amount of EMD. In case EMD is in the form of a "Bank Guarantee", the same shall be from any Indian scheduled Bank or a branch of an International Bank situated in India and registered with "Reserve Bank of India" as Scheduled Foreign Bank. However, in case of „Bank Guarantee" from Banks other than the Nationalized Indian Banks, the Bank must be commercial Bank having networth in excess of Rs. 100 Crores [Rupees One Hundred Crores] and a declaration to this effect should be made by such commercial Bank either in the "Bank Guarantee" itself or separately on its letterhead.
- 16.4 Any Bid not secured in accordance with "ITB: Clause-16.1 & Clause-16.3" may be rejected by TFL as non-responsive.
- 16.5 Unsuccessful Bidder's EMD will be discharged/ returned as promptly as possible, but not later than "thirty [30] days" after finalization of tendering process.
- 16.6 The successful Bidder's EMD will be discharged upon the Bidder's acknowledging the "Award" and signing the "Agreement" (if applicable) and furnishing the Contract Performance Security (CPS)/ Security Deposit" pursuant to clause no. 38 of ITB.
- 16.7 Notwithstanding anything contained herein, the EMD may also be forfeited in any of the following cases:

- (a) If a Bidder withdraws his Bid during the "Period of Bid Validity"
- (b) If a Bidder has indulged in corrupt/fraudulent /collusive/coercive practice
- (c) If the Bidder modifies Bid during the period of bid validity (after Due Date and Time for Bid Submission).
- (d) Violates any other condition, mentioned elsewhere in the Tender Document, which may lead to forfeiture of EMD.
- (e) In case of Cartelization of bid.
- (f) In the case of a successful Bidder, if the Bidder fails to:
  - (i) to acknowledge receipt of the "Notification of Award" / Fax of Acceptance[FOA] / Detailed Letter of Acceptance [DLOA]",
  - (ii) to furnish "Contract Performance Security / Security Deposit", in accordance with "ITB: Clause-38".

16.8 In case EMD is in the form of „Bank Guarantee“, the same must indicate the Tender Document No. and the name of Tender Document for which the Bidder is quoting. This is essential to have proper correlation at a later date.

16.9 MSEs (Micro & Small Enterprises) are exempted from submission of EMD in accordance with the provisions of PPP-2012 and Clause 40 of ITB. However, Traders/Dealers/ Distributors /Stockiest /Wholesaler are not entitled for exemption of EMD. The Government Departments/PSUs are also exempted from the payment of EMD. Further, Startups are also exempted from the payment of EMD.

16.10 In case of forfeiture of EMD/ Bid Security, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by TFL. The forfeiture amount will be subject to final decision of TFL based on other terms and conditions of order/contract.

**16.11 DECLARATION FOR BID SECURITY**

MSEs (Micro & Small Enterprises), Start-ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue) are required to submit, "DECLARATION FOR BID SECURITY" as per prescribed format (F-2B).

**17 PRE-BID MEETING (IF APPLICABLE)**

17.1 The Bidder(s) or his designated representative are invited to attend a "Pre-Bid Meeting" which will be held at address specified in IFB. It is expected that a bidder shall not depute more than 02 representatives for the meeting.

17.2 Purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage and give hands-on e-tendering.

17.3 Text of the questions raised and the responses given, together with any responses prepared after the meeting, will be uploaded on Central Public Procurement (CPP) Portal (<https://eprocure.gov.in/eprocure/app>) websites. Any modification of the Contents of Bidding Documents listed in "ITB: Clause-7.1", that may become necessary as a result of the Pre-Bid Meeting shall be made by the Employer exclusively through the issue of an Corrigendum pursuant to "ITB: Clause-9", and not through the minutes of the Pre-Bid Meeting.

17.4 Non-attendance of the Pre-Bid Meeting will not be a cause for disqualification of Bidder.

## **18 FORMAT AND SIGNING OF BID**

- 18.1 The original and all copies of the Bid shall be typed or written in indelible ink [in the case of copies, photocopies are also acceptable] and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder (as per POA). The name and position held by each person signing, must be typed or printed below the signature. All pages of the Bid except for unamendable printed literature where entry(s) or amendment(s) have been made shall be initialed by the person or persons signing the Bid.
- 18.2 The Bid shall contain no alterations, omissions, or additions, unless such corrections are initialed by the person or persons signing the Bid.
- 18.3 In case of e-tendering, digitally Digitally signed documents to be uploaded as detailed in addendum to ITB (Annexure-III of Section –III).

## **19 ZERO DEVIATION AND REJECTION CRITERIA**

- 19.1 ZERO DEVIATION: Deviation to terms and conditions of "Bidding Documents" may lead to rejection of bid. TFL will accept bids based on terms & conditions of "Bidding Documents" only. Bidder may note TFL will determine the substantial responsiveness of each bid to the Tender documents pursuant to provision contained in clause 29 of ITB. For purpose of this, a substantially responsive bid is one which conforms to all terms and conditions of the Bidding Documents without deviations or reservations. TFL's determination of a bid's responsiveness is based on the content of the bid itself without recourse to extrinsic evidence. TFL reserves the right to raise technical and/or commercial query(s), if required, may be raised on the bidder(s). The response(s) to the same shall be in writing, and no change in the price(s) or substance of the bids shall be sought, offered or permitted. The substance of the bid includes but not limited to prices, completion, scope, technical specifications, etc. Bidders are requested to not to take any deviation/exception to the terms and conditions laid down in this "Tender Documents", and submit all requisite documents as mentioned in this "Tender Documents", failing which their offer will be liable for rejection. If a bidder does not reply to the queries in the permitted time frame, then its bid shall be evaluated based on the documents available in the bid.
- 19.2 **REJECTION CRITERIA:** Notwithstanding the above, deviation to the following clauses of Tender document shall lead to summarily rejection of Bid:
- a) Bidder not meeting Bid Evaluation Criteria as per Tender Document
  - b) Firm Price
  - c) EMD / Declaration for Bid Security (as applicable)
  - d) Specifications & Scope of Work
  - e) Schedule of Rates / Price Schedule / Price Basis
  - f) Duration / Period of Contract/ Completion Period
  - g) Payment Terms
  - h) Period of Validity of Bid
  - i) Integrity Pact
  - j) Mutually Agreed Damages
  - k) Overall ceiling on total liability
  - l) Contract Performance Security
  - m) Guarantee / Defect Liability Period
  - n) Arbitration / Settlement of Dispute

- o) Governing laws, language & measures
- p) Force Majeure
- q) Undertaking forms, Form I of Annexure VII for provision for procurement from a bidder which shares a land border with India
- r) Bidder quoting less than 20% as minimum Local content (as per make in India PPLC policy)
- s) Any other condition specifically mentioned in the tender document elsewhere that non-compliance of the clause lead to rejection of bid

Note: Further, it is once again reminded not to mention any condition in the Bid which is contradictory to the terms and conditions of Tender document.

## **20     E-PAYMENT**

OWNER has initiated payments to Contractors electronically, and to facilitate the payments electronically through '**e-banking**'.

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## **[D] – SUBMISSION OF BIDS**

### **21 SUBMISSION, SEALING AND MARKING OF BIDS**

- 21.1 In case of e-tendering, bids shall be submitted through e-tender in the manner specified elsewhere in tender document. No Manual/ Hard Copy (Original) offer shall be acceptable. Physical documents shall be addressed to the owner at address specified in IFB.
- 21.2 Deleted
- 21.3 Bids submitted under the name of AGENT/ REPRESENTATIVE /RETAINER/ ASSOCIATE etc. on behalf of a bidder/affiliate shall not be accepted.

### **22 DEADLINE FOR SUBMISSION OF BIDS**

- 22.1 In case of e-bidding, the bids must be submitted through e-tender mode not later than the date and time specified in the tender document/BDS (Bidding Data Sheet).
- 22.2 Deleted.
- 22.3 TFL may, in exceptional circumstances and at its discretion, extend the deadline for submission of Bids (clause 8 and/or 9 of ITB refers). In which case all rights and obligations of TFL and the Bidders, previously subject to the original deadline will thereafter be subject to the deadline as extended. Notice for extension of due date of submission of bid will be uploaded on website only as mentioned in Clause No. 2.0(G) of IFB.

### **23 LATE BIDS**

- 23.1 Any bids received after the notified date and time of closing of tenders will be treated as late bids.
- 23.2 In case of e-tendering, e-tendering system of CPP Portal (eprocure.gov.in) shall close immediately after the due date for submission of bid and no bids can be submitted thereafter.
- 23.3 Physical documents received to address other than one specifically stipulated in the Tender Document will not be considered for evaluation/opening/award if not received to the specified destination within stipulated date & time.
- 23.4 Unsolicited Bids or Bids received to address other than one specifically stipulated in the tender document will not be considered for evaluation/opening/award if not received to the specified destination within stipulated date & time.

### **24 MODIFICATION AND WITHDRAWAL OF BIDS**

- 24.1 Modification and withdrawal of bids shall be as follows:-

#### **24.1.1 IN CASE OF E- TENDERING**

The bidder may withdraw or modify its bid after bid submission but before the due date and time for submission as per tender document.

**24.1.2 IN CASE OF MANUAL BIDDING**

Deleted.

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## **[E] – BID OPENING AND EVALUATION**

### **25 EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS**

TFL reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids, at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligations to inform the affected Bidder or Bidders of the ground for TFL's action. However, Bidder if so desire may seek the reason (in writing) for rejection of their Bid to which TFL shall respond quickly.

### **26 BID OPENING**

#### **26.1 Unpriced Bid Opening:**

TFL/ PDIL will open bids in the presence of bidders' designated representatives who choose to attend date, time and location stipulated in the BDS. The bidders' representatives, who are present shall sign a bid opening register evidencing their attendance.

#### **26.2 Priced Bid Opening:**

26.2.1 TFL will open the price bids of those bidders who meet the qualification requirement and whose bids is determined to be technically and commercially responsive. Bidders selected for opening of their price bids shall be informed about the date of price bid opening.

Bidders may depute their authorized representative to attend the bid opening. The bidders' representatives, who are present shall sign a register evidencing their attendance and may be required to be present even on a short notice.

26.2.2 The price bids of those Bidders who were not found to be techno-commercially responsive shall not be opened.

In case of bids invited under the single bid system, bid shall be opened on the specified date & time.

#### **26.3 Reverse Auction (Clause not applicable)**

~~26.3.1 OWNER shall finalize tender after conducting reverse auction except in those cases where less than four techno-commercially acceptable offers are available.~~

~~— In case, after techno commercial evaluation, number of technically & commercially acceptable offers are less than 04 (four), then no reverse auction will be conducted (but the OWNER/CONSULTANT shall take appropriate decision regarding conducting offline price negotiation, if required).~~

~~— Accordingly, the decision to conduct reverse auction shall be communicated to shortlisted bidders prior to opening of price bid. The due date and time of conducting the event of Reverse Auction (if conducted) shall be intimated well in advance to the techno-commercially acceptable bidders, through email.~~

#### **26.3.2 Detailed methodology of Reverse Auction**

~~With the assistance of RA system provider, training to all eligible bidders on the Online Reverse Auction process shall be facilitated prior to conduct of Online Reverse Auction.~~

- ~~a) Computerized Reverse Auction shall be conducted by PDIL through M/s e-Procurement Technologies Limited, on pre-specified date, while the bidders shall be quoting from their own offices/ place of their choice.~~
- ~~b) The due date and time of conducting the event of Reverse Auction shall be intimated at least 2 (two) days in advance to the techno-commercially acceptable bidders, through email /letter. For better understanding of Reverse Auction by the bidders, one day online training shall be conducted by M/s e-Procurement Technologies Limited i.e. the agency conducting the Reverse Auction, for all the techno-commercially qualified bidders. Reverse Auction Training and Demo auction shall be conducted through Video conferencing only.~~
- ~~c) A user ID and a password shall be created for each techno-commercially qualified bidder by the M/s e-Procurement Technologies Limited and the same shall be communicated to the bidders during the training process. A Valid Digital Signature Certificate is required to take part in Reverse Bidding process.~~

~~**d) Display of Details during Reverse Auction(RA)**~~

~~———— The bidder will be able to view the following details on their screen during RA:~~

- ~~———— 1) “Total basic Price” (i.e. Total Price excluding GST)~~
- ~~———— 2) “Loading factor”~~
- ~~———— 3) “Total Evaluated Price” (i.e. Total Basic Price x Loading factor, calculated by system)~~
- ~~———— 4) “Rank of the bidder” (i.e. present rank, auto updated by system)~~
- ~~———— 5) “L1 price” (i.e. Present Lowest Total Evaluated Price, auto updated by system)~~

~~The “Total basic Price”, Loading factor and the “Total Evaluated Price” before RA shall be informed to individual bidders shortly after completion of the RA training. The “Total basic Price” before RA shall be the “Start price” of each bidder. During RA, the bidder will be able to reduce only the “Total Basic Price”. The “Total Evaluated Price” will be automatically calculated by the system and system will then compare it with “Total Evaluated Price” of other bidders to arrive at Rank and L1 price after every price change during the RA.~~

~~After completion of RA, the “Total Evaluated Price” of the lowest bidder shall be considered as the L-1 price after RA.~~

~~However, at no point of time will any bidder see names of other bidders, or prices of bidders other than the lowest bid. The Bidder has to out-bid his own previous price & try to reach Number-1 rank.~~

~~The tender shall be processed further for award or otherwise based on L-1 prices received at the end of Online Reverse Auction. Price reasonableness will still need to be established by PDIL/TFL even though the bidding is through Online Reverse Auction and TFL will~~



reserve the right to negotiate with the L1 bidder as per CVC guidelines.

- e) ~~All timings of the online bid shall be based on the time indicated by the Server hosting the Auction Engine which would reflect as closely as possible the Indian Standard Time (IST) i.e. GMT+05:30 hrs. However, in the event of any deviations between the Server Time and the Indian Standard Time, the functioning of the Auction Engine (launch, operation and closure) would be guided by the Server time. Bidders should be advised to refresh the window of the Auction module and check the exact server Time.~~
- f) ~~The start price of bidders will be automatically populated by system at the time of start of Reverse Auction. The same will be considered as participation by bidder in Online Reverse Auction process. In case any bidder emerges lowest bidder after RA based on their start price(s), the same will be considered as their final price(s) taking into consideration respective loading factor (to arrive at "Total Evaluated Price") for award of contract/ order irrespective of whether bidder had actually logged in RA portal or not. In case bidder does not accept the same, such bidder will be considered as errant bidder and action will be taken against bidder as per provision in this regard.~~
- g) ~~During Reverse Auction, a bidder can reduce his prices repeatedly. The minimum percentage reduction in each step namely, the bid decrement' shall not be less than 0.5% of the last bid of the respective bidder. Bidders are allowed to submit/accept first price without decrement amount but afterwards participation in reverse auction is allowed only with minimum decrement amount /percentage.~~
- h) ~~The process of Online Reverse Auction shall initially be held for a period of 30 minutes. In the event of a bid received in the last 5 minutes resulting in a change of prevailing L1 price, the period of the auction shall get extended automatically by 8 minutes from the time of submission of such bid. This process will continue till no change in L 1 price takes place in last 5 minutes after which the auction will close. All bidders regardless of their previous position can submit their bid during the extended period also.~~
- i) ~~In case of a tie during auction i.e. two bidders entering same lowest price, the bidder who enters the prices first in the system would be taken as L 1 and the other bidder would see their ranking as L 2.~~
- j) ~~Internet connectivity shall have to be ensured by bidders themselves. Bidders are requested to make all the necessary arrangements/ alternatives whatever required so that they are able to circumvent such situation and still be able to participate in the Reverse Auction successfully.~~
- k) ~~Bidders in their own interest should ensure uninterrupted internet connectivity at their end during the reverse auction with necessary backups to take care of any connectivity problem. No request for any extension of RAP due to internet connectivity issues or for any other reason at bidders end shall be entertained by PDIL/TFL.~~
- l) ~~In case of disruption of service at the service provider's end i.e. M/s e-Procurement Technologies Limited while the RAP (Reverse Auction Process) is online, due to any technical snag or otherwise attributable to the system failure at the server end, the RAP process will start all over again, through a fresh RAP (hereinafter referred to as "Restarted RAP"), the time and date of which will be intimated in writing to all bidders. In such a situation, the last recorded lowest price of prematurely ended RAP, will be the 'Start Bid Price' for the "Re-started RAP". The prices quoted in the prematurely ended RAP will be~~

~~binding on all the bidders for consideration. All the time stipulations of normal RAP will be applicable to the "Restarted RAP".~~

- ~~m) Communication with any official with service provider/PDIL/TFL when the RAP is online is strictly prohibited. Bidders in their own interest will have to get themselves satisfied on any queries that they may have during the RAP training session. No query when the RAP is online will be entertained.~~
- ~~n) Upon completion of reverse auction, rate of individual items of SOR shall be worked out applying uniform reduction (reduction being derived from the original Total Evaluated Price & final Total Evaluated Price after RA).~~
- ~~o) While working out rate of individual items, unit rate upto two decimals only will be considered and the figures beyond two decimals shall be ignored without rounding off (e.g. if item rates after applying uniform reduction works out to 10.910 or 10.912 or 10.915 or 10.919, the rate will be considered as 10.91). Above prices shall be the final prices of lowest bidder against the tender for all the purposes and the original quoted prices against tender shall no more be valid for tender for which Reverse Auction was held.~~

~~26.3.3 Preferences: Purchase Preference shall be applicable as defined in tender document.~~

## **27 CONFIDENTIALITY**

Information relating to the examination, clarification, evaluation and comparison of Bids, and recommendations for the award of a Contract, shall not be disclosed to Bidder(s) or any other persons not officially concerned with such process.

## **28 CONTACTING THE EMPLOYER**

- 28.1 From the time of Bid opening to the time of award of Contract, if any Bidder wishes to contact the Employer on any matter related to the Bid, it should do so in writing.
- 28.2 Any effort by the Bidder to influence the Employer in the Employer's 'Bid Evaluation', 'Bid Comparison', or 'Contract Award' decisions may result in the rejection of the Bidder's Bid and action shall be initiated as per procedure for action in case Corrupt / Fraudulent / Collusive / Coercive practices in this regard, apart from forfeiture of EMD/ Bid Security, if any.

## **29 EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS**

- 29.1 The employer's determination of a bid's responsiveness is based on the content of the bid only. Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid:
  - (a) Meets the "Bid Evaluation Criteria" of the Bidding Documents ;
  - (b) Has been properly signed;
  - (c) Is accompanied by the required 'Earnest Money / Bid Security / Bid Security Declaration'
  - (d) Is substantially responsive to the requirements of the Bidding Documents ; and
  - (d) Provides any clarification and/or substantiation that the Employer may require to determine responsiveness pursuant to "ITB: Clause-29.2"

29.2 A substantially responsive Bid is one which conforms to all the terms, conditions and specifications of the Bidding Documents without material deviations or reservations or omissions for this purpose employer defines the foregoing terms below:

- a) "Deviation" is departure from the requirement specified in the tender documents.
- b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirement in the tender documents.
- c) "Omission" is the failure to submit part or all of the information or documentation required in the tender document for evaluation of bid.

29.3 A material deviation, reservation or omission is one that,

- a) If accepted would,
  - i) Affect in any substantial way the scope, quality, or performance of the job as specified in tender documents.
  - ii) Limit, in any substantial way, inconsistent with the Tender Document, the Employer's rights or the tenderer's obligations under the proposed Contract.
- b) If rectified, would unfairly affect the competitive position of other bidders presenting substantially responsive bids.

29.4 The employer shall examine all aspects of the bid to confirm that all requirements have been met without any material deviation, reservation or omission.

29.5 If a Bid is not substantially responsive, it may be rejected by the Employer and may not subsequently be made responsive by correction or withdrawal of the of material deviation, reservation or omission.

### **30 CORRECTION OF ERRORS-**

Arithmetic Correction of Errors (if any) in multiplication to derive the total cost of an individual item shall be done by the Consultant based on the quoted Unit Price by the Bidder. If the bidder does not accept the corrected amount of bid, its bid will be rejected.

### **31 CONVERSION TO SINGLE CURRENCY FOR COMPARISON OF BIDS**

Not Applicable. All bids submitted must be in the currency specified at clause 14 of ITB.

### **32 EVALUATION AND COMPARISON OF BIDS**

Bid shall be evaluated as per evaluation criteria mentioned in Section-II of bidding documents on lowest bid basis.

In case of a tie at the lowest bid (L1) position between two or more bidders, the order/LoA will be placed on the bidder who has higher/ highest turnover in last audited financial year.

In case there is a tie at the lowest bid (L1) position between only startup bidders and none of them has past turnover, the order/FOA will be placed on the startup who is registered earlier with Department for Promotion of Industry and Internal Trade (wherever applicable).

**33 COMPENSATION FOR EXTENDED STAY [FOR APPLICABILITY OF THIS CLAUSE REFER BDS]:**

Not Applicable

**34 PURCHASE PREFERENCE**

Purchase preference to Local Content (PP-LC) bidders/Domestically manufactured Telecom Products (DMTP) shall be allowed as per Government instructions in vogue, as applicable from time to time

The policy for providing Purchase Preference (linked with Local content) is enclosed as Annexure V to ITB herewith.

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## **[F] – AWARD OF CONTRACT**

### **35     **AWARD****

Subject to "ITB: Clause-29", Owner will award the Contract to the successful Bidder whose Bid has been determined to be substantially responsive and has been determined as the lowest provided that bidder, is determined to be qualified to satisfactorily perform the Contract.

***“TFL intends to place the contract directly on the address from where Goods are produced / dispatched or Services are rendered. In case, bidder wants contract at some other address or supply of Goods/ Services from multiple locations, bidder is required to provide in their bid address on which order is to be placed.”***

TFL will place the Contract directly on the successful bidder from whom the bid has been received & evaluated and will not place order on other entities such as subsidiary, business associate or partner, dealer/distributor etc. of the Bidder.

### **36     **NOTIFICATION OF AWARD / FAX OF ACCEPTANCE****

- 36.1 Prior to the expiry of 'Period of Bid Validity', Notification of Award for acceptance of the Bid will be intimated to the successful Bidder by TFL either by E-mail /Letter or like means defined as the "Fax of Acceptance (FOA)". The Contract shall enter into force on the date of FOA and the same shall be binding on TFL and successful Bidder (i.e. Contractor). The Notification of Award/FOA will constitute the formation of a Contract. The detailed Letter of Acceptance shall be issued thereafter incorporating terms & conditions of Tender Document, Corrigendum, Clarification(s), Bid and agreed variation(s)/acceptable deviation(s), if any. TFL may choose to issue Notification of Award in form of detailed Letter of Acceptance without issuing FOA and in such case the Contract shall enter into force on the date of Detailed Letter of Acceptance only.
- 36.2 Contract period shall commence from the date of "Notification of Award" or as mentioned in the Notification of Award. The "Notification of Award" will constitute the formation of a Contract, until the Contract has been effected pursuant to signing of Contract as per "ITB: Clause-37".
- 36.3 Upon the successful Bidder's / Contractor's furnishing of 'Contract Performance Security / Security Deposit', pursuant to "ITB: Clause-38", TFL will promptly discharge his 'Earnest Money Deposit / Bid Security (if applicable)', pursuant to "ITB: Clause-16".
- 36.4 The Order/ contract value mentioned above is subject to Mutually Agreed Damages clause.
- 36.5 TFL will award the Contract to the successful Bidder, who, within 'fifteen [15] days' of receipt of the same, shall sign and return the acknowledged copy to TFL.

### **37     **SIGNING OF AGREEMENT****

The successful Bidder/Contractor shall be required to execute an ' Agreement' in the proforma given in this Bidding Document) on a 'non-judicial stamp paper' of appropriate value [cost of the 'stamp-paper' shall be borne by the successful Bidder/Contractor] and of 'state of India' specified in Bidding Data Sheet (BDS) only, within 'fifteen [15] days' of receipt of the " Fax of Acceptance (FOA)" of the Tender by the successful

Bidder/Contractor failure on the part of the successful Bidder/Contractor to sign the 'Agreement' within the above stipulated period, shall constitute sufficient grounds for Action as per Bid Security declaration.

### **38 CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT ((CPS/SD)**

38.1 Within 30 days of the receipt of the notification of Award/ Fax of Acceptance (FOA) by from TFL, the successful bidder shall furnish the Contract Performance Security (CPS) in accordance with of General Conditions of the Contract. The CPS shall be in the form of either Banker's Cheque or Demand Draft or Bank Guarantee or Letter of Credit and shall be in the currency of the Contract. However, CPS shall not be applicable in cases wherein the individual ~~order~~ contract value as specified in Notification of Award is less than INR 5 Lakh (exclusive of GST).

38.2 The CONTRACT PERFORMANCE SECURITY shall be for an amount equal specified in Bidding Data Sheet (BDS) towards faithful performance of the contractual obligations and performance of equipment. For the purpose of CPS, Contract/order value shall be exclusive of **GST (CGST & SGST/UTGST or IGST)**.

Bank Guarantee towards CPS shall be from any Indian scheduled bank or a branch of an International bank situated in India and registered with Reserve Bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalized Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect should be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.

38.3 Failure of the successful bidder to comply with the requirements of this article shall constitute sufficient grounds for consideration of the annulment of the award and Forfeiture of EMD/action as per declaration of Bid Security.

38.4 The CPS has to cover the entire contract value including extra works/services also. As long as the CPS submitted at the time of award take cares the extra works/services executed and total executed value are within the awarded contract price, there is no need for additional CPS. As soon as the total executed value is likely to burst the ceiling of awarded contract price, the contractor should furnish additional CPS.

38.5 ~~Further, Ministry of Finance (MOF) Department of financial service has issued direction for submission of Bank Guarantee through online vide letter ref number F.No.7/112/2011-BOA dated 17th July 2012. The successful bidder can submit CPS online through issuing bank to TFL directly as per the above direction including its revisions, if any. In such cases confirmation will not be sought from issuing banker by TFL.~~

38.6 In addition to existing specified form (i.e. Demand Draft (DD)/ Banker's Cheque/ Bank Guarantee/Letter of Credit) mentioned in tender documents for submission of Security Deposit/ Contract Performance Security, the successful bidder can also submit the Security Deposit/ Contract Performance Security through online banking transaction i.e. IMPS/NEFT/RTGS/SWIFT etc. For this purpose, the details of TFL's Bank Account is mentioned in BDS. Further, in case a successful Bidder is willing to furnish CPS through SWIFT, the details may be obtained from Purchase Officer immediately after receipt of FOA.

While remitting such online transaction, the bidder must indicate “**Security Deposit/ Contract Performance Security against FOA/DLOA no. \_\_ (contractor to specify the FOA/DLOA No.)**” under remarks column of such transaction of respective bank portal. The contractor/vendor shall be required to submit the successful transaction details to the dealing officer immediately through email/letter and necessarily within 30 days from the date of Fax of Acceptance.

- 38.7 In case of forfeiture of Contract Performance Security/ Security Deposit in terms of GCC, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by TFL. The forfeiture amount will be subject to final decision of TFL based on other terms and conditions of order/ contract.
- 38.8 The Contractor will also submit covering letter along with CPS as per format at F-4.
- 38.9 CPBG/Security Deposit will not be accepted in case the same has reference of ‘remitter’/‘financer’ other than bidder on the aforementioned financial instrument of CPBG/ Security Deposit submitted by the Contractor.

**39 PROCEDURE FOR ACTION IN CASE CORRUPT/FRAUDULENT/COLLUSIVE/ COERCIVE PRACTICES**

- 39.1 Procedure for action in case Corrupt/ Fraudulent/Collusive/Coercive Practices is enclosed at Annexure-I.

**39.4 NON-APPLICABILITY OF ARBITRATION CLAUSE IN CASE OF BANNING OF VENDORS/ SUPPLIERS / CONTRACTORS/ BIDDERS/ CONSULTANTS INDULGED IN FRAUDULENT/ COERCIVE PRACTICES**

Notwithstanding anything contained contrary in GCC and other "CONTRACT DOCUMENTS", in case it is found that the Contractors/Bidders indulged in fraudulent/ coercive practices at the time of bidding, during execution of the contract etc. and/or on other grounds as mentioned in OWNER's "Procedure for action in case Corrupt/Fraudulent/Collusive/Coercive Practices" (Annexure-I to Section-III), the contractor/bidder shall be banned (in terms of aforesaid procedure) from the date of issuance of such order by TFL, to such Contractors/Bidders.

The Contractor/ Bidder understands and agrees that in such cases where Contractor/ Bidder has been banned (in terms of aforesaid procedure) from the date of issuance of such order by TFL, such decision of TFL shall be final and binding on such Contractor/ Bidder and the 'Arbitration clause' in the GCC and other "CONTRACT DOCUMENTS" shall not be applicable for any consequential issue /dispute arising in the matter.

**40 PUBLIC PROCUREMENT POLICY FOR MICRO AND SMALL ENTERPRISES**

- 40.1 Government of India, vide Gazette of India No. 503 dated 26.03.2012 proclaimed the Public Procurement Policy for Micro and Small Enterprises (MSEs). The following benefit is available in case of work contract also:

- i) Issue of tender document to MSEs free of cost.
- ii) Exemption to MSEs from payment of EMD/Bid Security.

- 40.2 In case bidder is a Micro or Small Enterprise the bidder shall submit the following:

- i. Ministry of MSME vide Gazette notification no. CG-DL-E-26062020-220191 dated 26.06.2020 had notified certain criteria for classifying the enterprises as Micro, Small and Medium Enterprises and specified, form and procedure for filing the memorandum (Udyam Registration) w.e.f. 01.07.2020 (for complete details of policy refer website of Ministry of MSME i.e. <https://msme.gov.in/>)

Accordingly, Micro and Small Enterprises (MSEs) shall be required to submit Udyam Registration Certificate for availing benefit under Public Procurement Policy for MSEs-2012

- ii. An enterprise registered prior to 30.06.2020 and who is not re-registered with Udyam Registration, shall continue to be valid for a period upto 31.12.2021. Such enterprise shall submit EM Part-II or Udyog Aadhaar Memorandum (UAM) for availing benefits of PPP-2012.

The above documents submitted by the bidder shall be duly certified by the Chartered Accountant (not being an employee or a Director or not having any interest in the bidder's company/firm) and notary public with legible stamp.

If the bidder does not provide the above confirmation or appropriate document or any evidence, then it will be presumed that they do not qualify for any preference admissible in the Public Procurement Policy (PPP) 2012.

Further, MSEs who are availing the benefits of the Public Procurement Policy (PPP) 2012 get themselves registered with MSME Data Bank being operated by NSIC, under SME Division, M/o MSME, in order to create proper data base of MSEs which are making supplies to CPSUs.

- 40.3 If against an order placed by TFL , successful bidder(s) (other than Micro/Small Enterprise) is procuring material/services from their sub-vendor who is a Micro or Small Enterprise as per provision mentioned at clause no. 40.2 with prior consent in writing of the purchasing authority/Engineer-in-charge, the details like Name, Registration No., Address, Contact No. details of material & value of procurement made, etc. of such Enterprises shall be furnished by the successful bidder at the time of submission of invoice/Bill.
- 40.4 The benefit of policy are not extended to the traders/dealers/ Distributors /Stockiest/Wholesalers.
- 40.5 NSIC has initiated a scheme of "Consortia and Tender Marketing Scheme" under which they are assisting the Micro & Small enterprises to market their products and services through tender participation on behalf of the individual unit or through consortia.

Accordingly, if the MSEs or the consortia, on whose behalf the bid is submitted by NSIC, is meeting the BEC and other terms and conditions of tender their bid will be considered for further evaluation. Further, in such cases a declaration is to be submitted by MSE/ consortia on their letter head (s) that all the terms and conditions of tender document shall be acceptable to them.

- 40.6 Interest payment on delayed payments to MSME is payable in line with Micro, Small and Medium Enterprises Development Act, 2006



#### **41 AHR ITEMS**

In item rate contract where the quoted rates for the items exceed 50% of the estimate rates, such items will be considered as Abnormally High Rates (AHR) items and payment of AHR items beyond the SOR stipulated quantities shall be made at the lowest amongst the following rates:

- i) Rates as per SOR, quoted by the Contractor/Bidder.
- ii) Rate of the item, which shall be derived as follows:
  - a. Based on rates of Machine and labour as available from the contract (which includes contractor's supervision, profit, overheads and other expenses).
  - b. In case rates are not available in the contract, rates will be calculated based on prevailing market rates of machine, material and labour /latest DSR and plus 15% to cover contractor's supervision profit, overhead & other expenses

#### **42 VENDOR PERFORMANCE EVALUATION**

Shall be as stipulated Annexure II to ITB herewith.

#### **43 INCOME TAX & CORPORATE TAX**

43.1 Income tax deduction shall be made from all payments made to the contractor as per the rules and regulations in force and in accordance with the Income Tax Act prevailing from time to time.

43.2 Corporate Tax liability, if any, shall be to the contractor's account.

#### **43.3 TDS**

- (i) TDS, wherever applicable, shall be deducted as per applicable act/law/rule.
- (ii) **Higher rate of TDS for non-filers of ITR**

As per Section 206AB of Income Tax Act, 1961, in case of any vendor/customer who does not filed their Income Tax Return for both of the two previous years preceding to current year and aggregate amount of TDS is more than or equal to 50,000/- in each of those previous two years (or limit defined by Govt. from time to time), then TDS will be deducted at the higher of following rates:

- (I) Twice the rate mentioned in relevant TDS section.
- (II) Twice the rate or rates in force
- (III) 5%

#### **43.4 MENTIONING OF PAN NO. IN INVOICE/BILL**

As per CBDT Notification No. 95/2015 dated 30.12.2015, mentioning of PAN no. is mandatory for procurement of goods / services/works/consultancy services exceeding Rs. 2 Lacs per transaction or as amended from time to time.

Accordingly, contractor should mention their PAN no. in their invoice/ bill for any transaction exceeding Rs. 2 lakhs or as amended from time to time. As provided in the notification, in case contractors do not have PAN no., they have to submit declaration in Form 60 along with invoice/ bill for each transaction.

Payment of contractor shall be processed only after fulfillment of above requirement.

#### **44. DISPUTE RESOLUTION MECHANISM**

##### **44.1 QUARTERLY CLOSURE OF THE CONTRACT**

During execution of orders, various issues may arise. In order to timely detect and to address the contractual issue(s) during the execution of contracts, TFL has introduced a mechanism of Quarterly Closure of the contract, under which all the related issues /disputes will be monitored and addressed on quarterly basis for resolution. Vendor (hereinafter referred 'Vendor') should first refer any issues/disputes to Engineer-in-Charge (EIC) for LOA/contracts/ Dealing C&P Executive for Purchase Orders and co-operate them for smooth execution of the contract and to timely address the issues, if any. For applicability of 'Quarterly Closure', please refer BDS.

##### **44.2 ARBITRATION**

All issue(s)/dispute(s) excluding the matters that have been specified as excepted matters and listed at clause no. 2.6 and which cannot be resolved through Conciliation, such issue(s)/dispute(s) shall be referred to arbitration for adjudication by Sole Arbitrator.

The party invoking the Arbitration shall have the option to either opt for Ad-hoc Arbitration as provided at Clause 2.1 below or Institutionalized Arbitration as provided at Clause 2.2 below, the remaining clauses from 2.3 to 2.7 shall apply to both Ad-hoc and Institutional Arbitration:-

2.1 On invocation of the Arbitration clause by either party, TFL shall suggest a panel of three independent and distinguished persons (Retd Supreme Court & High Court Judges only) to the other party from the Panel of Arbitrators maintained by 'Delhi International Arbitration Centre (DIAC) to select any one among them to act as the Sole Arbitrator. In the event of failure of the other party to select the Sole Arbitrator within 30 days from the receipt of the communication from TFL suggesting the panel of arbitrators, the right of selection of the sole arbitrator by the other party shall stand forfeited and TFL shall appoint the Sole Arbitrator from the suggested panel of three Arbitrators for adjudication of dispute(s). The decision of TFL on the appointment of the sole arbitrator shall be final and binding on the other party. The fees payable to Sole Arbitrator shall be governed by the fee Schedule of "Delhi International Arbitration Centre".

OR

2.2 If a dispute arises out of or in connection with this contract, the party invoking the Arbitration shall submit that dispute to any one of the Arbitral Institutions i.e ICADR/ICA/DIAC/SFCA and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd. Supreme Court/High Court Judge to be appointed/nominated by the respective institution. The cost/expenses pertaining to

the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to a specific Arbitral institution for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged.

- 2.3 The cost of arbitration proceedings shall be shared equally by the parties.
- 2.4 The Arbitration proceedings shall be in English language and the seat, venue and place of Arbitration shall be New Delhi, India only.
- 2.5 Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable. All matter relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.
- 2.6 List of Excepted matters:
- a) Dispute(s)/issue(s) involving claims below Rs 25 lakhs and above Rs 25 crores.
  - b) Dispute(s)/issue(s) relating to indulgence of Contractor/Vendor/Bidder in corrupt/fraudulent/collusive/coercive practices and/or the same is under investigation by CBI or Vigilance or any other investigating agency or Government.
  - c) Dispute(s)/issue(s) wherein the decision of Engineer-In-Charge/owner/TFL has been made final and binding in terms of the Contract.
- 2.7. Disputes involving claims below Rs 25 Lakhs and above Rs. 25 crores:- Parties mutually agree that dispute(s)/issue(s) involving claims below Rs 25 Lakhs and above Rs 25 crores shall not be subject matter of Arbitration and are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.

#### **44.3 GOVERNING LAW AND JURISDICTION:**

The Contract shall be governed by and construed in accordance with the laws in force in India. The Parties hereby submit to the exclusive jurisdiction of the Courts situated at New Delhi for adjudication of disputes, injunctive reliefs, actions and proceedings, if any, arising out of this Contract.

#### **45. DISPUTES BETWEEN CPSE'S/ GOVERNMENT DEPARTMENT'S / ORGANIZATIONS**

Subject to conciliation as provided above, in the event of any dispute (other than those related to taxation matters) or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments /Organizations , such dispute or difference shall be taken up by either party for resolution only through AMRCD as mentioned in OPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018.

Any party aggrieved with the decision of the Committee at the First level (tier) may prefer an appeal before the Cabinet Secretary at the Second level (tier) within 15 days from the date of receipt of decision of the Committee at First level, through its administrative Ministry/Department, whose decision will be final and binding on all concerned.

The above provisions mentioned at clause no. 44 & 45 shall supersede provisions relating to Conciliation, Arbitration, Governing Law & Jurisdiction and Disputes between CPSE's/ Government Department's/ Organizations mentioned in General Conditions of Contract (GCC) and elsewhere in tender document.

46 **INAM-PRO (PLATFORM FOR INFRASTRUCTURE AND MATERIALS PROVIDERS)**

INAM-Pro (Platform for infrastructure and materials providers) is a web based platform for infrastructure providers and materials suppliers and was developed by Ministry of Road Transport and Highways (MoRT&H) with a view to reduce project execution delays on account of supply shortages and inspire greater confidence in contractors to procure cement to start with directly from the manufacturers. Presently, numerous cement companies are registered in the portal and offering cement for sale on the portal with a commitment period of 3 years. These companies have bound themselves by ceiling rates for the entire commitment period, wherein they are allowed to reduce or increase their cement rates any number of times within the ceiling rate, but are not permitted to exceed the said ceiling rate.

MoRT&H is expanding the reach of this web-portal by increasing both the product width as well as the product depth. They are working on incorporating 60 plus product categories. The product range will span from large machineries like Earth Movers and Concrete Mixers, to even the smallest items like road studs. MoRT&H intend to turn it into a portal which services every infrastructure development related need of a modern contractor.

TFL's contractors may use this innovative platform, wherever applicable. The usage of web – Portal is a completely voluntary exercise. The platform, however, can serve as a benchmark for comparison of offered prices and products.

47 **PROMOTION OF PAYMENT THROUGH CARDS AND DIGITAL MEANS**

To promote cashless transactions, the onward payments by Contractors to their employees, service providers, sub-contractors and suppliers may be made through Cards and Digital means to the extent possible.

48 **CONTRACTOR TO ENGAGE CONTRACT MANPOWER BELONGING TO SCHEDULED CASTES AND WEAKER SECTIONS OF THE SOCIETY**

While engaging the contractual manpower, Contractors are required to make efforts to provide opportunity of employment to the people belonging to Scheduled Castes and weaker sections of the society also in order to have a fair representation of these sections.

49 **PROVISIONS FOR STARTUPS (AS DEFINED IN GAZETTENOTIFICATION NO. D.L-33004/99 DATED 18.02.2016 AND 23.05.2017 OF MINISTRY OF COMMERCE AND INDUSTRY AND AS AMENDED FROM TIME TO TIME) [FOR APPLICABILITY REFER BDS]**

As mentioned in Section-II, Technical and Financial BEC shall be applicable for all Startups [whether Micro & Small Enterprises (MSEs) or otherwise].

Further, the Startups are also exempted from submission of EMDs (if applicable).

If a Startup emerge lowest bidder, the LoA on such Startup shall be placed for entire tendered quantity/group/item/part (as the case may be). However, during the Kick of Meeting monthly milestones/ check points would be drawn. Further, the performance of such contractor/ service provider will be reviewed more carefully and action to be taken as per provision of contract in case of failure/ poor performance.

**50. PROVISION REGARDING INVOICE FOR REDUCED VALUE OR CREDIT NOTE TOWARDS MAD**

MAD is the reduction in the consideration / contract value for the / services covered under this contract. In case of delay in execution of service provider should raise invoice for reduced value as per MAD) clause. If service provider has raised the invoice for full value, then service provider should issue Credit Note towards the applicable MAD amount with applicable taxes.

In such cases if service provider fails to submit the invoice with reduced value or does not issue credit note as mentioned above, TFL will release the payment to service provider after giving effect of the MAD clause with corresponding reduction of taxes charged on service provider's invoice, to avoid delay in payment.

In case any financial implication arises on TFL due to issuance of invoice without reduction in price or non-issuance of Credit Note, the same shall be to the account of service provider. TFL shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) together with penalties and interest, if any, against any amounts paid or becomes payable by OWNER in future to the service provider's under this contract or under any other contract.

**51. UNIQUE DOCUMENT IDENTIFICATION NUMBER BY PRACTICING CHARTERED ACCOUNTANTS**

Practicing Chartered Accountants shall generate Unique Document Identification Number (UDIN) for all certificates issued by them as per provisions of Tender Document.

However, UDIN may not be required for documents being attested by Chartered Accountants in terms of provisions of Tender Document

**52. PROVISION FOR PROCUREMENT FROM A BIDDER WHICH SHARES A LAND BORDER WITH INDIA.**

**The clause regarding provision for procurement from a bidder** which shares a land with India is enclosed as Annexure-VII to ITB herewith.

**PROCEDURE FOR ACTION IN CASE CORRUPT/ FRAUDULENT/COLLUSIVE/COERCIVE PRACTICES**

**Annexure-I**

**A Definitions:**

- A.1 "Corrupt Practice" means the offering, giving, receiving or soliciting, directly or indirectly, anything of value to improperly influence the actions in selection process or in contract execution.  
"Corrupt Practice" also includes any omission for misrepresentation that may mislead or attempt to mislead so that financial or other benefit may be obtained or an obligation avoided.
- A.2 "Fraudulent Practice" means and include any act or omission committed by a agency or with his connivance or by his agent by misrepresenting/ submitting false documents and/ or false information or concealment of facts or to deceive in order to influence a selection process or during execution of contract/ order.
- A.3 "Collusive Practice amongst bidders (prior to or after bid submission)" means a scheme or arrangement designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.
- A.4 "Coercive practice" means impairing or harming or threatening to impair or harm directly or indirectly, any agency or its property to influence the improperly actions of an agency, obstruction of any investigation or auditing of a procurement process.
- A.5 "Vendor/Supplier/Contractor/Consultant/Bidder" is herein after referred as "Agency"
- A.6 "Appellate Authority" shall mean Committee of Directors consisting of Director (Finance) and Director (BD) for works centers under Director (Projects). For all other cases committee of Directors shall consist of Director (Finance) & Director (Projects).
- A.7 "Competent Authority" shall mean the authority, who is competent to take final decision for Suspension of business dealing with an Agency/ (ies) and Banning of business dealings with Agency/ (ies) and shall be the "Director" concerned.
- A.8 "Allied Agency" shall mean all the concerns within the sphere of effective influence of banned/ suspended agencies. In determining this, the following factors may be taken into consideration:
- (a) Whether the management is common;
  - (b) Majority interest in the management is held by the partners or directors of banned/ suspended firm.
  - (c) substantial or majority shares are owned by banned/ suspended agency and by virtue of this it has a controlling voice.
- A.9 "Investigating Agency" shall mean any department or unit of TFL investigating into the conduct of Agency/ party and shall include the Vigilance Department of the TFL, Central Bureau of Investigation, State Police or any other agency set up by the Central or state government having power to investigate.

**B Actions against bidder(s) indulging in corrupt /fraudulent/ collusive/ coercive practice**

**B.1 Irregularities noticed during the evaluation of the bids:**

If it is observed during bidding process/ bids evaluation stage that a bidder has indulged in corrupt/fraudulent /collusive/coercive practice, the bid of such Bidder (s) shall be rejected and its Earnest Money Deposit (EMD) shall be forfeited.

Further, such agency shall be banned for future business with TFL for a period specified in para B 2.2 below from the date of issue of banning order.

## **B.2 Irregularities noticed after award of contract**

### **(i) During execution of contract:**

If an agency, is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, action shall be initiated for putting the agency on banning list.

After conclusion of process and issuance of Speaking order for putting party on banning list, the order (s)/ contract (s) where it is concluded that such irregularities have been committed shall be terminated and Contract cum Performance Bank Guarantee (CPBG) submitted by agency against such order (s)/ contract (s) shall also be forfeited. Further such order/ contract will be closed following the due procedure in this regard.

The amount that may have become due to the contractor on account of work already executed by him shall be payable to the contractor and this amount shall be subject to adjustment against any amounts due from the contractor under the terms of the contract. No risk and cost provision will be enforced in such cases.

### **Suspension of order/ contract:**

Further, only in the following situations, the concerned order (s)/ contract(s) (where Corrupt/Fraudulent/ Collusive/ Coercive Practices are observed) and payment shall be suspended after issuance of Suspension cum Show Cause Notice:

- (i) Head of Corporate Vigilance Department/CVO based on the investigation by them, recommend for specific immediate action against the agency.
- (ii) Head of Corporate Vigilance Department/CVO based on the input from investigating agency, forward for specific immediate action against the agency.

Suspension cum Show Cause Notice being issued in above cases after approval of the competent authority (as per provisions mentioned under Clause no. D) shall also include the provision for suspension of Order (s)/ Contract (s) and payment. Accordingly, after issuance of Suspension cum Show Cause Notice, the formal communication for suspension of Order (s)/ Contract (s) and payment with immediate effect will be issued by the concerned person of TFL.

During suspension, Contractor/ Service Providers will be allowed to visit the plant/ site for upkeep of their items/ equipment, TFL's issued materials (in case custody of same is not taken over), demobilizing the site on confirmation of EIC, etc.

### **(ii) After execution of contract and during Defect liability period (DLP)/ Warranty/Guarantee Period:**





	(vi) Repeated twice or more	period already served)  15 years (in addition to the period already served)
3	Indulged in unauthorized disposal of materials provided by TFL	7 years
4	If act of vendor/ contractor is a threat to the National Security	15 years

**C Effect of banning on other ongoing contracts/ tenders**

- C.1 If an agency is put on Banning, such agency should not be considered in ongoing tenders/future tenders.
- C.2 However, if such an agency is already executing other order (s)/ contract (s) where no corrupt/fraudulent/ collusive/coercive practice is found, the agency should be allowed to continue till its completion without any further increase in scope except those incidental to original scope mentioned in the contract.
- C.3 If an agency is put on the Banning List during tendering and no irregularity is found in the case under process:
  - C.3.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the agency shall be ignored.
  - C.3.2 after opening Technical bid but before opening the Price bid, the Price bid of the agency shall not be opened and BG/EMD submitted by the agency shall be returned to the agency.
  - C.3.3 after opening of price, BG/EMD made by the agency shall be returned; the offer of the agency shall be ignored & will not be further evaluated. If the agency is put on banning list for fraud/ mis-appropriation of facts committed in the same tender/other tender where errant agency emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.

**D. Procedure for Suspension of Bidder**

**D.1 Initiation of Suspension**

Action for suspension business dealing with any agency/(ies) shall be initiated by Corporate C&P Department when

- (i) Corporate Vigilance Department based on the fact of the case gathered during investigation by them recommend for specific immediate action against the agency.
- (ii) Corporate Vigilance Department based on the input from Investigating agency, forward for specific immediate action against the agency.
- (iii) Non performance of Vendor/Supplier/Contractor/Consultant leading to termination of Contract/ Order.

## **D.2 Suspension Procedure:**

- D.2.1 The order of suspension would operate initially for a period not more than six months and is to be communicated to the agency and also to Corporate Vigilance Department. Period of suspension can be extended with the approval of the Competent Authority by one month at a time with a ceiling of six months pending a conclusive decision to put the agency on banning list.
- D.2.2 During the period of suspension, no new business dealing may be held with the agency.
- D.2.3 Period of suspension shall be accounted for in the final order passed for banning of business with the agency.
- D.2.4 The decision regarding suspension of business dealings should also be communicated to the agency.
- D.2.5 If a prima-facie, case is made out that the agency is guilty on the grounds which can result in banning of business dealings, proposal for issuance of suspension order and show cause notice shall be put up to the Competent Authority. The suspension order and show cause notice must include that (i) the agency is put on suspension list and (ii) why action should not be taken for banning the agency for future business from TFL. The competent authority to approve the suspension will be same as that for according approval for banning.

## **D 3 Effect of Suspension of business:**

Effect of suspension on other on-going/future tenders will be as under:

- D.3.1 No enquiry/bid/tender shall be entertained from an agency as long as the name of agency appears in the Suspension List.
- D.3.2 If an agency is put on the Suspension List during tendering:
  - D.3.2.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the agency shall be ignored.
  - D.3.2.2 after opening Technical bid but before opening the Price bid, the Price bid of the agency shall not be opened and BG/EMD submitted by the agency shall be returned to the agency.
  - D.3.2.3 after opening of price, BG/EMD made by the agency shall be returned; the offer of the agency shall be ignored & will not be further evaluated. If the agency is put on Suspension list for fraud/ mis-appropriation of facts conducted in the sametender/other tender where errant agency emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.
- D.3.3 The existing contract (s)/ order (s) under execution shall continue.
- D.3.4 Tenders invited for procurement of goods, works and services shall have provision that the bidder shall submit a undertaking to the effect that (i) neither the bidder themselves nor their allied agency/(ies) are on banning list of TFL and(ii) bidder is not banned by any Government department/ Public Sector.

## **F. Appeal against the Decision of the Competent Authority:**

- F.1 The agency may file an appeal against the order of the Competent Authority for putting the agency on banning list. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the of receipt of banning order.
- F.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the party as well as the Competent Authority.

- F.3 Appeal process may be completed within 45 days of filing of appeal with the Appellate Authority.
- G.** Wherever there is contradiction with respect to terms of 'Integrity pact' , GCC and 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice', the provisions of 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice' shall prevail.

**PROCEDURE FOR EVALUATION OF PERFORMANCE OF VENDORS/ SUPPLIERS/  
CONTRACTORS/ CONSULTANTS**

**1.0 GENERAL**

A system for evaluation of Vendors/ Suppliers/Contractors/ Consultants and their performance is a key process and important to support an effective purchasing & contracting function of an organization.

Performance of all participating Vendors/ Suppliers/Contractors/ Consultants need to be closely monitored to ensure timely receipt of supplies from a Vendor, completion of an assignment by a Consultant or complete execution of order by a contractor within scheduled completion period. For timely execution of projects and meeting the operation & maintenance requirement of operating plants, it is necessary to monitor the execution of order or contracts right from the award stage to completion stage and take corrective measures in time.

**2.0 OBJECTIVE**

The objective of Evaluation of Performance aims to recognize, and develop reliable Vendors/ Suppliers/Contractors/ Consultants so that they consistently meet or exceed expectations and requirements.

The purpose of this procedure is to put in place a system to monitor performance of Vendors/ Suppliers/Contractors/ Consultants associated with TFL so as to ensure timely completion of various projects, timely receipt of supplies including completion of works & services for operation and maintenance of operating plants and quality standards in all respects.

**3.0 METHODOLOGY**

i) Preparation of Performance Rating Data Sheet

Performance rating data Sheet for each and every Vendor/ Supplier/Contractor/Consultant for all orders/Contracts with a value of Rs. 50 Lakhs and above is recommended to be drawn up. Further, Performance rating data Sheet for orders/contracts of Vendor/Supplier/Contractor/ Consultant who are on watch list/holiday list/ banning list shall be prepared irrespective of order/ contract value. These data sheets are to be separately prepared for orders/ contracts related to Projects and O&M. Format, Parameters, Process, responsibility for preparation of Performance Rating Data Sheet are separately mentioned.

ii) Measurement of Performance

Based on the parameters defined in Data Sheet, Performance of concerned Vendor/ Supplier/Contractor/ Consultant would be computed and graded accordingly. The measurement of the performance of the Party would be its ability to achieve the minimum scoring of 60% points in the given parameters.

iii) Initiation of Measures:

Depending upon the Grading of Performance, corrective measures would be initiated by taking up the matter with concerned Vendor/ Supplier/Contractor/ Consultant. Response of Vendor/ Supplier/Contractor/ Consultant would be considered before deciding further course of action.

iv) Implementation of Corrective Measures:

Based on the response of Vendor/ Supplier/Contractor/ Consultant, concerned Engineer-in-Charge for the Projects and/or OIC in case of O&M would recommend for continuation or discontinuation of such party from the business of TFL.

v) Orders/contracts placed on Proprietary/OEM basis for O&M will be evaluated and, if required, corrective action will be taken for improvement in future.

**4.0 EXCLUSIONS:**

The following would be excluded from the scope of evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants:

- i) Orders/Contracts below the value of Rs. 50 Lakhs if Vendor/ Supplier/Contractor/ Consultant is not on watch list/ holiday list/ banning list.
- ii) Orders for Misc./Administrative items/ Non stock Non valued items (PO with material code ending with 9).

However, concerned Engineer-in-Charge /OICs will continue to monitor such cases so as to minimize the impact on Projects/O&M plants due to non performance of Vendors/ Suppliers/Contractors/ Consultants in all such cases.

**5.0 PROCESS OF EVALUATION OF PERFORMANCE OF VENDORS/ SUPPLIERS/ CONTRACTORS/ CONSULTANTS**

**5.1 FOR PROJECTS**

- i) Evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants in case of PROJECTS shall be done immediately with commissioning of any Project.
- ii) On commissioning of any Project, EIC (Engineer-in-charge)/ Project-in-charge shall prepare a Performance Rating Data Sheet (Format at Annexure-1) for all Orders and Contracts.
- iii) Depending upon the Performance Rating, following action shall be initiated by Engineer-in-charge/Project-in-charge:

Sl.No.	Performance Rating	Action
1	POOR	Seek explanation for Poor performance
2	FAIR	Seek explanation for Fair performance
3	GOOD	Letter to the concerned for improving performance in future
4	VERY GOOD	No further action

iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.

v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

A) Where performance rating is "POOR" (as per Performance Rating carried out after execution of Order/ Contract and where no reply/ unsatisfactory reply is received from party against the letter seeking the explanation from Vendor/Supplier/Contractor/ Consultant along with sharing the performance rating)

Recommend such defaulting Vendor / Supplier / Contractor / Consultant for the following action:

1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):

(a) **First Instance: Holiday (Red Card) for Two Years**

(b) **Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Three Years**

2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):

(a) **First such instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Three (3) Years.

(b) **Second such instance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of One Year**

(c) **Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Three Years.**

B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 34.2.3 of GCC)

(a) **First instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Three (3) Years.

Further such vendor will not be allowed to participate in the re-tender of the same supply/work/services of that location which has terminated / offloaded. Moreover, it will be ensured that all other action as per provision of contract including forfeiture of Contract Performance Security (CPS) etc. are undertaken.

However, such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).

The Yellow card will be automatically revoked after a period of three years unless the same is converted into Red Card due to subsequent instances of poor/ non-performance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant.

- (b) **Second instances** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card)** for period of One Year and they shall also to be considered for Suspension.
- (c) **Subsequent instances (more than two)** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card) for period of Three Years and they shall also to be considered for Suspension.**

(C) Where Performance rating is "FAIR":

Issuance of warning to such defaulting Vendor/ Supplier/Contractor/ Consultant to improve their performance.

## 5.2 FOR CONSULTANCY JOBS

Monitoring and Evaluation of consultancy jobs will be carried out in the same way as described in para 5.1 for Projects.

## 5.3 FOR OPERATION & MAINTENANCE

- i) Evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants in case of Operation and Maintenance shall be done immediately after execution of order/ contract.
- ii) After execution of orders a Performance Rating Data Sheet (Format at Annexure-2) shall be prepared for Orders by Site C&P and for Contracts/Services by respective Engineer-In-Charge.
- iii) Depending upon Performance Rating, following action shall be initiated by EIC:

Sl. No.	Performance Rating	Action
1	<b>POOR</b>	Seek explanation for Poor performance
2.	<b>FAIR</b>	Seek explanation for Fair performance
3	<b>GOOD</b>	Letter to the concerned for improving performance in future.
4	<b>VERY GOOD</b>	No further action

- iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.

v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

A) Where performance rating is "POOR" (as per Performance Rating carried out after execution of Order/ Contract and where no reply/ unsatisfactory reply is received from party against the letter seeking the explanation from Vendor/Supplier/Contractor/ Consultant along with sharing the performance rating)

Recommend such defaulting Vendor / Supplier / Contractor / Consultant for the following action:

1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):

(a) **First Instance: Holiday (Red Card) for Two Years**

(b) **Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Three Years**

2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):

(a) **First such instance:Advisory notice(Yellow Card)** shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Three (3) Years.

(b) **Second such instance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of One Year**

(c) **Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Three Years.**

B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 34.2.3 of GCC)

(a) **First instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Three (3) Years.

Further such vendor will not be allowed to participate in the re-tender of the same supply/work/services of that location which has terminated / offloaded. Moreover, it will be ensured that all other action as per provision of contract including forfeiture of Contract Performance Security (CPS) etc. are undertaken.

However, such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).

The Yellow card will be automatically revoked after a period of three years unless the same is converted into Red Card due to



subsequence instances of poor/ non-performance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant.

(b) **Second instances** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card)** for period of One Year and they shall also to be considered for Suspension.

(c) **Subsequent instances (more than two)** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card) for period of Three Years and they shall also to be considered for Suspension.**

(C) Where Performance rating is "FAIR"

Issuance of warning to such defaulting Vendors/Contractors/Consultants to improve their performance.

## **6.0 REVIEW & RESTORATION OF PARITES PUT ON HOLIDAY**

6.1 An order for Holiday passed for a certain specified period shall deemed to have been automatically revoked on the expiry of that specified period and it will not be necessary to issue a specific formal order of revocation.

Further, in case Vendor/ Supplier/Contractor/ Consultant is put on holiday due to quality, and new order is placed on bidder after restoration of Vendor/ Supplier/Contractor/ Consultant, such order will be properly monitored during execution stage by the concerned site.

## **7.0 EFFECT OF HOLIDAY**

7.1 If a Vendor/ Supplier/Contractor/ Consultant is put on Holiday, such Vendor/ Supplier/Contractor/ Consultant shall not be considered in ongoing tenders/future tenders.

7.2 However, if such Vendor/ Supplier/Contractor/ Consultant is already executing any other order/ contract and their performance is satisfactory in terms of the relevant contract, should be allowed to continue till its completion without any further increase in scope except those incidental to original scope mentioned in the contract. In such a case CPBG will not be forfeited and payment will be made as per provisions of concerned contract. However, this would be without prejudice to other terms and conditions of the contract.

7.3. Effect on other ongoing tendering:

7.3.1 After issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the party shall be ignored.

7.3.2 After opening Technical bid but before opening the Price bid, the Price bid of the party shall not be opened and BG/EMD submitted by the party shall be returned to the party.

7.3.3 After opening of price, BG/EMD made by the party shall be returned; the offer of the party shall be ignored & will not be further evaluated. If errant party emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.

8.0 While putting the Vendor/ Supplier/Contractor/ Consultant on holiday as per the procedure, the holding company, subsidiary, joint venture, sister concerns, group division of the errant Vendor/ Supplier/Contractor/ Consultant shall not be considered for putting on holiday list. Any bidder, put on holiday, will not be allowed to bid through consortium route also in new tender during the period of holiday.

9.0 If an unsuccessful bidder makes any vexatious, frivolous or malicious complaint against the tender process with the intention of delaying or defeating any procurement or causing loss to TFL or any other bidder, such bidder will be put on holiday for a period of six months, if such complaint is proved to be vexatious, frivolous or malicious, after following the due procedure.

10. **APPEAL AGAINST THE DECISION OF THE COMPETENT AUTHORITY:**

- (a) The party may file an appeal against the order of the Competent Authority for putting the party on Holiday list. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the of receipt of Holiday order.
- (b) Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the party as well as the Competent Authority.
- (c) Appeal process may be completed within 45 days of filing of appeal with the Appellate Authority.
- (d) "Appellate Authority" shall mean Committee of Directors consisting of Director (Finance) and Director (BD) for works centers under Director (Projects). For all other cases committee of Directors shall consist of Director (Finance) & Director (Projects).

11. **ERRANT BIDDER**

In case after price bid opening the lowest evaluated bidder (L1) is not awarded the job for any mistake committed by him in bidding or withdrawal of bid or modification of bid or varying any term in regard thereof leading to re-tendering, TFL shall forfeit EMD if paid by the bidder and such bidders shall be debarred from participation in retendering of the same job(s)/item(s).

Further, such bidder will be put on Watch List (Yellow Card) for a period of three years after following the due procedure. However, during the period in watch list such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).

In case of subsequent instances of default in other tender(s) during aforesaid watch list period, the action shall be initiated as per provision of sl. no. 2 of para A of Clause no. 5.1 (v) and 5.3 (v).

The Yellow card will be automatically revoked after specified period unless the same is

converted into Red Card

12. In case CBIC (Central Board of Indirect Taxes and Customs)/ any tax authority / any equivalent government agency brings to the notice of TFL that the Supplier has not remitted the amount towards GST (CGST & SGST/UTGST or IGST) collected from TFL to the government exchequer, then, that Supplier shall be put under Holiday list of TFL for period of six months after following the due procedure. This action will be in addition to the right of recovery of financial implication arising on TFL.

**TALCHER FERTITIZERS LIMITED  
PERFORMANCE RATING DATA SHEET  
(FOR PROJECTS/ CONSULTANCY JOBS)**

- i) Project/Work Centre :  
 ii) Order/ Contract No. & date :  
 iii) Brief description of Items :  
 Works/Assignment :  
 iv) Order/Contract value (Rs.) :  
 v) Name of Vendor/Supplier/ :  
 Contractor/ Consultant :  
 vi) Contracted delivery/ :  
 Completion Schedule :  
 vii) Actual delivery/ :  
 Completion date :

Performance Parameter	Delivery/ Completion Performance	Quality Performance	Reliability Performance#	Total
Maximum Marks	40	40	20	100
Marks Allocated				

Note:

Remarks (if any)

PERFORMANCE RATING (\*\*)

Note :

(#) Vendor/Supplier/Contractor/Consultant who seek repeated financial assistance or deviation beyond contract payment term or seeking direct payment to the sub-vendor/sub-contractor due to financial constraints, then '0' marks should be allotted against Reliability Performance.

(\*) Allocation of marks should be as per enclosed instructions

(\*\*) Performance rating shall be classified as under :

Sl. No.	Range (Marks)	Rating
1	60 & below	POOR
2	61-75	FAIR
3	76-90	GOOD
4	More than 90	VERY GOOD

Signature of  
Authorised Signatory:

Name:

Designation:

### Instructions for allocation of marks

1. Marks are to be allocated as under:

**1.1 DELIVERY/ COMPLETION PERFORMANCE 40 Marks**

<b>Marks</b>	<b>Delivery Period/ Completion Schedule</b>	<b>Delay in Weeks</b>	
	a) Upto 3 months	Before CDD	40
		Delay upto 4 weeks	35
		" 8 weeks	30
		" 10 weeks	25
		" 12 weeks	20
		" 16 weeks	15
		More than 16 weeks	0
	b) Above 3 months	Before CDD	40
		Delay upto 4 weeks	35
		" 8 weeks	30
		" 10 weeks	25
		" 16 weeks	20
		" 20 weeks	15
		" 24 weeks	10
		More than 24 weeks	0

**1.2 QUALITY PERFORMANCE 40 Marks**

	For Normal Cases : No Defects/ No Deviation/ No failure:		40 marks
	i) Rejection/Defects	Marks to be allocated on prorata basis for acceptable quantity as compared to total quantity for normal cases	10 marks
	ii) When quality	Failure of severe nature	0
marks	failure endanger system integration and safety of the system	- Moderate nature	5 marks
		- low severe nature	10-25 marks
	iii) Number of deviations	1. No deviation	5 marks
		2. No. of deviations ≤ 2	2 marks
		3. No. of deviations > 2	0 marks

**1.3 RELIABILITY PERFORMANCE****20 Marks**

<b>A.</b>	<b>FOR WORKS/CONTRACTS</b>	
i)	Submission of order acceptance, agreement, PBG, Drawings and other documents within time	4 marks
ii)	Mobilization of resources as per Contract and in time	4 marks
iii)	Liquidation of Check-list points	4 marks
iv)	Compliance to statutory and HS&E requirements or Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	4 marks
v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
<b>B.</b>	<b>FOR SUPPLIES</b>	
i)	Submission of order acceptance, PBG, Drawings and other documents within time	5 marks
ii)	Attending complaints and requests for after sales service/ warranty repairs and/ or query/ advice (upto the evaluation period).	5 marks
iii)	Response to various correspondence and conformance to standards like ISO	5 marks
iv)	Submission of all required documents including Test Certificates at the time of supply	5 marks

**TALCHER FERTILIZERS LIMITED  
PERFORMANCE RATING DATA SHEET  
(FOR O&M)**

- i) Location :
- ii) Order/ Contract No. & date :
- iii) Brief description of Items :  
Works/Assignment :
- iv) Order/Contract value (Rs.) :
- v) Name of Vendor/Supplier/  
Contractor/ Consultant :
- vi) Contracted delivery/  
Completion Schedule :
- vii) Actual delivery/  
Completion date :

Performance Parameter	Delivery Performance	Quality Performance	Reliability Performance#	Total
Maximum Marks	40	40	20	100
Marks Allocated (*)				

Remarks (if any)

**PERFORMANCE RATING (\*\*)**

Note :

(#) Vendor/Supplier/Contractor/Consultant who seek repeated financial assistance or deviation beyond contract payment term or seeking direct payment to the sub-vendor/sub-contractor due to financial constraints, then '0' marks should be allotted against Reliability Performance

(\*) Allocation of marks should be as per enclosed instructions

(\*\*) Performance rating shall be classified as under :

Sl. No.	Range (Marks)	Rating
1	60 & below	POOR
2	61-75	FAIR
3	76-90	GOOD
4	More than 90	VERY GOOD

Signature of  
Authorised Signatory:

Name:

Designation:

**Instructions for allocation of marks (For O&M)**

1. Marks are to be allocated as under :

**1.1 DELIVERY/ COMPLETION PERFORMANCE 40 Marks**

Marks	Delivery Period/ Completion Schedule	Delay in Weeks	
	a) Upto 3 months	Before CDD	40
		Delay upto 4 weeks	35
		"    8 weeks	30
		"   10 weeks	25
		"   12 weeks	20
		"   16 weeks	15
		More than 16 weeks	0
	b) Above 3 months	Before CDD	40
		Delay upto 4 weeks	35
		"    8 weeks	30
		"   10 weeks	25
		"   16 weeks	20
		"   20 weeks	15
		"   24 weeks	10
		More than 24 weeks	0

**1.2 QUALITY PERFORMANCE 40 Marks**

	For Normal Cases : No Defects/ No Deviation/ No failure:		40 marks
	i) Rejection/Defects	Marks to be allocated on prorata basis for acceptable quantity as compared to total quantity for normal cases	10 marks
	ii) When quality	Failure of severe nature	0
marks	failure endanger system integration and safety of the system	- Moderate nature - low severe nature	5 marks 10-25 marks
	iii) Number of deviations	1. No deviation 2. No. of deviations ≤ 2 3. No. of deviations > 2	5 marks 2 marks 0 marks



**1.3 RELIABILITY PERFORMANCE****20 Marks**

<b>A.</b>	<b>FOR WORKS/CONTRACTS</b>	
i)	Submission of order acceptance, agreement, PBG, Drawings and other documents within time	4 marks
ii)	Mobilization of resources as per Contract and in time	4 marks
iii)	Liquidation of Check-list points	4 marks
iv)	Compliance to statutory and HS&E requirements or Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	4 marks
v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
<b>B.</b>	<b>FOR SUPPLIES</b>	
i)	Submission of order acceptance, PBG, Drawings and other documents within time	5 marks
ii)	Attending complaints and requests for after sales service/ warranty repairs and/ or query/ advice (upto the evaluation period).	5 marks
iii)	Response to various correspondence and conformance to standards like ISO	5 marks
iv)	Submission of all required documents including Test Certificates at the time of supply	5 marks

**INSTRUCTIONS FOR SUBMISSION OF BID ONLINE THROUGH CPP PORTAL**

1. The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.  
More information useful for submitting online bids on the CPP Portal may be obtained at: <https://eprocure.gov.in/eprocure/app>.

**2. REGISTRATION**

- i. Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: <https://eprocure.gov.in/eprocure/app>) by clicking on the link "Online bidder Enrollment" on the CPP Portal which is free of charge.
- ii. As part of the enrollment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- iii. Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
- iv. Bidders are advised to make ensure the accessibility & availability of java software in their system (PC) either download & install the latest version of java software or click on the below link to install the java in their system prior to proceed further.  
<https://www.oracle.com/technetwork/java/javase/downloads/index.html>
- v. Upon enrollment, the bidders will be required to register their valid Digital Signature Certificate (Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / nCode / eMudhra etc.), with their profile.
- vi. Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC's to others which may lead to misuse.
- vii. Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / e-Token.

**3. SEARCHING FOR TENDER DOCUMENTS**

- i. There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, Organization Name, Location, Date, Value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as Organization Name, Form of Contract, Location, Date, Other keywords etc. to search for a tender published on the CPP Portal.

- ii. Once the bidders have selected the tenders they are interested in, they may download the required documents / tender schedules. These tenders can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / email in case there is any corrigendum issued to the tender document.
- iii. The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

#### **4. PREPARATION OF BIDS**

- i. Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- ii. Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.
- iii. Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF/JPG formats. Bid documents may be scanned with 100 dpi with black and white option which helps in reducing size of the scanned document.
- iv. To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" or "Other Important Documents" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

Note: My Documents space is only a repository given to the Bidders to ease the uploading process. If Bidder has uploaded his Documents in My Documents space, this does not automatically ensure these Documents being part of Technical Bid.

#### **5. SUBMISSION OF BIDS**

- i. Bidder should log into the site well in advance for bid submission so that they can upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
- ii. The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
- iii. Bidder should submit Declaration for Bid security strictly as per format Form F-2 provided in the NIT.. Otherwise the uploaded bid will be rejected.

- iv. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. If the price bid has been given as a standard SOR format with the tender document, then the same is to be downloaded and to be filled by all the bidders. Bidders are required to download the SOR file, open it and complete the white coloured (unprotected) cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the SOR file is found to be modified by the bidder, the bid will be rejected.
- v. The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.
- vi. All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done. Any bid document that is uploaded to the server is subjected to symmetric encryption using a system generated symmetric key. Further this key is subjected to asymmetric encryption using buyers/bid opener's public keys. Overall, the uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- vii. The uploaded tender documents become readable only after the tender opening by the authorized bid openers.
- viii. Upon the successful and timely submission of bids (i.e. after Clicking "Freeze Bid Submission" in the portal), the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.
- ix. The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. This acknowledgement may be used as an entry pass for any bid opening meetings.

## **6. ASSISTANCE TO BIDDERS**

- i. Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the relevant contact person indicated in the tender.
- ii. Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk.

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**BIDDING DATA SHEET (BDS)**

**ITB TO BE READ IN CONJUNCTION WITH THE FOLLOWING:**

<b>A. GENERAL</b>					
<b>ITB clause</b>	<b>Description</b>				
1.2	The Invitation for Bid/ Tender is for SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILISER LIMITED, ANGUL, TALCHER				
1.1	The Employer/Owner is: The Employer/Owner is: Talcher Fertilizers Limited				
2.1	The name of the Works/Services to be performed is: "SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES" on item rate basis.				
3	BIDS FROM CONSORTIUM/ JOINT VENTURE: <table border="1"><tr><td>APPLICABLE</td><td><input checked="" type="checkbox"/></td></tr><tr><td>NOT APPLICABLE</td><td><input type="checkbox"/></td></tr></table>	APPLICABLE	<input checked="" type="checkbox"/>	NOT APPLICABLE	<input type="checkbox"/>
APPLICABLE	<input checked="" type="checkbox"/>				
NOT APPLICABLE	<input type="checkbox"/>				
<b>B. BIDDING DOCUMENT</b>					
<b>ITB clause</b>	<b>Description</b>				
8.1	For <b>clarification purposes</b> only, the communication address is: Projects & Development India Limited, (Project Management Department) P.D.I.L Bhawan, A-14, Sector-1, Noida , (India) Fax no.:0120-2529801  Kind Attention: Mr. Kailash Joshi Project Manager Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 314 Fax no. : +91-120-2529801 E-mail : <a href="mailto:kjoshi@pdilin.com">kjoshi@pdilin.com</a>				
<b>C. PREPARATION OF BIDS</b>					
<b>ITB clause</b>	<b>Description</b>				

11.1.1 (r)	Additional documents to be submitted by the Bidder with its Part-I (Techno-commercial/ Unpriced bid) : as per SCC/Scope of Work.												
12 & 13	<p>Whether TFL will be able to avail input tax credit in the instant tender</p> <table border="1"> <tr> <td>YES</td> <td>✓</td> </tr> <tr> <td>NO</td> <td>✗</td> </tr> </table> <p>Details of Buyer:</p> <table border="1"> <tr> <td>Services to be rendered at</td> <td>M/s Talcher Fertilizers Ltd. (TFL), Administrative Building, Talcher, Post: Vikrampur, Dist: Angul, Pincode-759106, Odisha</td> </tr> <tr> <td>PAN No.</td> <td>AAFCT8667A</td> </tr> <tr> <td>GST no.</td> <td>21AAFCT8667A1ZH</td> </tr> <tr> <td>TFL Bank details</td> <td>Account No.: 37088269547 Bank &amp; Branch Name: SBI, CAG-II, New Delhi IFSC Code: SBIN0017313</td> </tr> </table>	YES	✓	NO	✗	Services to be rendered at	M/s Talcher Fertilizers Ltd. (TFL), Administrative Building, Talcher, Post: Vikrampur, Dist: Angul, Pincode-759106, Odisha	PAN No.	AAFCT8667A	GST no.	21AAFCT8667A1ZH	TFL Bank details	Account No.: 37088269547 Bank & Branch Name: SBI, CAG-II, New Delhi IFSC Code: SBIN0017313
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PAN No.	AAFCT8667A												
GST no.	21AAFCT8667A1ZH												
TFL Bank details	Account No.: 37088269547 Bank & Branch Name: SBI, CAG-II, New Delhi IFSC Code: SBIN0017313												
14	The currency of the Bid shall be INR												
15	The bid validity period shall be Six (6) Months from final 'Bid Due Date'.												

<b>16.1, 16.10 and 38.6</b>	<p>In case '<del>Earnest Money / Bid Security</del>' or "Contract Performance Security" is in the form of 'Demand Draft' or 'Banker's Cheque', the same should be favor of TFL (India) Limited, payable at _____</p> <p>In case of submission through online banking transaction i.e. IMPS / NEFT / RTGS / SWIFT, etc, the details of TFL 's Bank account are as under:  Account Holder's Name:.....  Account No.: 37088269547  Bank &amp; Branch Name: SBI, CAG-II, New Delhi  IFSC Code: SBIN0017313  Bidder to mention reference no. "CPS/....." in narration while remitting the CPS amount in TFL's Bank Account.</p>
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**D. SUBMISSION AND OPENING OF BIDS**

ITB clause	Description
<b>18</b>	In addition to the original of the Bid, the number of copies required is one. Not applicable in case of e-tendering.
<b>4.0 of IFB</b>	<p>The submission of physical document as per clause no. 4.0 of IFB shall at following address: :</p> <p>Projects &amp; Development India Limited,  (Project Management Department)  P.D.I.L Bhawan, A-14, Sector-1,  Noida , (India)  Fax no.:0120-2529801</p> <p>Kind Attention: Mr. Kailash Joshi  Project Manager  Tel no. : +91-120-2529842/43/47/51/53/54  Extn. 314  Fax no. : +91-120-2529801  E-mail :<a href="mailto:kjoshi@pdilin.com">kjoshi@pdilin.com</a></p>

**E. EVALUATION, AND COMPARISON OF BIDS**

ITB clause	Description				
<b>32</b>	Evaluation Methodology is mentioned in Section-II.				
<b>33</b>	<table border="1" style="width: 100%;"> <tr> <td style="width: 40%;">Compensation for Extended Stay: APPLICABLE</td> <td align="center"><b>X</b></td> </tr> <tr> <td>NOT APPLICABLE</td> <td align="center">✓</td> </tr> </table>	Compensation for Extended Stay: APPLICABLE	<b>X</b>	NOT APPLICABLE	✓
	Compensation for Extended Stay: APPLICABLE	<b>X</b>			
NOT APPLICABLE	✓				

**F. AWARD OF CONTRACT**

ITB clause	Description
<b>37</b>	State of India of which stamp paper is required for Contract Agreement: <b>Uttar</b>

	<b>Pradesh.</b>				
<b>38</b>	<p>Contract Performance Security/ Security Deposit</p> <table border="1"> <tr> <td>APPLICABLE</td> <td>✓</td> </tr> <tr> <td>NOT APPLICABLE</td> <td>✗</td> </tr> </table> <p><u>The value/ amount of Contract Performance Security/ Security Deposit:</u></p> <p>CPS/SD @ 3% of Total Order / Contract value</p>	APPLICABLE	✓	NOT APPLICABLE	✗
APPLICABLE	✓				
NOT APPLICABLE	✗				
<b>41</b>	<p>Provision of AHR Item :</p> <table border="1"> <tr> <td>APPLICABLE</td> <td>✓</td> </tr> <tr> <td>NOT APPLICABLE</td> <td>✗</td> </tr> </table>	APPLICABLE	✓	NOT APPLICABLE	✗
APPLICABLE	✓				
NOT APPLICABLE	✗				
<b>44.1</b>	<p>Quarterly Closure of Contract:</p> <table border="1"> <tr> <td>APPLICABLE</td> <td>✓</td> </tr> <tr> <td>NOT APPLICABLE</td> <td>✗</td> </tr> </table>	APPLICABLE	✓	NOT APPLICABLE	✗
APPLICABLE	✓				
NOT APPLICABLE	✗				
<b>49</b>	<p>Applicability of BEC relaxation relating to Startups:</p> <table border="1"> <tr> <td>APPLICABLE</td> <td>✓</td> </tr> <tr> <td>NOT APPLICABLE</td> <td>✗</td> </tr> </table>	APPLICABLE	✓	NOT APPLICABLE	✗
APPLICABLE	✓				
NOT APPLICABLE	✗				



**PUBLIC PROCUREMENT  
(PREFERENCE TO MAKE IN INDIA), ORDER 2017**

No. P-45021/2/2017-PP (BE-II)  
Government of India  
Ministry of Commerce and Industry  
Department for Promotion of Industry and Internal Trade  
(Public Procurement Section)

Udyog Bhawan, New Delhi  
Dated: 16<sup>th</sup> September, 2020

To

All Central Ministries/Departments/CPSUs/All concerned

**ORDER**

**Subject: Public Procurement (Preference to Make in India), Order 2017– Revision; regarding.**

Department for Promotion of Industry and Internal Trade, in partial modification [Paras 2, 3, 5, 10 & 13] of Order No.P-45021/2/2017-B.E.-II dated 15.6.2017 as amended by Order No.P-45021/2/2017-B.E.-II dated 28.05.2018, Order No.P-45021/2/2017-B.E.-II dated 29.05.2019 and Order No.P-45021/2/2017-B.E.-II dated 04.06.2020, hereby issues the revised 'Public Procurement (Preference to Make in India), Order 2017' dated 16.09.2020 effective with immediate effect.

**Whereas** it is the policy of the Government of India to encourage 'Make in India' and promote manufacturing and production of goods and services in India with a view to enhancing income and employment, and

**Whereas** procurement by the Government is substantial in amount and can contribute towards this policy objective, and

**Whereas** local content can be increased through partnerships, cooperation with local companies, establishing production units in India or Joint Ventures (JV) with Indian suppliers, increasing the participation of local employees in services and training them,

**Now therefore the following Order is issued:**

1. This Order is issued pursuant to Rule 153 (iii) of the General Financial Rules 2017.
2. **Definitions:** For the purposes of this Order:

*'Local content'* means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent.

*'Class-I local supplier'* means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-I local supplier' under this Order.

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'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-II local supplier' but less than that prescribed for 'Class-I local supplier' under this Order.

'Non - Local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content less than that prescribed for 'Class-II local supplier' under this Order.

'L1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

'Margin of purchase preference' means the maximum extent to which the price quoted by a "Class-I local supplier" may be above the L1 for the purpose of purchase preference.

'Nodal Ministry' means the Ministry or Department identified pursuant to this order in respect of a particular item of goods or services or works.

'Procuring entity' means a Ministry or department or attached or subordinate office of, or autonomous body controlled by, the Government of India and includes Government companies as defined in the Companies Act.

'Works' means all works as per Rule 130 of GFR- 2017, and will also include 'turnkey works'.

### **3. Eligibility of 'Class-I local supplier'/ 'Class-II local supplier'/ 'Non-local suppliers' for different types of procurement**

(a) In procurement of all goods, services or works in respect of which the Nodal Ministry / Department has communicated that there is sufficient local capacity and local competition, only 'Class-I local supplier', as defined under the Order, shall be eligible to bid irrespective of purchase value.

(b) Only 'Class-I local supplier' and 'Class-II local supplier', as defined under the Order, shall be eligible to bid in procurements undertaken by procuring entities, except when Global tender enquiry has been issued. In global tender enquiries, 'Non-local suppliers' shall also be eligible to bid along with 'Class-I local suppliers' and 'Class-II local suppliers'. In procurement of all goods, services or works, not covered by sub-para 3(a) above, and with estimated value of purchases less than Rs. 200 Crore, in accordance with Rule 161(iv) of GFR, 2017, Global tender enquiry shall not be issued except with the approval of competent authority as designated by Department of Expenditure.

(c) For the purpose of this Order, works includes Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts.

.....Contd. p/3

### 3A. Purchase Preference

(a) Subject to the provisions of this Order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order, purchase preference shall be given to 'Class-I local supplier' in procurements undertaken by procuring entities in the manner specified here under.

(b) In the procurements of goods or works, which are covered by para 3(b) above and which are divisible in nature, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

- i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract for full quantity will be awarded to L1.
- ii. If L1 bid is not a 'Class-I local supplier', 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price for the remaining 50% quantity subject to the Class-I local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such 'Class-I local supplier' subject to matching the L1 price. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price or accepts less than the offered quantity, the next higher 'Class-I local supplier' within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on Class-I local suppliers, then such balance quantity may also be ordered on the L1 bidder.

(c) In the procurements of goods or works, which are covered by para 3(b) above and which are not divisible in nature, and in procurement of services where the bid is evaluated on price alone, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

- i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract will be awarded to L1.
- ii. If L1 is not 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier', will be invited to match the L1 price subject to Class-I local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price.
- iii. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the 'Class-I local supplier' within the margin of purchase preference matches the L1 price, the contract may be awarded to the L1 bidder.

.....Contd. p/4

(d) "Class-II local supplier" will not get purchase preference in any procurement, undertaken by procuring entities.

**3B. Applicability in tenders where contract is to be awarded to multiple bidders -** In tenders where contract is awarded to multiple bidders subject to matching of L1 rates or otherwise, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

a) In case there is sufficient local capacity and competition for the item to be procured, as notified by the nodal Ministry, only Class I local suppliers shall be eligible to bid. As such, the multiple suppliers, who would be awarded the contract, should be all and only 'Class I Local suppliers'.

b) In other cases, 'Class II local suppliers' and 'Non local suppliers' may also participate in the bidding process along with 'Class I Local suppliers' as per provisions of this Order.

c) If 'Class I Local suppliers' qualify for award of contract for at least 50% of the tendered quantity in any tender, the contract may be awarded to all the qualified bidders as per award criteria stipulated in the bid documents. However, in case 'Class I Local suppliers' do not qualify for award of contract for at least 50% of the tendered quantity, purchase preference should be given to the 'Class I local supplier' over 'Class II local suppliers' / 'Non local suppliers' provided that their quoted rate falls within 20% margin of purchase preference of the highest quoted bidder considered for award of contract so as to ensure that the 'Class I Local suppliers' taken in totality are considered for award of contract for at least 50% of the tendered quantity.

d) First purchase preference has to be given to the lowest quoting 'Class-I local supplier', whose quoted rates fall within 20% margin of purchase preference, subject to its meeting the prescribed criteria for award of contract as also the constraint of maximum quantity that can be sourced from any single supplier. If the lowest quoting 'Class-I local supplier', does not qualify for purchase preference because of aforesaid constraints or does not accept the offered quantity, an opportunity may be given to next higher 'Class-I local supplier', falling within 20% margin of purchase preference, and so on.

e) To avoid any ambiguity during bid evaluation process, the procuring entities may stipulate its own tender specific criteria for award of contract amongst different bidders including the procedure for purchase preference to 'Class-I local supplier' within the broad policy guidelines stipulated in sub-paras above.

**4. Exemption of small purchases:** Notwithstanding anything contained in paragraph 3, procurements where the estimated value to be procured is less than Rs. 5 lakhs shall be exempt from this Order. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this Order.

**5. Minimum local content:** The 'local content' requirement to categorize a supplier as 'Class-I local supplier' is minimum 50%. For 'Class-II local supplier', the 'local content' requirement is minimum 20%. Nodal Ministry/ Department may prescribe only a higher

.....Contd. p/5

percentage of minimum local content requirement to categorize a supplier as 'Class-I local supplier'/ 'Class-II local supplier'. For the items, for which Nodal Ministry/ Department has not prescribed higher minimum local content notification under the Order, it shall be 50% and 20% for 'Class-I local supplier'/ 'Class-II local supplier' respectively.

6. **Margin of Purchase Preference:** The margin of purchase preference shall be 20%.
7. **Requirement for specification in advance:** The minimum local content, the margin of purchase preference and the procedure for preference to Make in India shall be specified in the notice inviting tenders or other form of procurement solicitation and shall not be varied during a particular procurement transaction.
8. **Government E-marketplace:** In respect of procurement through the Government E-marketplace (GeM) shall, as far as possible, specifically mark the items which meet the minimum local content while registering the item for display, and shall, wherever feasible, make provision for automated comparison with purchase preference and without purchase preference and for obtaining consent of the local supplier in those cases where purchase preference is to be exercised.
9. **Verification of local content:**
  - a. The 'Class-I local supplier'/ 'Class-II local supplier' at the time of tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier'/ 'Class-II local supplier', as the case may be. They shall also give details of the location(s) at which the local value addition is made.
  - b. In cases of procurement for a value in excess of Rs. 10 crores, the 'Class-I local supplier'/ 'Class-II local supplier' shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.
  - c. Decisions on complaints relating to implementation of this Order shall be taken by the competent authority which is empowered to look into procurement-related complaints relating to the procuring entity.
  - d. Nodal Ministries may constitute committees with internal and external experts for independent verification of self-declarations and auditor's/ accountant's certificates on random basis and in the case of complaints.
  - e. Nodal Ministries and procuring entities may prescribe fees for such complaints.
  - f. False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.

- g. A supplier who has been debarred by any procuring entity for violation of this Order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities, in the manner prescribed under paragraph 9h below.
- h. The Department of Expenditure shall issue suitable instructions for the effective and smooth operation of this process, so that:
  - i. The fact and duration of debarment for violation of this Order by any procuring entity are promptly brought to the notice of the Member-Convenor of the Standing Committee and the Department of Expenditure through the concerned Ministry /Department or in some other manner;
  - ii. on a periodical basis such cases are consolidated and a centralized list or decentralized lists of such suppliers with the period of debarment is maintained and displayed on website(s);
  - iii. in respect of procuring entities other than the one which has carried out the debarment, the debarment takes effect prospectively from the date of uploading on the website(s) in the such a manner that ongoing procurements are not disrupted.

**10. Specifications in Tenders and other procurement solicitations:**

- a. Every procuring entity shall ensure that the eligibility conditions in respect of previous experience fixed in any tender or solicitation do not require proof of supply in other countries or proof of exports.
- b. Procuring entities shall endeavour to see that eligibility conditions, including on matters like turnover, production capability and financial strength do not result in unreasonable exclusion of 'Class-I local supplier'/ 'Class-II local supplier' who would otherwise be eligible, beyond what is essential for ensuring quality or creditworthiness of the supplier.
- c. Procuring entities shall, within 2 months of the issue of this Order review all existing eligibility norms and conditions with reference to sub-paragraphs 'a' and 'b' above.

**d. Reciprocity Clause**

- i. When a Nodal Ministry/Department identifies that Indian suppliers of an item are not allowed to participate and/ or compete in procurement by any foreign government, due to restrictive tender conditions which have direct or indirect effect of barring Indian companies such as registration in the procuring country, execution of projects of specific value in the procuring country etc., it shall provide such details to all its procuring entities including CMDs/CEOs of PSEs/PSUs, State Governments and other procurement agencies under their administrative control and GeM for appropriate reciprocal action.

.....Contd. p/7

- ii. Entities of countries which have been identified by the nodal Ministry/Department as not allowing Indian companies to participate in their Government procurement for any item related to that nodal Ministry shall not be allowed to participate in Government procurement in India for all items related to that nodal Ministry/ Department, except for the list of items published by the Ministry/ Department permitting their participation.
  - iii. The stipulation in (ii) above shall be part of all tenders invited by the Central Government procuring entities stated in (i) above. All purchases on GeM shall also necessarily have the above provisions for items identified by nodal Ministry/ Department.
  - iv. State Governments should be encouraged to incorporate similar provisions in their respective tenders.
  - v. The term 'entity' of a country shall have the same meaning as under the FDI Policy of DPIIT as amended from time to time.
- e. Specifying foreign certifications/ unreasonable technical specifications/ brands/ models in the bid document is restrictive and discriminatory practice against local suppliers. If foreign certification is required to be stipulated because of non-availability of Indian Standards and/or for any other reason, the same shall be done only after written approval of Secretary of the Department concerned or any other Authority having been designated such power by the Secretary of the Department concerned.
- f. "All administrative Ministries/Departments whose procurement exceeds Rs. 1000 Crore per annum shall notify/ update their procurement projections every year, including those of the PSEs/PSUs, for the next 5 years on their respective website."

**10A. Action for non-compliance of the Provisions of the Order:** In case restrictive or discriminatory conditions against domestic suppliers are included in bid documents, an inquiry shall be conducted by the Administrative Department undertaking the procurement (including procurement by any entity under its administrative control) to fix responsibility for the same. Thereafter, appropriate action, administrative or otherwise, shall be taken against erring officials of procurement entities under relevant provisions. Intimation on all such actions shall be sent to the Standing Committee.

**11. Assessment of supply base by Nodal Ministries:** The Nodal Ministry shall keep in view the domestic manufacturing / supply base and assess the available capacity and the extent of local competition while identifying items and prescribing the higher minimum local content or the manner of its calculation, with a view to avoiding cost increase from the operation of this Order.

**12. Increase in minimum local content:** The Nodal Ministry may annually review the local content requirements with a view to increasing them, subject to availability of sufficient local competition with adequate quality.



**13. Manufacture under license/ technology collaboration agreements with phased indigenization:** While notifying the minimum local content, Nodal Ministries may make special provisions for exempting suppliers from meeting the stipulated local content if the product is being manufactured in India under a license from a foreign manufacturer who holds intellectual property rights and where there is a technology collaboration agreement / transfer of technology agreement for indigenous manufacture of a product developed abroad with clear phasing of increase in local content.

13A. In procurement of all goods, services or works in respect of which there is substantial quantity of public procurement and for which the nodal ministry has not notified that there is sufficient local capacity and local competition, the concerned nodal ministry shall notify an upper threshold value of procurement beyond which foreign companies shall enter into a joint venture with an Indian company to participate in the tender. Procuring entities, while procuring such items beyond the notified threshold value, shall prescribe in their respective tenders that foreign companies may enter into a joint venture with an Indian company to participate in the tender. The procuring Ministries/Departments shall also make special provisions for exempting such joint ventures from meeting the stipulated minimum local content requirement, which shall be increased in a phased manner.

**14. Powers to grant exemption and to reduce minimum local content:** The administrative Department undertaking the procurement (including procurement by any entity under its administrative control), with the approval of their Minister-in-charge, may by written order, for reasons to be recorded in writing,

- a. reduce the minimum local content below the prescribed level; or
- b. reduce the margin of purchase preference below 20%; or
- c. exempt any particular item or supplying entities from the operation of this Order or any part of the Order.

A copy of every such order shall be provided to the Standing Committee and concerned Nodal Ministry / Department. The Nodal Ministry / Department concerned will continue to have the power to vary its notification on Minimum Local Content.

**15. Directions to Government companies:** In respect of Government companies and other procuring entities not governed by the General Financial Rules, the administrative Ministry or Department shall issue policy directions requiring compliance with this Order.

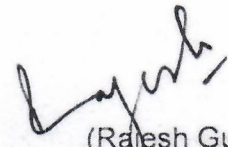
**16. Standing Committee:** A standing committee is hereby constituted with the following membership:

Secretary, Department for Promotion of Industry and Internal Trade—Chairman  
Secretary, Commerce—Member  
Secretary, Ministry of Electronics and Information Technology—Member  
Joint Secretary (Public Procurement), Department of Expenditure—Member  
Joint Secretary (DPIIT)—Member-Convenor

.....Contd. p/9

The Secretary of the Department concerned with a particular item shall be a member in respect of issues relating to such item. The Chairman of the Committee may co-opt technical experts as relevant to any issue or class of issues under its consideration.

17. **Functions of the Standing Committee:** The Standing Committee shall meet as often as necessary, but not less than once in six months. The Committee
- a. shall oversee the implementation of this order and issues arising therefrom, and make recommendations to Nodal Ministries and procuring entities.
  - b. shall annually assess and periodically monitor compliance with this Order
  - c. shall identify Nodal Ministries and the allocation of items among them for issue of notifications on minimum local content
  - d. may require furnishing of details or returns regarding compliance with this Order and related matters
  - e. may, during the annual review or otherwise, assess issues, if any, where it is felt that the manner of implementation of the order results in any restrictive practices, cartelization or increase in public expenditure and suggest remedial measures
  - f. may examine cases covered by paragraph 13 above relating to manufacture under license/ technology transfer agreements with a view to satisfying itself that adequate mechanisms exist for enforcement of such agreements and for attaining the underlying objective of progressive indigenization
  - g. may consider any other issue relating to this Order which may arise.
18. **Removal of difficulties:** Ministries /Departments and the Boards of Directors of Government companies may issue such clarifications and instructions as may be necessary for the removal of any difficulties arising in the implementation of this Order.
19. **Ministries having existing policies:** Where any Ministry or Department has its own policy for preference to local content approved by the Cabinet after 1<sup>st</sup> January 2015, such policies will prevail over the provisions of this Order. All other existing orders on preference to local content shall be reviewed by the Nodal Ministries and revised as needed to conform to this Order, within two months of the issue of this Order.
20. **Transitional provision:** This Order shall not apply to any tender or procurement for which notice inviting tender or other form of procurement solicitation has been issued before the issue of this Order.



(Rajesh Gupta)  
Director

Tel: 23063211

[rajesh.gupta66@gov.in](mailto:rajesh.gupta66@gov.in)

**CERTIFICATE FROM STATUTORY AUDITOR OR COST AUDITOR OF THE COMPANY (IN THE CASE OF COMPANIES) OR FROM A PRACTICING COST ACCOUNTANT OR PRACTICING CHARTERED ACCOUNTANT (IN RESPECT OF SUPPLIERS OTHER THAN COMPANIES) TOWARDS MINIMUM LOCAL CONTENT**

**(FOR SUPPLY OF GOODS/ SERVICES / WORKS / EPC / LSTK)**

To,  
M/s Talcher Fertilizers Limited

**SUB:**

**TENDER NO:**

Dear Sir

- A. We..... the Statutory Auditor / Cost Auditor / Practicing Cost Accountant / Practicing Chartered Accountant) have verified relevant records of M/s ..... **(Name of the bidder)** and certify that M/s ..... **(Name of the bidder)** meets the following:

Sl. No.	Description	Confirmation
a	Bidder meets the mandatory minimum Local content requirement of 20% for participating in the Bidding process under Public Procurement (Preference to Make in India) Policy. (In case bidder does not meet the minimum Local content requirement of 20%, such bidders are not allowed to participate in the Bidding process)	Confirmed.
b	The bidder meets mandatory minimum Local content requirement of 50% for claiming purchase preference under Public Procurement (Preference to Make in India) Policy	Confirmed / Not Confirmed

- B. The **details of the location** at which the local value addition is made as follows:

Sl. No.	Item Description	Details of the Location(s) where the local value addition is made
1.		
2.		
3.		

Name of Audit Firm / Chartered Accountant: [Signature of Authorized Signatory]

Name:

Date:

Designation:

Seal:

Membership No.:

UDIN:

**FORM-II of ANNEXURE-V**

**Salient Points of Public Procurement (Preference to Make in India) Policy**

<b>Sr. No.</b>	<b>Description</b>	<b>Parameter / Document</b>
<b>1</b>	<b>Minimum Local Content (LC) for Availing Preference under this Policy</b>	50%
<b>2</b>	<b>Margin of Purchase Preference</b>	20%
<b>3</b>	<b>Local Content (LC) % declared by bidder</b> (Documents to be submitted as per Sr. No. 4 below)	[Tick (✓) whichever is applicable] a) LC Equal to or more than 50% <input type="checkbox"/> b) LC More than 20% but less than 50% <input type="checkbox"/>
<b>4</b>	<b>Documents to be submitted by bidder under this Policy</b>	Certificate from the statutory auditor or cost auditor of the company (in case of companies) or from a practicing cost accountant or practicing chartered accountant as per <u>Form-I</u> to be submitted by bidder.
<b>5</b>	<b>Whether tender is divisible or not divisible</b>	Not Divisible; Clause No. 3A (c) of revised Policy dated 16.09.2020 shall be applicable

**(Not Applicable for this Tender)**

**DECLARATION BY BIDDER TOWARDS MINIMUM LOCAL CONTENT  
(FOR SUPPLY OF GOODS / SERVICES / WORKS / EPC / LSTK )**

To,  
M/s Talcher Fertilizers Limited

SUB:

TENDER NO:

Dear Sir,

A. We M/s ..... (**Name of Bidder**) hereby confirm/certify that the goods / services offered vide our offer no..... dated ..... meets the following-

Sl. No.	Description	Confirmation
A	Bidder meets the mandatory minimum Local content requirement of 20% for participating in the Bidding process under Public Procurement (Preference to Make in India) Policy. (In case bidder does not meet the minimum Local content requirement of 20%, such bidders are not allowed to participate in the Bidding process)	Confirmed.
B	The bidder meets mandatory minimum Local content requirement of 50% for claiming purchase preference under Public Procurement (Preference to Make in India) Policy	Confirmed / Not Confirmed

B. The **details of the location** at which the local value addition is made as follows:

Sl. No.	Item Description	Details of the Location(s) where the local value addition is made
1.		
2.		

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:

**Note:**

- i. The Authorized Signatory of Bidder shall be the person in whose name Power of Attorney has been issued.

**PREAMBLE TO SCHEDULE OF RATES**

1. The "Bill of Quantity (BOQ)" will be in Excel format (password protected) and will be uploaded during tender creation. This will be downloaded by the bidder and bidder will quote Price on this Excel file for entire scope of work as per NIT. Thereafter, the bidder will upload the same Excel file during bid submission.
2. The BOQ format is provided in a spread sheet file (BoQ\_xxxx.xls). The rates offered should be entered in the allotted space only and uploaded after filling the relevant columns. The BOQ template must not be modified / replaced by the bidder; else the bid submitted shall be rejected.
3. Bidder shall quote all Prices in INR only.
4. BOQ consists of following one sheets:
  - Schedule of Rates containing Item Rates & GST
5. It is mandatory to quote prices in BOQ and fill up as listed in Para 4. It will be the responsibility of the contractor to quote for all Materials/ Equipments /Services/Civil & Structural Works etc. as per scope of work defined in NIT.
6. BIDDER shall be responsible for payment of all taxes, duties and levies as applicable on performance of WORK under CONTRACT and shall be included in the quoted price.
7. A copy of SOR, with prices/figures completely blanked out but with the word "QUOTED" in all columns is to be uploaded along with the un-priced bid, as a confirmation of price/data quoted against each head.
8. The plans and Tender drawings have been evolved tentatively based on information available with Owner / Consultant but the dimensions and details etc. are liable to changes. The Tenderers shall not be entitled to claim any higher rate or compensation on this account. The tender drawings are intended mainly to give an indication of the probable type of work. Detail engineering and fabrication drawings are in the Contractor's scope as per the technical requirement. The same shall be approved by the Owner/PMC. Owner reserves the right to add / delete any of the works mentioned in the N.I.T., during the currency of the contract.
9. The Tenderers shall note that the quantities of the different Items, as given in the "Schedule of Rates" are tentative based on tentative tender drawings and are subject to variation and they shall not be entitled to claim any higher rate or compensation on this account. Owner / Consultant reserve the right to change / modify the size and type of sections at any time. Owner / Consultant do not guarantee work under each item of the Schedule of Quantities. Quantity of some or all the items may increase or decrease up to any extent at the time of actual execution. ***For variation in value of contract, please refers relevant clause of GCC.***
10. The Tenderers shall be fully responsible for the correct setting out and execution of the work. All tools, tackles, construction equipments etc., required for the successful execution / construction of the complete work shall be responsibility of the Tenderers.

11. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved scope of work. Unless otherwise specified in Tender Documents, measurements of quantities shall be taken as per Indian Standards IS: 1200.
12. The rates to be inserted in the "Schedule of Rates" are to be inclusive of the value of the work described under several items including all costs and expenses which may be required for the detail design and construction of the work described together with all taxes, general risks, liabilities and obligations such as temporary buildings / hutments, fencing, watching, lighting, insurance, labour regulations, indemnity, maintenance and the like. The prices shall be inclusive of Supply of materials, construction, erection, all labors, materials, tools and tackles, plants, equipment, hoists, scaffoldings, the sundries, etc., as may be necessary for the completion of the work in all respects.
13. In case of any discrepancy between the description of items given in the "Schedule of Rates" and Specifications, Tender drawings and other documents, the decision of the Owner / Consultant in writing shall be final, binding and conclusive for the purpose of this contract.
14. Only good earth shall be stacked in within the plant & Township leads & the spaces/locations shall also be undertaken during the execution of the contract as per site requirement.
15. The CONTRACTOR shall dispose-off all surplus and unserviceable earth (if any), outside the plant in accordance to local Governing authority, Disposal shall be done at a place outside the plant, with the consent of the OWNER. Location of disposal area shall be decided by the CONTRACTOR and the required necessary approvals from the local bodies shall be the CONTRACTOR's responsibility.
16. Quantities mentioned in SOR are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site.
17. Unit rates shall include the cost of Detail Engineering, labour, supervision and consumables, cost towards providing necessary tools and tackles, detail engineering and providing all the required facilities for execution and inspection, testing, guarantees etc. as per scope of work and Technical specification and other relevant sections / sub sections etc. listed in ITB. Minor repair and touch painting work towards providing all required facilities for execution shall be in bidder's scope.
18. Owner reserve their right to execute any additional works / extra works, during the execution of work, either by themselves or by appointing any other agency, even though such works are incidental to and necessary for the completion of works awarded to the Contractor. In the event of such decisions taken by Owner, Contractor is required to extend necessary cooperation, and act as per the instructions of Engineer-in-Charge.
19. The Contractor must visit TFL sites to assess the quantum and nature of work before quoting. However, the Contractor shall inform PDIL / TFL, 1 week prior to their visit to the site.
20. The Contractor must visit TFL sites to assess the quantum and nature of work before quoting. However, the Contractor shall inform PDIL / TFL, 1 week prior to their visit to the site.



**PROCUREMENT FROM A BIDDER WHICH SHARES A LAND BORDER WITH INDIA**

1. Order (Public Procurement No. 1) dated 23.07.2020, Order (Public Procurement No.2) dated 23.07.2020 and Order (Public Procurement No. 3) dated 24.07.2020, Department of Expenditure, Ministry of Finance, Govt. of India refers. The same are available at web-site <https://doe.gov.in/procurement-policy-divisions>.

2. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. For details of competent authority refer to Annexure I of Order (Public Procurement No. 1) dated 23.07.2020.

Further the above will not apply to bidders from those countries (even if sharing a land border with India) to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects. Updated lists of countries to which lines of credit have been extended or in which development projects are undertaken are given in the website of the Ministry of External Affairs, Govt. of India

3. "Bidder" (including the term 'tenderer', 'consultant' 'vendor' or 'service provider' in certain contexts) for purpose of this provision means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency, branch or office controlled by such person, participating in a procurement process.
4. "Bidder from a country which shares a land border with India" for the purpose of this:
  - a) An entity incorporated, established or registered in such a country; or
  - b) A subsidiary of an entity incorporated, established or registered in such a country; or
  - c) An entity substantially controlled through entities incorporated, established or registered in such a country; or
  - d) An entity whose beneficial owner is situated in such a country; or
  - e) An Indian (or other) agent of such an entity; or
  - f) A natural person who is a citizen of such a country; or
  - g) A consortium or joint venture where any member of the consortium or joint venture falls under any of the above
5. **"Beneficial owner"** for the purpose of above (4) will be as under:
  - i) In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one

or more juridical person(s), has a controlling ownership interest or who exercises control through other means.

**Explanation-**

- a) "Controlling ownership interest" means ownership of, or entitlement to, more than twenty-five per cent of shares or capital or profits of the company;
  - b) "Control" shall include the right to appoint the majority of the directors or to control the management or policy decisions, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;
  - ii) In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;
  - iii) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
  - iv) Where no natural person is identified under (i) or (ii) or (iii) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
  - v) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.
6. **"Agent"** for the purpose of this Order is a person employed to do any act for another, or to represent another in dealings with third persons

7. **SUBMISSION OF CERTIFICATE IN BIDS:**

Bidder shall submit a certificate in this regard as Form-I to Annexure-VII.

If such certificate given by a bidder whose bid is accepted is found to be false, this would be a ground for immediate rejection of the bid/termination and further action as per "Procedure for Action in case of Corrupt/Fraudulent/ Collusive / Coercive Practices" of tender document.

8. The registration, wherever applicable, should be valid at the time of submission of bids and at the time of acceptance of bids. In respect of supply otherwise than by tender, registration should be valid at the time of placement of order. If the bidder was validly registered at the time of acceptance / placement of order, registration shall not be a relevant consideration during contract execution.

**9. PROVISION FOR WORKS CONTRACTS, INCLUDING TURNKEY CONTRACTS:**

The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of "contractor from a country which shares a land border with India" shall be as in Para 4 herein above. A Certificate to this regard is to be submitted by bidder is placed at Form-II.

**UNDERTAKING ON LETTERHEAD**

To,  
M/s Talcher Fertilizers LIMITED

\_\_\_\_\_

SUB:

TENDER NO:

Dear Sir

We have read the clause regarding Provisions for Procurement from a Bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; we certify that, bidder M/s \_\_\_\_\_ (**Name of Bidder**) is:

- (i) not from such a country [       ]
- (ii) if from such a country, has been registered with the Competent Authority. [       ]  
(Evidence of valid registration by the Competent Authority shall be attached)

***(Bidder is to tick appropriate option (✓ or X) above).***

We further certify that bidder **M/s** \_\_\_\_\_ (**Name of Bidder**) will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority.

We hereby certify that bidder **M/s** \_\_\_\_\_ (**Name of Bidder**) fulfills all requirements in this regard and is eligible to be considered.

Place:

Date:

[Signature of Authorized Signatory of Bidder]

Name:

Designation:

Seal:

**FORMS & FORMATS**

**LIST OF FORMS & FORMATS**

<b>Form No.</b>	<b>Description</b>
F-1	BIDDER'S GENERAL INFORMATION
F-2A	PROFORMA OF "BANK GUARANTEE"FOR "EARNEST MONEY / BID SECURITY"
F-2B	FORMAT OF " DECLARATION FOR BID SECURITY "
F-3	LETTER OF AUTHORITY
F-4	PROFORMA OF "BANK GUARANTEE" FOR "CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT"
F-4 (a)	MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR ALONG WITH BANK GUARANTEE (BG)
F-5	AGREED TERMS & CONDITIONS
F-6	ACKNOWLEDGEMENT CUM CONSENT LETTER
F-7	BIDDER'S EXPERIENCE
F-8	CHECKLIST
F-8(B)	CHECKLIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING DOCUMENTS
F-9	FORMAT FOR CERTIFICATE FROM BANK IF BIDDER'S WORKING CAPITAL IS INADEQUATE
F-10	FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE FOR FINANCIAL CAPABILITY OF THE BIDDER
F-11	FORMAT FOR CONSORTIUM AGREEMENT(ON NON- JUDICIAL STAMP PAPER OF APPROPRIATE VALUE) CONSORTIUM/ JV AGREEMENT- <b>NOT APPLICABLE</b>
F-12	BIDDER'S QUERIES FOR PRE BID MEETING
F-13	E-BANKING FORMAT
F-14	INTEGRITY PACT
F-15	INDEMNITY BOND
F-16	FREQUENTLY ASKED QUESTIONS (FAQS)
F-17	PROFORMA OF BANK GUARANTEE FOR MOBILISATIONS ADVANCE PAYMENT <b>NOT APPLICABLE</b>
F-18	PROFORMA OF BANK GUARANTEE FOR PAYMENTS TOWARDS PLACEMENT OF ALL PURCHASE ORDERS OF MAJOR TAGGED ITEMS <b>NOT APPLICABLE</b>
F-19	FORMAT OF LETTER OF NO DEVIATIONS
F-20	FORMAT FOR POWER OF ATTORNEY
F-21	UNDERTAKING REGARDING SUBMISSION OF ELECTRONIC INVOICE( E-INVOICE AS PER GST LAW)

F-22	UNDERTAKING REGARDING SUBMISSION CONTRACT PERFORMANCE SECURITY (CPS) / SECURITY DEPOSIT (SD) WITHIN STIPULATED TIME LINE
F-23	PROFORMA FOR CONTRACT AGREEMENT

F-1

**BIDDER'S GENERAL INFORMATION**

To,  
**M/s TALCHER FERTILIZERS LIMITED,  
NOIDA**

TENDER NO:

1	Bidder Name:	M/s.....
2	Status of Firm	Proprietorship Firm/Partnership firm/ Public Limited/ Pvt. Limited/ Govt. Dept. / PSU/ Others If Others Specify: _____  [Enclose relevant certificates / partnership deed/certificate of Registration, as applicable]
3	Name of Proprietor/ Partners/ Directors of the firm/company	1. 2. 3.
4	Name of Power of Attorney holders of bidder	
5	Number of Years in Operation	
6	Address of Registered Office	_____ City: _____ District: _____  State: _____  PIN/ZIP : _____
7	Bidder's address where order/contract is to be placed	_____ City: _____ District: _____  State: _____  PIN/ZIP : _____
8	Office responsible for executing the contract with GST no.(In case supply of works are from multiple locations, addresses and GST no. of all such locations are to be provided)	City: District:  State: PIN/ZIP:  GST No.:
9	Telephone Number & Contact Information of address where order	_____  (Country Code) (Area Code) (Telephone Number)



	is to be placed	FAX No. : ..... e-mail ID: .....
10	E-mail Address	
11	ISO Certification, if any {If yes, please furnish details}	
12	PAN No	[Enclose copy of relevant document]
13	GST No. (refer sl. no. 8 above)	[Enclose copy of relevant document]
14	EPF Registration No.	[Enclose copy of relevant document]
15	ESI code No.	[Enclose copy of relevant document]
16	Whether Micro or Small Enterprise	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No. 40)
	Whether MSE is owned by SC/ST Entrepreneur(s)	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No. 40)
	Whether MSE is owned by Women	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No. 40)
17	Whether Bidder is Startups or not	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No. 49)
18	In case of Start-up confirm the following: (i) Date of its incorporation/ registration (ii) Whether turnover for any financial years since incorporation/ registration has exceeded Rs.100 Crores.	

Note: \* TFL intent to place the contract directly on the address from where Works are to be supplied. In case, bidder wants contract at some other address or Works are to be supplied from multiple locations, bidder is required to provide in their bid, the address on which contract is to be placed.

Place:  
Date:

[Signature of Authorized Signatory of Bidder]

Name:  
Designation:  
Seal:

**FORMAT F-2A**

**PROFORMA OF "BANK GUARANTEE"  
FOR "EARNEST MONEY / BID SECURITY"**

(To be stamped in accordance with the Stamp Act)

To, Talcher Fertilizers Limited (TFL) _____	<b>Bank Guarantee No.</b>	
	<b>Date of BG</b>	
	<b>BG Valid up to (Expiry date)</b>	
	<b>Claim period up to (indicate date of expiry of claim period which includes minimum three months from the expiry date)</b>	
	<b>Stamp Sl. No./e-Stamp Certificate No.</b>	

**Dear Sir(s),**

In accordance with Letter Inviting Tender under your reference No \_\_\_\_\_ M/s.

\_\_\_\_\_ having their Registered / Head Office at \_\_\_\_\_ (hereinafter called the Tenderer), wish to participate in the said tender for \_\_\_\_\_

As an irrevocable Bank Guarantee against Earnest Money for the amount of \_\_\_\_\_ is required to be submitted by the Tenderer as a condition precedent for participation in the said tender which amount is liable to be forfeited on the happening of any contingencies mentioned in the Tender Document.

We, \_\_\_\_\_ the \_\_\_\_\_ Bank at \_\_\_\_\_ having \_\_\_\_\_ our \_\_\_\_\_ Head Office \_\_\_\_\_ (Local Address) guarantee and undertake to pay immediately on demand without any recourse to the tenderers by Talcher Fertilizers Limited, the amount \_\_\_\_\_ without any reservation, protest, demur and recourse. Any such demand made by TFL, shall be conclusive and binding on us irrespective of any dispute or difference raised by the Tenderer.

This guarantee shall be irrevocable and shall remain valid up to \_\_\_\_\_ [this date should be two (02) months beyond the validity of the bid]. If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instructions from M/s. \_\_\_\_\_ whose behalf this guarantee is issued.

Notwithstanding anything contained herein:

- a) The Bank's liability under this Guarantee shall not exceed (currency in figures) . . . . . (currency in words only) . . . . .
- b) This Guarantee shall remain in force upto \_\_\_\_\_ (this expiry date of BG should be two months beyond the validity of bid) and any extension(s) thereof; and
- c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of \_\_\_\_\_ (indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the

last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of TFL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

In witness whereof the Bank, through its authorized officer, has set its hand and stamp on this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_ at \_\_\_\_\_.

WITNESS:

(SIGNATURE)  
(NAME)

(SIGNATURE)  
(NAME)  
Designation with Bank Stamp

(OFFICIAL ADDRESS)

Attorney as per  
Power of Attorney No. \_\_\_\_\_  
Date: \_\_\_\_\_

**INSTRUCTIONS FOR FURNISHING "BID SECURITY / EARNEST MONEY" BY "BANK GUARANTEE"**

1. The Bank Guarantee by Bidders will be given on non-judicial stamp paper as per "Stamp Duty" applicable. The non-judicial stamp paper should be in the name of the issuing Bank.
2. The expiry date should be arrived at in accordance with "ITB: Clause-16.1".
3. The Bank Guarantee by bidders will be given from Bank as specified in "ITB Clause-16.2".
4. A letter from the issuing Bank of the requisite Bank Guarantee confirming that said Bank Guarantee / all future communication relating to the Bank Guarantee shall be forwarded to the Employer at its address as mentioned at "ITB".
5. Bidders must indicate the full postal address of the Bank along with the Bank's E-mail / Fax / Phone from where the Earnest Money Bond has been issued as per proforma provided below.
6. If a Bank Guarantee is issued by a commercial Bank, then a letter to Employer confirming its net worth is more than Rs. 1,000,000,000.00 [Rupees One Hundred Crores] or equivalent along with documentary evidence in the Bank Guarantee itself.

**FORMAT F-2B**

**DECLARATION FOR BID SECURITY**  
(To be submitted on Letter head of Bidder)

To,

M/s TALCHER FERTILIZERS LIMITED

\_\_\_\_\_

SUB:

TENDER NO:

Dear Sir,

After examining / reviewing provisions of above referred tender documents (including all corrigendum/ Addenda), we M/s \_\_\_\_\_ (Name of Bidder) have submitted our offer/ bid no. \_\_\_\_\_.

We, M/s \_\_\_\_\_ (Name of Bidder) hereby understand that, according to your conditions, we are submitting this Declaration for Bid Security.

We understand that we will be put on watch list/holiday/ banning list (as per polices of TALCHER FERTILIZERS LIMITED in this regard), if we are in breach of our obligation(s) as per following:

- (a) have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or
- (b) having been notified of the acceptance of our Bid by the TALCHER FERTILIZERS LIMITED during the period of bid validity:
  - (i) fail or refuse to execute the Contract, if required, or
  - (ii) fail or refuse to furnish the Contract Performance Security, in accordance provisions of tender document.
  - (iii) fail or refuse to accept 'arithmetical corrections' as per provision of tender document.
- (c) having indulged in corrupt/fraudulent /collusive/coercive practice as per procedure.

Place:  
Date:

[Signature of Authorized Signatory of Bidder]  
Name:  
Designation:  
Seal

**F-3**

**LETTER OF AUTHORITY**

[Pro forma for Letter of Authority for Attending 'Pre-Bid Meetings' /'Un-priced Bid Opening' / 'Price Bid Opening']

Ref:

Date:

To,  
**M/s TALCHER FERTILIZERS LIMITED,  
NOIDA**

SUB:  
TENDER NO:

**Dear Sir,**

I/We, \_\_\_\_\_ hereby authorize the following representative(s) for attending any 'Meetings [Pre-Bid Meeting]', 'Un-priced Bid Opening' and 'Price Bid Opening' against the above Tender Documents:

[1] Name & Designation \_\_\_\_\_ Signature \_\_\_\_\_  
Phone/Cell: \_\_\_\_\_

E-mail: ..... @ .....

[2] Name & Designation \_\_\_\_\_ Signature \_\_\_\_\_  
Phone/Cell: \_\_\_\_\_

E-mail: ..... @ .....

We confirm that we shall be bound by all commitments made by aforementioned authorised representative(s).

Place:	[Signature of Authorized Signatory of Bidder]
Date:	Name:
	Designation:
	Seal:

- (i) Note: This "Letter of Authority" should be on the **"letter head"** of the Bidder and should be signed by a person competent and having the 'Power of Attorney' to bind the Bidder. Not more than 'two [02] persons per Bidder' are permitted to attend 'Pre-Bid Meetings' /'Un-priced Bid Opening' / 'Price Bid Opening'..
- (ii) Bidder's authorized representative is required to carry a copy of this authority letter while attending the 'Pre-Bid Meetings' /'Un-priced Bid Opening' .

F-4

**PROFORMA OF "BANK GUARANTEE" FOR "CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT"**  
**(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)**

To,  M/s Talcher Fertilizers Limited, Noida	<b>Bank Guarantee No.</b>	
	<b>Date of BG</b>	
	<b>BG Valid up to</b>	
	<b>Claim period up to (There should be three months gap between expiry date of BG &amp; Claim period)</b>	
	<b>Stamp Sl. No./e-Stamp Certificate No.</b>	

**Dear Sir(s),**

M/s. \_\_\_\_\_ having registered office at \_\_\_\_\_ (herein after called the "contractor" which expression shall wherever the context so require include its successors and assignees) have been placed/ awarded the job/work of \_\_\_\_\_ vide LOA /FOA No. \_\_\_\_\_ dated \_\_\_\_\_ for Talcher Fertilizers Limited having registered office at Plot 2/H, Kalpana Area, BJB Nagar, Khorda, Bhubaneswar-751014, Odisha (herein after called the "TFL" which expression shall wherever the context so require include its successors and assignees).

The Contract conditions provide that the CONTRACTOR shall pay a sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) as full Contract Performance Guarantee in the form therein mentioned. The form of payment of Contract Performance Guarantee includes guarantee executed by Nationalized Bank/Scheduled Commercial Bank, undertaking full responsibility to indemnify Talcher Fertilizers Limited, in case of default.

The said M/s. \_\_\_\_\_ has approached us and at their request and in consideration of the premises we having our office at \_\_\_\_\_ have agreed to give such guarantee as hereinafter mentioned.

1. We \_\_\_\_\_ hereby undertake to give the irrevocable & unconditional guarantee to you that if default shall be made by M/s. \_\_\_\_\_ in performing any of the terms and conditions of the tender/order/contract or in payment of any money payable to Talcher Fertilizers Limited we shall on first demand pay without demur, contest, protest and/ or without any recourse to the contractor to TFL in such manner as TFL may direct the said amount of Rupees \_\_\_\_\_ only or such portion thereof not exceeding the said sum as you may require from time to time.

2. You will have the full liberty without reference to us and without affecting this guarantee, postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the order/contract with the said \_\_\_\_\_ M/s. \_\_\_\_\_ and to enforce or to forbear from endorsing any powers or rights or by reason of time being given to the said M/s. \_\_\_\_\_ and such postponement forbearance would not have the effect of releasing the bank from its obligation under this debt.
3. Your right to recover the said sum of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_) from us in manner aforesaid is absolute & unequivocal and will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s. \_\_\_\_\_ and/or that any dispute or disputes are pending before any officer, tribunal or court or arbitrator or any other authority/forum and any demand made by you in the bank shall be conclusive and binding. The bank shall not be released of its obligations under these presents by any exercise by you of its liberty with reference to matter aforesaid or any of their or by reason or any other act of omission or commission on your part or any other indulgence shown by you or by any other matter or changed what so ever which under law would, but for this provision, have the effect of releasing the bank.
4. The guarantee herein contained shall not be determined or affected by the liquidation or winding up dissolution or changes of constitution or insolvency of the said contractor but shall in all respects and for all purposes be binding and operative until payment of all money due to you in respect of such liabilities is paid.
5. The bank undertakes not to revoke this guarantee during its currency without your previous consent and further agrees that the guarantee shall continue to be enforceable until it is discharged by TFL in writing. However, if for any reason, the contractor is unable to complete the work within the period stipulated in the order/contract and in case of extension of the date of delivery/completion resulting extension of defect liability period/guarantee period of the contractor fails to perform the work fully, the bank hereby agrees to further extend this guarantee at the instance of the contractor till such time as may be determined by TFL. If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instruction from M/s. \_\_\_\_\_ (contractor) on whose behalf this guarantee is issued.
6. Bank also agrees that TFL at its option shall be entitled to enforce this Guarantee against the bank (as principal debtor) in the first instant, without proceeding against the contractor and notwithstanding any security or other guarantee that TFL may have in relation to the /contractor's liabilities.
7. The amount under the Bank Guarantee is payable forthwith without any delay by Bank upon the written demand raised by TFL. Any dispute arising out of or in relation to the said Bank Guarantee shall be subject to the exclusive jurisdiction of courts at New Delhi.

8. Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Contractor up to a total amount of \_\_\_\_\_ (amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Contractor to be in default under the order/contract and without caveat or argument, any sum or sums within the limits of (amounts of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein.
9. We have power to issue this guarantee in your favor under Memorandum and Articles of Association and the undersigned has full power to do under the Power of Attorney, dated \_\_\_\_\_ granted to him by the Bank.
10. Notwithstanding anything contained herein:
- a) The Bank's liability under this Guarantee shall not exceed (currency in figures) \_\_\_\_\_ (currency in words only) \_\_\_\_\_
  - b) This Guarantee shall remain in force upto \_\_\_\_\_ (this date should be expiry date of defect liability period of the Contract) and any extension(s) thereof; and
  - c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of \_\_\_\_\_ (indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of TFL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

Yours faithfully,

\_\_\_\_\_  
Bank by its Constituted Attorney

\_\_\_\_\_  
Signature of a person duly  
Authorized to sign on behalf of the Bank



**INSTRUCTIONS FOR FURNISHING  
"CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT" BY "BANK GUARANTEE"**

1. The Bank Guarantee by successful Bidder(s) will be given on non-judicial stamp paper as per 'stamp duty' applicable. The non-judicial stamp paper should be in name of the issuing bank..
2. The Bank Guarantee by Bidders will be given from bank as specified in Cl no. 38.3 of ITB [Section-III] of Tender Document .
3. A letter from the issuing bank of the requisite Bank Guarantee confirming that said Bank Guarantee and all future communication relating to the Bank Guarantee shall be forwarded to Employer.
4. If a Bank Guarantee is issued by a commercial bank, then a letter to Employer and copy to Consultant (if applicable) confirming its net worth is more than Rs. 100,00,00,000.00 [Rupees One Hundred Crores] or its equivalent in foreign currency alongwith documentary evidence OR in the Bank Guarantee itself.
5. Contractor shall submit attached cover letter (Annexure) while submitting Contract Performance Security.

**Form-4 (a)**

**MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR  
ALONG WITH BANK GUARANTEE (BG)**

<b>1. Bank Guarantee No.</b>			
<b>2. Vendor Name/ VENDOR CODE</b>	NAME		
	VENDOR CODE		
<b>Bank GUARANTEE AMOUNT</b>			
<b>PURCHASE ORDER/LOA</b>			
<b>1. Nature of Bank Guarantee [Please Tick ( <input type="checkbox"/> ) whichever is applicable]</b>	Performance Security (CPS)	SECURITY DEPOSIT	ADVANCE
<b>2. BG ISSUING Bank DETAILS:</b>			
<b>(A) E-MAIL ID</b>			
<b>(B) ADDRESS</b>			
<b>(C) Phone No. / Mobile No.</b>			

**F-5**

**AGREED TERMS & CONDITIONS**

To,  
**M/s TALCHER FERTILIZERS LIMITED**  
**NOIDA**

SUB:  
TENDER NO:

This Questionnaire duly filled in, signed & stamped must form part of Bidder's Bid and should be returned along with Un-priced Bid. Clauses confirmed hereunder need not be repeated in the Bid.

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
1	Bidder's name, Vendor Code of TFL (If any) and address	Bidder's Name:  TFL's Vendor Code:  Address:
2.	Bidder confirms the currency of quoted prices is in Indian Rupees	
3.	Bidder confirms quoted prices will remain firm and fixed till complete execution of the order (except where price escalation/variation is allowed in the Tender).	
4.	Bidder confirms that they have quoted <b>GST (CGST &amp; SGST/ UTGST or IGST)</b> in Price Schedule / Schedule of Rates (SOR) of Price bid.	Confirmed
4.1	Whether in the instant tender services/works are covered in reverse charge rule of <b>GST (CGST &amp; SGST/UTGST or IGST)</b>  If yes, Bidder confirms that they have quoted rate of applicable GST (CGST & SGST/ UTGST or IGST) in Price Schedule / Schedule of Rates of Price Bid	
4.2	Indicate Harmonized System of Nomenclature (HSN)/Service Accounting Codes (SAC) .	HSN/SAC Code (as applicable): _____
4.3	Bidder hereby confirms that the quoted prices are in compliance with the Section 171 of CGST Act/ SGST Act as mentioned as clause no. 13.10 of ITB (Anti-profiteering clause).	
4.4	a. Whether bidder is liable to raise E-Invoice as per GST Act. b. If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.	a. _____  b. _____
4.5	Whether bidder is liable to raise E-Invoice as per GST Act.  If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.	
5.	Bidder confirms acceptance of relevant Terms of Payment specified in the Bid Document.	

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION				
5.1	Deleted					
6.	Bidder confirms that Contract Performance Security will be furnished as per Bid Document within 30 days of FOA in case of successful bidder..					
7.	Bidder confirms that Contract Performance Security shall be from any Indian scheduled bank or a branch of an International bank situated in India and registered with Reserve bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalised Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect shall be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.					
8.	Bidder confirms compliance to Completion Schedule as specified in Bid document and the same shall be reckoned from the date of Fax of Acceptance.					
9.	(i) Bidder confirms acceptance of Mutually Agreed Damages for delay in completion schedule specified in Bid document. (ii) In case of delay, the bills/invoices shall be submitted after reducing the price reduction due to delay (refer MAD Clause).					
10.	a) Bidder confirms acceptance of all terms and conditions of Bid Document (all sections). b) Bidder confirms that printed terms and conditions of bidder are not applicable.					
11.	Bidder confirms that their offer is valid for period specified in BDS from Final/Extended due date of opening of Techno-commercial Bids.					
12.	Bidder have furnished Bid security Declaration					
13.	As per requirement of tender, bidder (having status as Pvt. Ltd. or Limited company) must upload bid duly digitally signed on e-portal through class-3B digital signature (DS). In case, class of DS or name of employee or name of employer is not visible in the digitally signed documents, the bid digitally signed as submitted by the person shall be binding on the bidder.					
14.	Bidder confirms that (i) none of Directors (in Board of Director) of bidder is a relative of any Director (in Board of Director) of TFL or (ii) the bidder is not a firm in which any Director (in Board of Director) of TFL or their relative is a partner.	<table border="1"> <tr> <td>Confirmed</td> <td></td> </tr> <tr> <td>Not confirmed</td> <td></td> </tr> </table>	Confirmed		Not confirmed	
Confirmed						
Not confirmed						
15.	All correspondence must be in ENGLISH language only					
16.	Bidder confirms the contents of this Tender Document have not been modified or altered by them. In case, it is found that the tender document has been modified / altered by the bidder, the bid submitted by them shall be liable for rejection.					
17.	Bidder confirms that all Bank charges associated with Bidder's Bank regarding release of payment etc. shall be borne by Bidder.					

SI.	DESCRIPTION	BIDDER'S CONFIRMATION
18.	<p><u>No Deviation Confirmation:</u> It may be note that any 'deviation / exception' in any form may result in rejection of Bid. Therefore, Bidder confirms that they have not taken any 'exception / deviation' anywhere in the Bid. In case any 'deviation / exception' is mentioned or noticed, Bidder's Bid may be rejected.</p>	
19.	<p>If Bidder becomes a successful Bidder pursuant to the provisions of the Tender Document, the following Confirmation shall be automatically become enforceable:</p> <p>"We agree and acknowledge that the Employer is entering into the Contract/Agreement solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood &amp; agreed that the Government of India is not a party to the Contract/Agreement and has no liabilities, obligations or rights thereunder. It is expressly understood and agreed that the Purchaser is authorized to enter into Contract/Agreement, solely on its own behalf under the applicable laws of India. We expressly agree, acknowledge and understand that the Purchaser is not an agent, representative or delegate of the Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Agreement. Accordingly, we hereby expressly waive, release and forego any and all actions or claims, including cross claims, VIP claims or counter claims against the Government of India arising out of the Agreement and covenants not to sue to Government of India as to any manner, claim, cause of action or things whatsoever arising of or under the Agreement."</p>	
20.	Bidder to ensure all documents as per tender including clause 11 of Section III and all Formats are included in their bid.	
21.	Bidder understands that Tender Document is not exhaustive. In case any activity though specifically not covered in description of 'Schedule of Rates' but is required to complete the work as per Scope of Work, Conditions of Contract, or any other part of Bidding document, the quoted rates will deemed to be inclusive of cost incurred for such activities unless otherwise specifically excluded. Bidder confirms to perform for fulfilment of the contract and completeness of the supplies in all respect within the scheduled time frame and quoted price.	
22.	<p>Bidder hereby confirms that they are not on 'Holiday' by OWNER or any of the JV partners of TFL (viz. GAIL, RCF, CIL, FCIL) or Public Sector Project Management Consultant (like PDIL, EIL, Mecon only due to "poor performance" or "corrupt and fraudulent practices") or banned by Government department/ Public Sector on due date of submission of bid.</p> <p>Further, Bidder confirms that neither they nor their allied agency/(ies) (as defined in the Procedure for Action in case of Corrupt/Fraudulent/Collusive/ Coercive Practices) are on banning</p>	

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
	<p>list of TFL or any of the JV partner of TFL viz. GAIL, RCF, CIL, FCIL.( or the Ministry of Petroleum and Natural Gas/ Ministry of Chemicals and Fertilizers).</p> <p>Bidder also confirms that they are not under any liquidation, court receivership or similar proceedings or 'bankruptcy'.</p> <p>In case it comes to the notice of TFL/PDIL that the bidder has given wrong declaration in this regard, the same shall be dealt as 'fraudulent practices' and action shall be initiated as per the Procedure for action in case of Corrupt/Fraudulent/Collusive/Coercive Practices.</p> <p>Further, Bidder also confirms that in case there is any change in status of the declaration prior to award of contract, the same will be promptly informed to TFL/PDIL by them.</p>	
	<p>Bidder certifies that they would adhere to the Fraud Prevention Policy of TFL [available on TFL's website (<a href="https://tflonline.co.in/">www.https://tflonline.co.in/</a>)] and shall not indulge themselves or allow others (working in TFL) to indulge in fraudulent activities and that they would immediately apprise TFL of the fraud/suspected fraud as soon as it comes to their notice.</p> <p>Concealment of facts regarding their involvement in fraudulent activities in connection with the business transaction(s) of TFL is liable to be treated as crime and dealt with by the procedures of TFL as applicable from time to time.</p>	
23	<p>Bidder confirms that (i) any variation in GST at the time of supplies for any reasons, other than statutory, including variations due to turnover, shall be borne by them and (ii) any error of interpretation of applicability of rate of GST (CGST &amp; SGST/ UTGST or IGST) on components of an item and/or various items of tender by them shall be dealt as per clause no. 13.13 of Section-III.</p>	
24	<p>Bidders confirm to submit signed copy of Integrity Pact (wherever included in tender).</p> <p>If Bidder is a partnership concern or a consortium, this agreement must be signed by all partners or consortium members.</p>	
23.	<p>Bidder confirms that, in case of contradiction between the confirmations provided in this format and to the terms &amp; conditions mentioned elsewhere in the offer, the confirmations given in this format shall prevail.</p>	

Place:  
Date:

[Signature of Authorized Signatory of Bidder]  
Name:  
Designation:  
Seal:

**ACKNOWLEDGEMENT CUM CONSENT LETTER**

(On receipt of tender document/information regarding the tender, Bidder shall acknowledge the receipt and confirm his intention to bid or reason for non-participation against the enquiry /tender through e-mail to concerned executive in TFL/PDIL issued the tender, by filling up the Format)

To,  
**M/s TALCHER FERTILIZERS LIMITED**  
**NOIDA**

SUB:  
TENDER NO:

Dear Sir,

We hereby acknowledge receipt of a complete set of bidding documents along with enclosures for subject item/job and/or the information regarding the subject tender.

- We intend to bid as requested for the subject item/job and furnish following details with respect to our quoting office:

Postal Address with Pin Code : .....  
Telephone Number : .....  
Contact Person : .....  
E-mail Address : .....  
Mobile No. : .....  
Date : .....  
Seal/Stamp : .....

- We are unable to bid for the reason given below:

Reasons for non-submission of bid:

---

Agency's Name : .....  
Signature : .....  
Name : .....  
Designation : .....  
Date : .....  
Seal/Stamp : .....

**F-7**  
**BIDDER'S EXPERIENCE**

To,

**M/s TALCHER FERTILIZERS LIMITED  
NOIDA**

SUB:  
TENDER NO:

Sl. No	Detailed Description of Job	LOA/WO No. and date	Full Postal Address & phone nos. of Client. <i>Name, designation and address of Engineer/Officer-in-Charge</i>	Capacity	Value of Contract/Order ( <i>Specify Currency Amount</i> )	Date of Commencement	Scheduled Completion Time (Months)	Date of Actual Completion	Reasons for delay in execution, if any	Details of satisfactory operation from the date of Acceptance
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

Place:  
Date:

[Signature of Authorized Signatory of Bidder]

Name:  
Designation:  
Seal:



**F-8(A)**  
**CHECK LIST**

Bidders are requested to duly fill in the checklist. This checklist gives only certain important items to facilitate the bidder to make sure that the necessary data/information as called for in the bid document has been submitted by them along with their offer. This, however, does not relieve the bidder of his responsibilities to make sure that his offer is otherwise complete in all respects.

Please ensure compliance and tick (√) against following points:

S. No.	DESCRIPTION	CHECK BOX
1.0	Digitally Signing (in case of e-bidding)/ Signing and Stamping (in case of manual bidding) on each sheet of offer, original bidding document including SCC, ITB,GCC, SOR DRAWINGS Corrigendum (if any)	
2.0	Confirm that the following details have been submitted in the Un-priced part of the bid	
i	Covering Letter, Letter of Submission	
ii	Declaration for Bid Security as per provisions of Tender	
iii.	Digitally signed (in case of e-tendering) or 'signed & stamped (in case of Manual tender) tender document along with drawings and addendum (if any)	
iv	Power of Attorney in the name of person signing the bid.	
v	Confirm submission of document alongwith un-priced bid as per bid requirement (including cl.no.11.1.1 of Section-III).	
3.0	Confirm that all format duly filled in are enclosed with the bid duly Digitally Signed (in case of e-bidding)/ / Signed and Stamped (in case of manual bidding) by authorised person(s)	
4.0	Confirm that the price part as per Price Schedule format submitted with Bidding Document/uploaded in case of e-bid.	
5.0	Confirm that Undertaking as per <i>Form-II to Annexure-V to Section-III</i> and Certification from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of other than companies) as per <i>Form-I to Annexure-V to Section-III</i> are submitted.	
6.0	Confirm that Undertaking as per Form-1 to Annexure-VII have been submitted by the bidder (Guidelines from Procurement from a Country sharing a Land Border with India)	
7.0	Confirm submission of Checklist against Bid Evaluation Criteria as per format F-8(B)	

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

**F-8(B)**

**CHECKLIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING DOCUMENTS**  
**(refer Section II of Tender document)**

<b>BEC Clause No.</b>	<b>Description</b>	<b>Documents required for qualification</b>	<b>Documents Submitted by Bidder</b>	<b>Documents attested as per Section-II of Tender</b>	<b>Reference Page No. of the Bid submitted</b>
<b>Technical BEC</b>					
1.	<b>Experience</b>	<p>(a) To meet the criteria A.1 above, Bidder must submit Copy of Detailed Letter of Acceptance (DLOA) / Work Order / relevant extract of work Order/ Contract Agreement along with detailed scope of work and Completion / Acceptance Certificate.</p> <p>The Detailed Letter of Acceptance (DLOA) / Work Order / Contract Agreement must clearly indicate nature of Work, period and contract value. Similarly, the Completion Certificate/ Acceptance Certificate must clearly indicate reference of relevant work order/ DLOA/ Contract Agreement, Name of Work, Contract Value, Completed order value and date of completion.</p>		Yes/No	
2.	<b>Job executed for Subsidiary / Fellow subsidiary/ Holding company.</b>	Tax paid invoice(s) duly certified by statutory auditor of the bidder towards payment of statutory tax in support of the job executed for Subsidiary / Fellow subsidiary/ Holding company.		Yes/No	
3.	<b>Any other technical criteria in BEC</b>			Yes/No	
<b>Financial BEC</b>					
1.	<b>Annual Turn Over</b>	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for last Audited Financial Year. [In case the Annual Turnover criteria is not met in last Audited Financial Year, then the Audited Financial Statements for previous two	Submitted  (Mention specific year.....)	Yes/No	

		<i>years of last Audited Financial Year is to be submitted]</i>			
2.	<b>Net Worth</b>	<i>Audited Financial Statements [including Auditor's Report, Balance sheet, Profit &amp; Loss Accounts statements, Notes &amp; schedules etc.] for last Audited Financial Year.</i>	Submitted  (Mention specific year .....)	Yes/No	
3.	<b>Working Capital</b>	<i>Audited Financial Statements [including Auditor's Report, Balance sheet, Profit &amp; Loss Accounts statements, Notes &amp; schedules etc.] for last Audited Financial Year.</i>  <i>If the bidder's working capital is negative or inadequate, the bidder shall submit a letter (in prescribed format) from their bank having net worth not less than Rs.100 Crores, confirming the availability of line of credit for at least working capital requirement as stated above.</i>	Submitted  (Mention specific year.....)  Submitted/ Not Applicable (Bidder to tick appropriate option)	Yes/No	
4.	<b>Format for Details of financial capability of Bidder</b>	<i>Bidder shall submit "Details of financial capability of Bidder" in prescribed format duly signed and stamped by a chartered accountant / Certified Public Accountant (CPA).</i>	Submitted		

Place:  
Date:

[Signature of Authorized Signatory of Bidder]  
Name:  
Designation:  
Seal

**F-9**

**FORMAT FOR CERTIFICATE FROM BANK  
IF BIDDER'S WORKING CAPITAL IS INADEQUATE/NEGATIVE**

(To be provided on Bank's letter head)

Date:

To,  
**M/s. TALCHER FERTILIZERS LIMITED  
NOIDA**

Dear Sir,

This is to certify that M/s ..... (name of the bidder with address)  
(hereinafter referred to as Customer) is an existing customer of our Bank.

The Customer has informed that they wish to bid for TFL's RFQ/Tender no.  
..... dated ..... for .....(Name of the  
supply/work/services/consultancy) and as per the terms of the said RFQ/Tender they have to furnish  
a certificate from their Bank confirming the availability of line of credit.

Accordingly M/s ..... (name of the Bank with address) confirms availability of  
line of credit to M/s ..... (name of the bidder) for at least an amount of Rs.  
\_\_\_\_\_

It is also confirmed that the net worth of the Bank is more than Rs. 100 Crores (or Equivalent USD)  
and the undersigned is authorized to issue this certificate.

Yours truly

for ..... (Name & address of Bank)

(Authorized signatory)

Name of the signatory:

Designation :

Stamp

**F-10**

**FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE/ CERTIFIED PUBLIC  
ACCOUNTANT (CPA) FOR FINANCIAL CAPABILITY OF THE BIDDER**

We have verified the Audited Financial Statements and other relevant records of M/s..... (Name of the bidder) and certify the following:

**A. AUDITED ANNUAL TURNOVER\* OF PRECEDING THREE FINANCIAL YEARS:**

Year	Amount (Currency)
Year 1:	
Year 2:	
Year 3:	

**B. NETWORTH\* AS PER AUDITED FINANCIAL STATEMENT OF PRECEDING FINANCIAL YEAR:**

Description	Year ____
	Amount (Currency)
1. Net Worth	

**C. WORKING CAPITAL\* AS PER AUDITED FINANCIAL STATEMENT OF PRECEDING FINANCIAL YEAR:**

Description	Year ____
	Amount (Currency)
1. Current Assets	
2. Current Liabilities	
3. Working Capital (Current Assets-Current liabilities)	

***\*Refer Instructions***

**Notes:**

- (i) It is further certified that the above mentioned applicable figures are matching with the returns filed with Registrar of Companies (ROC) [Applicable only in case of Indian Companies]
- (ii) We confirm that above figures are after referring instructions at page 2 of 2 of Format F-10.
- (iii) Practicing Chartered Accountants shall generate Unique Document Identification Number (UDIN) for all certificates issued by them.

Name of Audit Firm:  
Chartered Accountant/CPA  
Date:

[Signature of Authorized Signatory]  
Name:  
Designation:  
Seal:  
Membership No.:  
UDIN

(Page 1 of 2)

**Instructions for Format F-10:**

1. The Separate Pro-forma shall be used for each member in case of JV/ Consortium(If applicable).
- 2.
3. The financial year would be the same as one normally followed by the bidder for its Annual Report.
4. The bidder shall provide the audited annual financial statements as required for this Tender document. Failure to do so would result in the Proposal being considered as non-responsive.
5. For the purpose of this Tender document:
  - (i) **Annual Turnover** shall be "Sale Value/ Operating Income"
  - (ii) **Working Capital** shall be "Current Assets less Current liabilities" and
  - (iii) **Net Worth** shall be Paid up share capital plus Free Reserves & Surplus less accumulated losses, deferred expenditure and miscellaneous expenditure not written off, if any.
6. **Above figures shall be calculated after considering the qualification, if any, made by the statutory auditor on the audited financial statements of the bidder including quantified financial implication.**
7. This certificate is to be submitted on the letter head of Chartered Accountant/CPA.

(Page 2 of 2)

F-11

**FORMAT FOR CONSORTIUM AGREEMENT  
(ON NON- JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)  
CONSORTIUM/JV AGREEMENT-**

**Not Applicable**

F-12

**BIDDER'S QUERIES FOR PRE BID MEETING**

To,

M/s TALCHER FERTILIZERS LIMITED  
NOIDA

SUB:

TENDER NO:

SI. NO.	REFERENCE OF TENDER DOCUMENT				BIDDER'S QUERY	OWNER'S REPLY
	SEC. NO.	Page No.	Clause No	Subject		

**NOTE:** The Pre-Bid Queries may be sent by e-mail before due date for receipt of Bidder's queries.

**SIGNATURE OF BIDDER:** \_\_\_\_\_

**NAME OF BIDDER:** \_\_\_\_\_



**F-13**

**E-Banking Mandate Form**

(To be issued on vendors letter head)

1. Vendor/customer Name :
2. Vendor/customer Code:
3. Vendor /customer Address:
4. Vendor/customer e-mail id:
5. Particulars of bank account
  - a) Name of Bank
  - b) Name of branch
  - c) Branch code:
  - d) Address:
  - e) Telephone number:
  - f) Type of account (current/saving etc.)
  - g) Account Number:
  - h) RTGS IFSC code of the bank branch
  - i) NEFT IFSC code of the bank branch
  - j) 9 digit MICR code

I/We hereby authorize TFL to release any amount due to me/us in the bank account as mentioned above. I/We hereby declare that the particulars given above are correct and complete. If the transaction is delayed or lost because of incomplete or incorrect information, we would not hold the TFL responsible.

(Signature of vendor/customer)

**BANK CERTIFICATE**

We certify that ----- has an Account no. ----- with us and we confirm that the details given above are correct as per our records.  
Bank stamp

Date

(Signature of authorized officer of bank)

**F-14**

**INTEGRITY PACT**

## INTEGRITY PACT

### INTRODUCTION:

TFL as one of its endeavour to maintain and foster most ethical and corruption free business environment, have decided to adopt the Integrity Pact, a tool developed by the Transparency International, to ensure that all activities and transactions between the Company (TFL) and its Counterparties (Bidders, Contractors, Vendors, Suppliers, Service Providers/Consultants etc.) are handled in a fair and transparent manner, completely free of corruption.

Considering the above, the details mentioned at attached Annexure-1 are applicable as stated in Instruction to Bidders of Bid Document in addition to the existing stipulation regarding Corrupt and Fraudulent Practices.

The attached copy of the Integrity Pact at Annexure - 2 shall be included in the Bid submitted by the bidder (to be executed by the bidder for all tenders of value Rs. 1 (One) crore and above). In case a bidder does not sign the Integrity Pact, his bid shall be liable for rejection.



## ANNEXURE-1

Bidder is required to sign the Integrity Pact with TFL as per format & terms and conditions enclosed with tender. In case a bidder does not sign the Integrity Pact, his bid shall be liable for rejection.

### I COMMITMENTS AND OBLIGATIONS OF THE “COUNTERPARTY”

- a) The Counterparty, directly or indirectly (through agent, consultant, advisor, etc.), shall not pay any bribe/ influence or give undue/ unlawful benefit to anyone to gain undue advantage in dealing with TFL.
- b) The Counterparty will not engage in collusion of any kind including price fixation etc. with other Counterparts.
- c) The counterparty will not pass TFL’s confidential information to any third party unless specifically authorized by TFL in writing.
- d) The Counterparties shall promote and observe best ethical practices within their respective organizations.
- e) The Counterparty shall inform the Independent External Monitor.
  - i) If it received any demand, directly or indirectly, for a bribe/ favour or any illegal gratification/ payment / benefit;
  - ii) If it comes to know of any unethical or illegal payment / benefit;
  - iii) If it makes any payment to any TFL associate.
- f) The Counterparty shall not make any false or misleading allegations against TFL or its associates.

### II VIOLATIONS & CONSEQUENCES:

- a) If a Counterparty commits a violation of its Commitments and Obligations under the Integrity Pact Programme during bidding process, their entire Earnest Money Deposit/ Bid Security, would be forfeited and in addition, action shall be taken as per “Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices”
- b) In case of violation of the Integrity pact by Counterparty after award of the Contract, TFL shall be entitled to terminate the Contract. Further, TFL would forfeit the security deposits/ Contract Performance Bank Guarantee and in addition, action shall be taken as per “Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices”

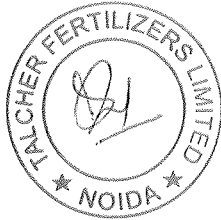


### **INDEPENDENT EXTERNAL MONITORS (IEMS)**

Presently the panel consisting of the following Independent External Monitors (IEMs) have been appointed by TFL, in terms of Integrity Pact (IP) which forms part of TFL Tenders / Contracts.

- i) Shri Anjan Kumar Banerjee (Email ID: [banerjeeanjan@gmail.com](mailto:banerjeeanjan@gmail.com))
- ii) Shri Atul Sobti (Email ID: [sobtiatul@gmail.com](mailto:sobtiatul@gmail.com))

This panel is authorised to examine / consider all references made to it under this tender. The bidder(s), in case of any dispute(s) / complaint(s) pertaining to this tender may raise the issue either with the designated tender issuing officer or Nodal Officer (presently Sh. Manna Paul, DGM (C&P) – Email: [mannapaul@gail.co.in](mailto:mannapaul@gail.co.in)) in TFL or directly with the IEMs on the panel or IEM c/o Chief Vigilance Officer, Rashtriya Chemicals and Fertilizers Ltd., Priyadarshini Building, Eastern Express Highway, Sion, Mumbai Maharashtra, 400022.



**INTEGRITY PACT**

(To be executed on plain paper)

Between TFL (India) Limited, a Government of India Public Sector, (here-in-after referred to as “Principal”).

**AND**

\_\_\_\_\_ (here-in-after referred to as “The Bidder/ Contractor”).

(Principal and the Bidder / Contractor are here-in-after are referred to individually as “Party” or collectively as “Parties”).

**PREAMBLE**

The Principal intends to award under laid down organizational procedures, contract/s for \_\_\_\_\_. The Principal values full compliance with all relevant laws of land rules, regulations, and economic use of resources and of fairness /transparency in its relations with its Bidder (s) and/or Contractor (s).

In order to achieve these goals, the Principal will appoint Independent External Monitors (IEMs) who will monitor the tender process and the execution of the contract for compliance with the principles mentioned above.

**Section 1 – Commitments of the Principal**

1. The Principal commits itself to take all measures necessary to prevent corruption and to observe the following Principles:-
  - i) No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or for a third person, any material or immaterial benefit which the person is not legally entitled to.
  - ii) The Principal will, during the tender process treat all Bidder(s) with equity and reasons. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the tender process or the contract execution.



- iii) The Principal will exclude from the process all known prejudiced persons.
2. If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal Code (IPC) / Prevention of Corruption Act (PC Act), or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officers and in addition can initiate disciplinary actions.

**Section 2 – Commitments of the Bidder (s)/Contractor (s)**

1. The Bidder(s) / Contractor(s) commits themselves to take all measures necessary to prevent corruption. The Bidder(s) / Contractor(s) commits themselves to observe the following principles during participation in the tender process and during the contract execution:
- i) The Bidder (s) / Contractor (s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the contract or to any third person any material or other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the contract.
  - ii) The Bidder (s) / Contractor (s) will not enter with other Bidders into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other action to restrict competitiveness or to introduce cartelisation in the bidding process.
  - iii) The Bidder (s) / Contractor (s) will not commit any offence under the relevant IPC/PC Act; further, the Bidder (s) / Contractor (s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
  - iv) The Bidder (s)/ Contractor (s) of foreign origin shall disclose the name and address of the Agents/ representatives in India, if any. Similarly, the Bidder (s)/ Contractor (s) of Indian Nationality shall furnish the name and address of the foreign principals, if any. Further, all the payments made to the Indian agent/ representative have to be in India Rupees only.
  - v) The Bidder (s) / Contractor (s) will, when presenting their bid, disclose any and all payments made, is committed to or intends to make to agents,



brokers or any other intermediaries in connection with the award of the contract.

- vi) Bidder(s) / Contractor(s) who have signed the Integrity Pact shall not approach the Courts while representing the matter to IEMs and shall wait for their decision in the matter.
2. The Bidder(s)/ Contractor(s) shall not instigate third person to commit offences outlined above or be an accessory to such offences.

### **Section 3 – Disqualification from tender process and exclusion from future contracts**

If the Bidder (s) / Contractor (s), before award or during execution has committed a transgression through a violation of Section 2, above or in any other form such as to put their reliability or credibility in question, the Principal is entitled to disqualify the Bidder (s) / Contractor (s) from the tender process or take action as per provisions of “Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices”.

### **Section 4 – Compensation for Damages**

1. If the Principal has disqualified the Bidder (s) from the tender process prior to the award according to Section 3, the Principal is entitled to demand and recover the damages equivalent to Earnest Money Deposit / Bid Security.
2. If the Principal has terminated the contract according to Section 3, or if the Principal is entitled to terminate the contract according to Section 3, the Principal shall be entitled to demand and recover from the Contractor liquidated damages equal to the Contract Value or the amount equivalent to Performance Bank Guarantee.

### **Section 5 – Previous transgression**

1. The Bidder declares that no previous transgression occurred in the last three years, with any other Company in any country conforming to the anti-corruption approach or with any Public Sector Enterprise in India that could justify his exclusion from the tender process.
2. If the Bidder makes incorrect statement on this subject, he can be disqualified from the tender process or actions can be taken as per provisions of “Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices”





### **Section 6 – Equal treatment to all Bidders / Contractors / Subcontractors**

1. In case of sub-contracting, the Principal contractor shall take the responsibility of the adoption of IP by the sub-contractor. It is to be ensured by him that all sub-contractors also sign the IP.
2. The Principal will enter into agreements with identical conditions as this one with all Bidders and Contractors.
3. The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

### **Section 7 – Criminal charges against violating Bidder (s) / Contractor (s) / Sub-contractor (s)**

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the same to the Chief Vigilance Officer.

### **Section 8 –Independent External Monitor / Monitors**

1. The Principal appoints competent and credible Independent External Monitor for this Pact after approval by Central Vigilance Commission. The task of the Monitor is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
2. The Monitor is not subject to instructions by the representatives of the parties and performs his/her functions neutrally and independently. The Monitor would have access to all documents / records pertaining to the contract for which a complaint or issue is raised before them, as and when warranted. However, the documents / records / information having National Security implications and those documents which have been classified as Secret/Top Secret are not to be disclosed. It will be obligatory for him/her to treat the information and documents of the Bidders / Contractors as confidential. He / she reports to MD, TFL.
3. The Bidder (s)/ Contractor (s) accepts that the Monitor has the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the Monitor, upon his/her request and demonstration of a valid interest, unrestricted and unconditional access to their project documentation. The same is applicable to Sub-contractors.
4. The Principal will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an



impact on the contractual relations between the Principal and the Contractor. The parties offer to the Monitor the option to participate in such meetings.

5. As soon as the Monitor notices, or believes to notice, a violation of this agreement, he/she will so inform the Management of the Principal and request the Management to discontinue or to take corrective action, or to take other relevant action. The monitor can in this regard submit non-binding recommendations. Beyond this, the Monitor has no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.
6. The Monitor will submit a written report to MD, TFL within 30 days from the date of reference or intimation to him by the 'Principal' and, should the occasion arise, submit proposals for correcting problematic situations.
7. If the Monitor has reported to MD, TFL, a substantiated suspicion of an offence under relevant IPC/PC Act, and MD, TFL has not, within reasonable time, taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, then, only in case of very serious issue having a specific verifiable Vigilance angle, the matter should be reported directly to the Central Vigilance Commission.
8. The word 'Monitor' would include both singular and plural.
9. In case of any complaints referred under IP Program, the role of IEMs is advisory and would not be legally binding and it is restricted to resolving the issues raised by an intending bidder regarding any aspect of the tender which allegedly restricts competition or bias towards some bidder.
10. After award of contract, the IEMs shall look into any issue relating to execution of contract, if specifically raised before them. As an illustrative example, if a contractor who has been awarded the contract, during the execution of contract, raises issue of delayed payment etc. before the IEMs, the same shall be examined by the panel of IEMs.

### **Section 9 – Pact Duration**

This Pact begins when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the respective contract, and for all other Bidders 6 months after the contract has been awarded. Any violation to the same would entail disqualification of the bidders and exclusion from future business dealing.

If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/determined by MD, TFL.

### **Section 10 – Miscellaneous provisions**



1. This agreement is subject to Indian Law. Place of performance and exclusive jurisdiction is the Registered Office of the Principal, i.e. New Delhi.
2. Changes and supplements as well as termination notices, if any, need to be made in writing. Side agreements have not been made.
3. If the Contractor/Bidder is a Joint Venture or a partnership concern or a consortium, this agreement must be signed by all partners or consortium members.
4. Should one or several of the provisions of this agreement turn out to be invalid, the remainder of this agreement shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions in such a case.
5. Issues like warranty / guarantee, etc. shall be outside the purview of IEMs.
6. In the event of any contradiction between the Integrity Pact and its Annexure, the Clause in Integrity Pact will prevail.



-----  
 (For & on Behalf of Principal)  
 उद्य. महासचिव (संविदा एवं कंत्राट) Dy. General Manager (O&C)  
 तालचर फर्टिलाइजर्स लिमिटेड/Talcher Fertilizers Ltd.  
 जीटीआई पीएआरसी बिल्डिंग/GTI PARC Building  
 प्लॉट नं. 24, सेक्टर-16A, नोएडा-201 301 (उ.प्र.)  
 Plot No. 24, Sec.-16A, Noida-201 301 (U.P.)  
 (Office Seal)

-----  
 (For & on Behalf of Bidder/Contractor)  
  
 (Office Seal)

Place ----- NOIDA -----  
 Date -----

Witness 1:  
 (Sign, Name & Address)  
 [FOR PRINCIPAL]

Geegam (SURA DEOGAM)  
 TALCHER FERTILIZERS LIMITED (TFL),  
 PLOT NO. 24, SECTOR-16A, NOIDA (U.P.)-201301

Witness 2:  
 (Sign, Name & Address)  
 [FOR BIDDER / CONTRACTOR]

.....  
 .....  
 .....

**INDEMNITY BOND**

WHEREAS TALCHER FERTILIZERS LIMITED (hereinafter referred to as “TFL”) which expression shall, unless repugnant to the context include its successors and assigns, having its registered office at Plot 2/H, Kalpana Area, BJB Nagar, Khorda, Bhubaneswar – 751014 has entered into a contract with M/s\*..... (hereinafter referred to as the “Contractor”) which expression shall unless repugnant to the context include its representatives, successors and assigns, having its registered office at \*..... and on the terms and conditions as set out, inter-alia in the ..... **[mention the work order/LOA/Tender No.]** and various documents forming part thereof, hereinafter collectively referred to as the ‘CONTRACT’ which expression shall include all amendments, modifications and / or variations thereto.

TFL has also advised the Contractor to execute an Indemnity Bond in general in favour of TFL indemnifying TFL and its employees and Directors including Independent Directors from all consequences which may arise out of any prospective litigation or proceedings filed or may be initiated by any third party, including any Banker / financial institution / worker(s) / vendor(s) / subcontractor(s) etc. who may have been associated or engaged by the Contractor directly or indirectly with or without consent of TFL for above works.

NOW, THEREFORE, in consideration of the promises aforesaid, the Contractor hereby irrevocably and unconditionally undertakes to indemnify and keep indemnified TFL and all its employees, Directors, including Independent Directors, from and against all/any claim(s), damages, loss, which may arise out of any litigations/ liabilities that may be raised by the Contractor or any third party against TFL under or in relation to this contract. The Contractor undertakes to compensate and pay to TFL and/or any of its employees, Directors including Independent Directors, forth with on demand without any protest the amount claimed by TFL for itself and for and on behalf of its employees, Directors including Independent Directors together with direct/indirect expenses including all legal expenses incurred by them or any of them on account of such litigation or proceedings.

AND THE CONTRACTOR hereby further agrees with TFL that:

- (i) This Indemnity shall remain valid and irrevocable for all claims of TFL and/or any of its employees and Directors including Independent Directors arising out of said contract with respect to any such litigation / court case for which TFL and/or its employees and Directors including Independent Directors has been made party until now or here-in-after.
- (ii) This Indemnity shall not be discharged/ revoked by any change/ modification/ amendment/ assignment of the contract or any merger of the Contractor with other entity or any change in the constitution/structure of the Contractor’s firm/ Company or any conditions thereof including insolvency etc. of the Contractor, but shall be in all respects and for all purposes binding and operative until any/ all claims for payment of TFL are settled by the Contractor and/or TFL discharges the Contractor in writing from this Indemnity.

The undersigned has full power to execute this Indemnity Bond for and on behalf of the Contractor and the same stands valid.

SIGNED BY :  
For [ Contractor ]

*Authorised Representative*

Place:

Dated:

Witnesses:1.

2.

**F-16**

**FREQUENTLY ASKED QUESTIONS (FAQs)**

<b>SL.NO.</b>	<b>QUESTION</b>	<b>ANSWER</b>
1.0	Can any vendor quote for subject Tender?	Yes. A Vendor has to meet Bid Evaluation Criteria given under Section II of Tender document in addition to other requirements.
2.0	Should the Bid Evaluation Criteria documents be attested?	Yes. Please refer Section II of Tender document
3.0	Is attending Pre Bid Meeting mandatory.	No. Refer Clause No. 17 of Instruction to Bidders of Tender Document. However attending Pre Bid Meeting is recommended to sort out any issue before submission of bid by a Bidder.
4.0	Can a vendor submit more than 1 offer?	No. Please refer Clause No. 4 of Instruction to Bidders of Tender Document.
5.0	Is there any Help document available for e-Tender.	Refer FAQs as available on CPP Portal e-Procurement).
6.0	Are there are any MSE (Micro & Small Enterprises) benefits available?	Refer Clause No. 40 of Instructions to Bidders of Tender Document.
7.0	Are there are any benefits available to Startups?	Refer Clause No. 49 of Instructions to Bidders of Tender Document.

All the terms and conditions of Tender remain unaltered.

**Form F-17**

**(Not Applicable for this Tender)**

**PROFORMA OF BANK GUARANTEE FOR MOBILISATION ADVANCE  
(ON NON-JUDICIAL PAPER OF APPROPRIATE VALUE)**

To,  M/s Talcher Fertilizers Limited,  Noida	<b>Bank Guarantee No.</b>	
	<b>Date of BG</b>	
	<b>BG Valid up to</b>	
	<b>Claim period up to (There should be three months gap between expiry date of BG &amp; Claim period)</b>	
	<b>Stamp Sl. No. / e-Stamp Certificate No.</b>	

**Dear Sir(s),**

In consideration of the Talcher Fertilizers Limited, hereinafter called the "Owner" which expression shall unless repugnant to the context or meaning thereof include its successors, executors, administrators and assignees, having awarded to M/s..... having its registered office at ..... hereinafter referred as the 'CONTRACTOR', which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assignees, a contract hereinafter referred to as the 'Contract' for related works..... referred to as the 'WORK' on terms and conditions set out, inter-alia in the Owner's Contract / DLOA / FOA No.....dated..... valued at..... (in words & figures) and as the Owner having agreed to make an advance payment (herein after referred as Mobilization advance) for the performance of the above contract to the CONTRACTOR amounting to.....(in words & figures) as an advance against Bank Guarantee to be furnished by the CONTRACTOR.

We..... hereinafter referred to as the BANK which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assignees having our office at..... do hereby undertake to give the irrevocable and unconditional guarantee and do hereby undertake to pay the OWNER on first demand without any demur, reservation, contest, recourse, protest and without reference to the CONTRACTOR any and all monies payable by the CONTRACTOR by reason of any breach by the said CONTRACTOR of any of the terms and conditions of the said Contract to the extent of..... till the said advance is adjusted as aforesaid at any time upto..... We agree that the guarantee herein contained shall continue to be enforceable till the sum due to the Owner on account of the said advance is adjusted/ recovered in full as aforesaid or till the Owner discharges this guarantee **in writing.**

The OWNER shall have the fullest liberty without affecting in any way the liability of the BANK under this guarantee, from time to time to vary the advance or to extend the time for performance of the

works by the CONTRACTOR. The BANK shall not be released from its liability under these presents by any exercise of the Owner of the liberty with reference to the matter aforesaid.

The Owner shall have the fullest liberty, without reference to CONTRACTOR and without affecting this guarantee to postpone for any time or from time to time the exercise of any powers vested in them or of any right which they might have against the CONTRACTOR, and to exercise the same at any time in any manner, and either to enforce or to forebear to enforce any power, covenants contained or implied in the Contract between the OWNER and the CONTRACTOR or any other course or remedy or security available to the OWNER and the BANK shall not be released of its obligations under these presents by any exercise by the OWNER of its liberty with reference to matters aforesaid or other acts of omission or commission on the part of the OWNER or any other law would, but for this provision, have the effect of releasing the BANK.

The right of the OWNER to recover the outstanding sum of advance upto Rs.....from the BANK in the manner aforesaid is **absolute and unequivocal** and will not be affected or suspended by reason of the fact that any dispute or disputes has or have been raised by the CONTRACTOR and/or that any dispute or disputes is or are pending before any officer, tribunal or court **or arbitrator or any other authority/forum** and any demand made by OWNER on the BANK shall be conclusive and binding.

The BANK further undertakes not to revoke this guarantee during its currency without previous consent of the OWNER and further agrees that the guarantee contained shall continue to be enforceable **until it is discharged by TFL in writing.**

The BANK also agrees that the OWNER shall at its option be entitled to enforce this guarantee against the BANK as a principal debtor, in the first instance, notwithstanding any other security or guarantee that OWNER may have in relation to the CONTRACTOR's liabilities towards the said advance.

The amount under the Bank Guarantee is payable forthwith without any delay by Bank upon the written demand raised by TFL. Any dispute arising out of or in relation to the said Bank Guarantee shall be subject to the exclusive jurisdiction of courts at New Delhi.

Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Contractor up to a total amount of \_\_\_\_\_ (amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Contractor to be in default under the contract and without caveat or argument, any sum or sums within the limits of \_\_\_\_\_ (amount of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein.

We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do so under the Power of Attorney/ resolution of the Board of Directors dated..... accorded to him by the BANK.

Notwithstanding anything contained herein:

- a) The Bank's liability under this Guarantee shall not exceed (currency in figures) \_\_\_\_\_ (currency in words only) \_\_\_\_\_
- b) This Guarantee shall remain in force upto \_\_\_\_\_ (three months beyond Completion Period) and any extension(s) thereof; and
- c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of \_\_\_\_\_ (indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the last extension of this Guarantee. If a claim

has been received by us within the said date, all the rights of TFL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

Dated.....this.....day of.....20 .....

Signed by

(Person duly authorised by Bank)

Place:

WITNESS :

1..... (Signature)

..... (Printed Name)

..... (Designation)

2..... (Signature)

..... (Printed Name)

..... (Designation)

(Common Seal)



**F-17 (A)**  
**MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY**  
**VENDOR ALONG WITH BANK GUARANTEE (BG)**

<b>1. Bank Guarantee No.</b>		
<b>2. Vendor Name</b>		
<b>3. Nature of Bank Guarantee [Please Tick ( <input type="checkbox"/> ) whichever is applicable]</b>	Contract Performance	
	Security (CPS)	Advance
<b>Purchase Order (PO) / Fax of Acceptance (FOA) / Detailed Letter of Acceptance (DLOA) No.</b>		
<b>Details of Bank issuing Bank Guarantee (BG)</b>		
<b>A. Name</b>		
<b>B. E-mail ID</b>		
<b>C. Address</b>		
<b>D. Phone No. / Mobile No.</b>		

**(Not Applicable for this Tender)**

**PROFORMA FOR BANK GUARANTEE FOR PAYMENTS TOWARDS PLACEMENT OF ALL  
PURCHASE ORDERS OF MAJOR TAGGED ITEMS.**

(To be submitted on Rs. 500/-(five hundred) non judicial stamp paper)

Ref.....

Bank Guarantee No.-----

Date.....

To,  
M/s Talcher Fertilizers Limited

**Dear Sir(s),**

In consideration of the Talcher Fertilizers Limited, hereinafter called the "Owner" which expression shall unless repugnant to the context or meaning thereof include its successors, executors, administrators and assignees, having awarded to M/s..... having its registered office at ..... hereinafter referred as the 'CONTRACTOR', which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assignees, a contract hereinafter referred to as the 'Contract' for related works..... referred to as the 'WORK' on terms and conditions set out, inter-alia in the Owner's Contract / DLOA / FOA No.....dated..... valued at..... (in words & figures) and as the Owner having agreed to make milestone payments (for the performance of the above contract to the CONTRACTOR amounting to.....(in words & figures) against Bank Guarantee to be furnished by the CONTRACTOR.

We..... hereinafter referred to as the BANK which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assignees having our office at..... do hereby undertake to give the irrevocable and unconditional guarantee and do hereby undertake to pay the OWNER on first demand without any demur, reservation, contest, recourse, protest and without reference to the CONTRACTOR any and all monies payable by the CONTRACTOR by reason of any breach by the said CONTRACTOR of any of the terms and conditions of the said Contract to the extent of.....We agree that the guarantee herein contained shall continue to be enforceable till the Owner discharges this guarantee **in writing.**

The OWNER shall have the fullest liberty without affecting in any way the liability of the BANK under this guarantee, from time to time to vary the amount or to extend the time for performance of the works by the CONTRACTOR. The BANK shall not be released from its liability under these presents by any exercise of the Owner of the liberty with reference to the matter aforesaid.

The Owner shall have the fullest liberty, without reference to CONTRACTOR and without affecting this guarantee to postpone for any time or from time to time the exercise of any powers vested in them or of any right which they might have against the CONTRACTOR, and to exercise the same at any time in any manner, and either to enforce or to forebear to enforce any power, covenants contained or implied in the Contract between the OWNER and the CONTRACTOR or any other course or remedy or security available to the OWNER and the BANK shall not be released of its obligations under these presents by any exercise by the OWNER of its liberty with reference to matters aforesaid or other acts of omission or commission on the part of the OWNER or any other law would, but for this provision, have the effect of releasing the BANK.

The right of the OWNER to recover the outstanding sum upto Rs..... from the BANK in the manner aforesaid **is absolute and unequivocal and** will not be affected or suspended by reason of the fact that any dispute or disputes has or have been raised by the CONTRACTOR and/or that any dispute or disputes is or are pending before any officer, tribunal or court **or arbitrator or any other authority/forum** and any demand made by OWNER on the BANK shall be conclusive and binding.

The BANK further undertakes not to revoke this guarantee during its currency without previous consent of the OWNER and further agrees that the guarantee contained shall continue to be enforceable **until it is discharged by TFL in writing.**

The BANK also agrees that the OWNER shall at its option be entitled to enforce this guarantee against the BANK as a principal debtor, in the first instance, notwithstanding any other security or guarantee that OWNER may have in relation to the CONTRACTOR's liabilities towards the said milestone payment .

The amount under the Bank Guarantee is payable forthwith without any delay by Bank upon the written demand raised by TFL. Any dispute arising out of or in relation to the said Bank Guarantee shall be subject to the exclusive jurisdiction of courts at New Delhi.

Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Contractor up to a total amount of \_\_\_\_\_(amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Contractor to be in default under the contract and without caveat or argument, any sum or sums within the limits of \_\_\_\_\_(amount of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein.

Notwithstanding anything contained hereinabove, our liability under this guarantee is restricted to \_\_\_\_\_ and it will remain in force upto and including \_\_\_\_\_ (this date shall be initially 15 months from date of FOA) and shall be extended from time to time for such periods as may be advised by M/s \_\_\_\_\_ on whose behalf this guarantee has been given.

We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do so under the Power of Attorney/ resolution of the Board of Directors dated..... accorded to him by the BANK.

Notwithstanding anything contained herein:

9.

- a) The Bank's liability under this Guarantee shall not exceed (currency in figures) \_\_\_\_\_ (currency in words only) \_\_\_\_\_
- b) This Guarantee shall remain in force upto \_\_\_\_\_ (this date shall be initially 15 months from date of FOA) and any extension(s) thereof; and

c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of \_\_\_\_\_ (indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of TFL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

Dated.....this.....day of.....20 .....

Signed by

(Person duly authorised by Bank)

Place:

**WITNESS :**

1..... (Signature)  
..... (Printed Name)  
..... (Designation)

2..... (Signature)  
..... (Printed Name)  
..... (Designation)

(Common Seal)

**FORMAT OF LETTER OF NO DEVIATIONS**  
**(ON BIDDER'S LETTERHEAD)**

(NIT NO : ..... DATED .....)

We \* hereby agree to fully comply with, abide by and accept without variation, deviation or reservation all technical, commercial and other condition whatsoever of the Bidding Documents and all Addenda / Corrigenda / Amendment/ Clarifications issued by OWNER.

We further hereby confirm that the bid is submitted in accordance of Tender Document and contains no deviation and the price bid submitted may be treated to conform to, in all respects, with the terms and conditions of the said tender documents including all Addenda / Corrigenda/ Amendment /Clarifications.

For and on behalf of\* : .....

Stamp & Signature\*\* : .....

Name : .....

Designation : .....

Date : .....

\*Here fill in the name of bidder.

\*\*The Letter of *No Deviation* must be signed by the person (s) authorized to sign as per POA.

**F-20**  
**POWER OF ATTORNEY (POA)**  
**(To be submitted on the Non-Judicial stamp paper / Company's Letter Head)**

TENDER NO:

Description of work:

Name of Bidder: \_\_\_\_\_

"The undersigned \_\_\_\_\_ (Name of LEGAL PERSON, i.e. CEO/C&MD/Company Secretary/Partners) is lawfully authorized to issue this POA\* on behalf of the company M/s \_\_\_\_\_ (Name of bidder) whose registered address is \_\_\_\_\_ and does hereby appoint Mr./Ms \_\_\_\_\_ (name of authorized person signing the bid document) \_\_\_\_\_ (Designation) of M/s \_\_\_\_\_ (Name of bidder) whose signature appears below to be the true and lawful attorney/(s) and authorize him/her to sign the bid (both physically & digitally on CPP Portal), conduct negotiation, sign contracts and execute all the necessary matter related thereto, in the name and on behalf of the company in connection with the tender no. \_\_\_\_\_.

The signature of the authorized person/(s) herein constitutes unconditional obligations of M/s \_\_\_\_\_ (Name of bidder).

This Power of Attorney (POA) shall remain valid and in full force and effect before we withdraw it in writing (by fax, or mail or post). All the documents signed (within the period of validity of the Power of Attorney) by the authorized person herein shall not be invalid because of such withdrawal.

- (\*) In case of a single Bidder, the Power of Attorney shall be issued as per the constitution of the bidder as below.
- a) **In case of Proprietorship:** By Proprietor
  - b) **In case of Partnership:** by all Partners or Managing Partner.
  - c) **In case of Limited Liability Partnership:** by any bidder's employee authorized in terms of Deed of LLP.
  - d) **In case of Public /Limited Company:** POA in favour of authorized employee(s) by Board of Directors through Board Resolution or by the designated officer authorized by Board to do so. Such Board Resolution should be duly countersigned by Company Secretary / MD / CMD / CEO.

SIGNATURE OF THE LEGAL PERSON

\_\_\_\_\_  
(Name of person with Company seal)

SIGNATURE OF THE AUTHORIZED PERSON  
(FOR SIGNING THE BID)

\_\_\_\_\_  
(Signature)

Name of person: \_\_\_\_\_

E-mail id: \_\_\_\_\_

DSC (Digital Signature Certificate) No.: \_\_\_\_\_

F-21

**UNDERTAKING REGARDING SUBMISSION OF ELECTRONIC INVOICE (E-INVOICE AS PER  
GST LAWS)**

**(to be submitted on letter head along with documents for release of payment)**

To,  
M/s TALCHER FERTILIZERS LIMITED

\_\_\_\_\_

SUB:  
LOA NO:  
**Dear Sir,**

We \_\_\_\_\_ (Name of the Supplier/Contractor/Service Provider/ Consultant)  
hereby confirm that E-Invoice provision as per the GST Law is

(i) Applicable to us [       ]

(ii) Not Applicable to us [       ]

**(Supplier/Contractor/Service Provider/ Consultant is to tick appropriate option (✓ or X) above).**

In case, same is applicable to us, we confirm that we will submit E-Invoice after complying with all the requirements of GST Laws. If the invoice issued without following this process, such invoice can-not be processed for payment by TFL as no ITC is allowed on such invoices. We also confirm that If input tax credit is not available to TFL for any reason attributable to Supplier/Contractor/Service Provider/ Consultant (both for E-invoicing cases and non-E-invoicing cases), then TFL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, by adjusting against any amounts paid or becomes payable in future to the Supplier/Contractor/Service Provider/ Consultant under this contract or under any other contract.

Place: [Signature of Authorized Signatory of Bidder]

Date: Name:  
Designation:  
Bidder Name:  
Seal:

**Form F-22**

**UNDERTAKING REGARDING SUBMISSION OF CONTRACT PERFORMANCE SECURITY  
(CPS)/ SECURITY DEPOSIT (SD) WITHIN STIPULATED TIME LINE**

**(to be submitted on letter head of bidder)**

To,

M/s Talcher Fertilizers Limited

\_\_\_\_\_

SUB:

TENDER NO:

**Dear Sir,**

We hereby confirm that we have clearly understood the requirement of Contract Performance Security (CPS) / Security Deposit (SD) specified in the tender document.

We also hereby confirm that in case of award of contract / order, we will submit Contract Performance Security (CPS) / Security Deposit (SD) within 30 days from the date of issuance of Fax of Acceptance.

Place: [Signature of Authorized Signatory of Bidder]

Date: Name:

Designation:

Bidder Name:

Seal:



**F-23**  
**PROFORMA FOR CONTRACT AGREEMENT**  
**(To be executed on non-judicial stamp paper of appropriate value)**

DLOA No. .... dated .....

**TFL's PAN No. ....**

Contract Agreement for the work of ----- of TALCHER FERTILIZERS LIMITED made on ---  
----- between (Name and Address)-----, hereinafter called the "CONTRACTOR" (which term shall unless excluded by or repugnant to the subject or context include its successors and permitted assignees) of the one part and TALCHER FERTILIZERS LIMITED hereinafter called the "EMPLOYER" (which term shall, unless excluded by or repugnant to the subject or context include its successors and assignees) of the other part.

**WHEREAS**

- A. The EMPLOYER being desirous of having provided and executed certain work mentioned, enumerated or referred to in the Tender Documents including Letter Inviting Tender, General Tender Notice, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings, Plans, Time Schedule of completion of jobs, Schedule of Rates, Agreed Variations, other documents has called for Tender.
- B. The CONTRACTOR has inspected the SITE and surroundings of WORK specified in the Tender Documents and has satisfied himself by careful examination before submitting his tender as to the nature of the surface, strata, soil, sub-soil and ground, the form and nature of site and local conditions, the quantities, nature and magnitude of the work, the availability of labour and materials necessary for the execution of work, the means of access to SITE, the supply of power and water thereto and the accommodation he may require and has made local and independent enquiries and obtained complete information as to the matters and thing referred to, or implied in the tender documents or having any connection therewith and has considered the nature and extent of all probable and possible situations, delays, hindrances or interferences to or with the execution and completion of the work to be carried out under the CONTRACT, and has examined and considered all other matters, conditions and things and probable and possible contingencies, and generally all matters incidental thereto and ancillary thereof affecting the execution and completion of the WORK and which might have influenced him in making his tender.
- C. The Tender Documents including the Notice Letter Inviting Tender, General Conditions of Contract, Special Conditions of Contract, Schedule of Rates, General Obligations, SPECIFICATIONS, DRAWINGS, PLANS, Time Schedule for completion of Jobs, Letter of Acceptance of Tender and any statement of agreed variations with its enclosures copies of which are hereto annexed form part of this CONTRACT though separately set out herein and are included in the expression "CONTRACT" wherever herein used.

**AND WHEREAS**

The EMPLOYER accepted the Tender of the CONTRACTOR for the provision and the execution of the said WORK at the rates stated in the schedule of quantities of the work and finally approved by EMPLOYER (hereinafter called the "Schedule of Rates") upon the terms and subject to the conditions of CONTRACT.

**NOW THIS AGREEMENT WITNESSETH AND IT IS HEREBY AGREED AND DECLARED AS FOLLOWS:-**

1. In consideration of the payment to be made to the CONTRACTOR for the WORK to be executed by him, the CONTRACTOR hereby covenants with EMPLOYER that the CONTRACTOR shall and will duly provide, execute and complete the said work and shall do and perform all other acts and things in the CONTRACT mentioned or described or which are to be implied there from or may be reasonably necessary for the completion of the said WORK and at the said times and in the manner and subject to the terms and conditions or stipulations mentioned in the contract.
2. In consideration of the due provision execution and completion of the said WORK, EMPLOYER does hereby agree with the CONTRACTOR that the EMPLOYER will pay to the CONTRACTOR the respective amounts for the WORK actually done by him and approved by the EMPLOYER at the Schedule of Rates and such other sum payable to the CONTRACTOR under provision of CONTRACT, such payment to be made at such time in such manner as provided for in the CONTRACT.

A N D

3. In consideration of the due provision, execution and completion of the said WORK the CONTRACTOR does hereby agree to pay such sums as may be due to the EMPLOYER for the services rendered by the EMPLOYER to the CONTRACTOR, such as power supply, water supply and others as set for in the said CONTRACT and such other sums as may become payable to the EMPLOYER towards the controlled items of consumable materials or towards loss, damage to the EMPLOYER'S equipment, materials construction plant and machinery, such payments to be made at such time and in such manner as is provided in the CONTRACT.

It is specifically and distinctly understood and agreed between the EMPLOYER and the CONTRACTOR that the CONTRACTOR shall have no right, title or interest in the SITE made available by the EMPLOYER for execution of the works or in the building, structures or work executed on the said SITE by the CONTRACTOR or in the goods, articles, materials etc., brought on the said SITE (unless the same specifically belongs to the CONTRACTOR) and the CONTRACTOR shall not have or deemed to have any lien whatsoever charge for unpaid bills will not be entitled to assume or retain possession or control of the SITE or structures and the EMPLOYER shall have an absolute and unfettered right to take full possession of SITE and to remove the CONTRACTOR, their servants, agents and materials belonging to the CONTRACTOR and lying on the SITE.

The CONTRACTOR shall be allowed to enter upon the SITE for execution of the WORK only as a licensee simpliciter and shall not have any claim, right, title or interest in the SITE or the structures erected thereon and the EMPLOYER shall be entitled to terminate such license at any time without assigning any reason.

The materials including sand, gravel, stone, loose, earth, rock etc., dug up or excavated from the said SITE shall, unless otherwise expressly agreed under this CONTRACT, exclusively belong to the EMPLOYER and the CONTRACTOR shall have no right to claim over the same and such excavation and materials should be disposed off on account of the EMPLOYER according to the instruction in writing issued from time to time by the ENGINEER-IN-CHARGE.

In Witness whereof the parties have executed these presents in the day and the year first above written.

Signed and Delivered for and on  
on behalf of EMPLOYER

Signed and Delivered for and  
on behalf of the CONTRACTOR.

TALCHER FERTILIZERS LIMITED

\_\_\_\_\_

Date : \_\_\_\_\_

Place: \_\_\_\_\_

**IN PRESENCE OF TWO WITNESSES**

1. \_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

NAME OF CONTRACTOR

\_\_\_\_\_

Date : \_\_\_\_\_

Place: \_\_\_\_\_

1. \_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



PROJECTS & DEVELOPMENT INDIA LIMITED

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## General Conditions of Contract

### Section- I. Definitions

#### 1. Definition of Terms:

- 1.1 In this CONTRACT (as here-in-after defined) the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise required.
- 1.1.1 The OWNER/EMPLOYER/COMPANY/TFL means Talcher Fertilizers Ltd. (a joint venture of four major Public Sector Units – M/s GAIL (India) Limited, M/s Rastriya Chemicals & Fertilizers Ltd., M/s Coal India Ltd. and M/s Fertilizers Corporation of India Ltd.) and having its Registered office at Plot 2/H, Kalpana Area, BJB Nagar, Khurda, Bhubaneswar-751 014 and includes its successors and assigns.
- 1.1.2 The "CONTRACTOR" means the person or the persons, firm or Company or corporation whose tender has been accepted by the EMPLOYER and includes the CONTRACTOR's legal Representatives his successors and permitted assigns.
- 1.1.3 The "ENGINEER/ENGINEER-IN-CHARGE" shall mean the person designated from time to time by the TFL and shall include those who are expressly authorized by him to act for and on his behalf for operation of this CONTRACT.
- 1.1.4 The "WORK" shall mean and include all items and things to be supplied/ done and services and activities to be performed by the CONTRACTOR in pursuant to and in accordance with CONTRACT or part thereof as the case may be and shall include all extra, additional, altered or substituted works as required for purpose of the CONTRACT.
- 1.1.5 The "PERMANENT WORK" means and includes works which will be incorporated in and form a part of the work to be handed over to the EMPLOYER by the CONTRACTOR on completion of the CONTRACT.
- 1.1.6 "CONSTRUCTION EQUIPMENT" means all appliances/equipment and things whatsoever nature for the use in or for the execution, completion, operation, or maintenance of the work or temporary works (as hereinafter defined) but does not include materials or other things intended to form or to be incorporated into the WORK, or camping facilities.
- 1.1.7 "CONTRACT DOCUMENTS" means collectively the Tender Documents, Designs, Drawings, Specification, Schedule of Quantities and Rates, Letter of Acceptance and agreed variations if any, and such other documents constituting the tender and acceptance thereof.
- 1.1.8 CONSULTANT: means Projects & Development India Ltd. (PDIL) who are the consulting engineer to the Employer for this project and having registered office at PDIL Bhawan, A-14, Sector 1, Noida - 201301 (U.P.)
- 1.1.9 The "SUB-CONTRACTOR" means any person or firm or Company (other than the CONTRACTOR) to whom any part of the work has been entrusted by the CONTRACTOR, with the written consent of the ENGINEER-IN-CHARGE, and the legal representatives, successors and



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permitted assigns of such person, firm or company.

- 1.1.10 The "CONTRACT" shall mean the Agreement between the EMPLOYER and the CONTRACTOR for the execution of the works including therein all contract documents.
- 1.1.11 The "SPECIFICATION" shall mean all directions the various technical specifications, provisions attached and referred to the Tender Documents which pertain to the method and manner of performing the work or works to the quantities and qualities of the work or works and the materials to be furnished under the CONTRACT for the work or works, as may be amplified or modified by the TFL or ENGINEER-IN-CHARGE during the performance of CONTRACT in order to provide the unforeseen conditions or in the best interests of the work or works. It shall also include the latest edition of relevant Standard Specifications including all addenda/corrigenda published before entering into CONTRACT.
- 1.1.12 The "DRAWINGS" shall include maps, plans and tracings or prints or sketches thereof with any modifications approved in writing by the ENGINEER-IN-CHARGE and such other drawing as may, from time to time, be furnished or approved in writing by the ENGINEER-IN-CHARGE.
- 1.1.13 The "TENDER" means the proposal along with supporting documents submitted by the CONTRACTOR for consideration by the EMPLOYER.
- 1.1.14 The "CHANGE ORDER" means an order given in writing by the ENGINEER-IN-CHARGE to effect additions to or deletion from and alteration in the works.
- 1.1.15 The "COMPLETION CERTIFICATE" shall mean the certificate to be issued by the ENGINEER-IN-CHARGE when the works have been completed entirely in accordance with CONTRACT DOCUMENT to his satisfaction.
- 1.1.16 The "FINAL CERTIFICATE" in relation to a work means the certificate regarding the satisfactory compliance of various provision of the CONTRACT by the CONTRACTOR issued by the ENGINEER-IN- CHARGE/EMPLOYER after the period of liability is over.
- 1.1.17 "DEFECT LIABILITY PERIOD" in relation to a work means the specified period from the date of COMPLETION CERTIFICATE upto the date of issue of FINAL CERTIFICATE during which the CONTRACTOR stands responsible for rectifying all defects that may appear in the works executed by the CONTRACTOR in pursuance of the CONTRACT and includes warranties against Manufacturing/Fabrication/ Erection/Construction defects covering all materials plants, equipment, components, and the like supplied by the CONTRACTOR, works executed against workmanship defects.
- 1.1.18 The "APPOINTING AUTHORITY" for the purpose of arbitration shall be the CHAIRMAN and MANAGING DIRECTOR or any other person so designated by the EMPLOYER.
- 1.1.19 "TEMPORARY WORKS" shall mean all temporary works of every kind required in or about the execution, completion or maintenance of works.
- 1.1.20 "PLANS" shall mean all maps, sketches and layouts as are incorporated in the CONTRACT in order to define broadly the scope and specifications of the work or works, and all reproductions thereof.



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- 1.1.21 "SITE" shall mean the lands and other places on, under, in or through which the permanent works are to be carried out and any other lands or places provided by the EMPLOYER for the purpose of the CONTRACT.
- 1.1.22 "NOTICE IN WRITING OR WRITTEN NOTICE" shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been received by the addressee) by registered post to the latest known private or business address or registered office of the addressee and shall be deemed to have been received in the ordinary course of post it would have been delivered.
- 1.1.23 "APPROVED" shall mean approved in writing including subsequent written confirmation of previous verbal approval and "APPROVAL" means approval in writing including as aforesaid.
- 1.1.24 "LETTER OF INTENT/FAX OF INTENT" shall mean intimation by a Fax/Letter to Tenderer(s) that the tender has been accepted in accordance with the provisions contained in the letter.
- 1.1.25 "DAY" means a day of 24 hours from midnight to midnight irrespective of the number of hours worked in that day.
- 1.1.26 "WORKING DAY" means any day which is not declared to be holiday or rest day by the EMPLOYER.
- 1.1.27 "WEEK" means a period of any consecutive seven days.
- 1.1.28 "METRIC SYSTEM" - All technical documents regarding the construction of works are given in the metric system and all work in the project should be carried out according to the metric system. All documents concerning the work shall also be maintained in the metric system.
- 1.1.29 "VALUE OF CONTRACT" or "TOTAL CONTRACT PRICE" shall mean the sum accepted or the sum calculated in accordance with the prices accepted in tender and/or the CONTRACT rates as payable to the CONTRACTOR for the entire execution and full completion of the work, including change order.
- 1.1.30 "LANGUAGE FOR DRAWINGS AND INSTRUCTION" All the drawings, titles, notes, instruction, dimensions, etc. shall be in English Language.
- 1.1.31 "MOBILIZATION" shall mean establishment of sufficiently adequate infrastructure by the CONTRACTOR at "SITE" comprising of construction equipments, aids, tools tackles including setting of site offices with facilities such as power, water, communication etc. establishing manpower organization comprising of Resident Engineers, Supervising personnel and an adequate strength of skilled, semi-skilled and un-skilled workers, who with the so established infrastructure shall be in a position to commence execution of work at site(s), in accordance with the agreed Time Schedule of Completion of Work. "MOBILISATION" shall be considered to have been achieved, if the CONTRACTOR is able to establish infrastructure as per Time Schedule, where so warranted in accordance with agreed schedule of work implementation to the satisfaction of ENGINEER-IN-CHARGE/ EMPLOYER.
- 1.1.32 "COMMISSIONING" shall mean pressing into service of the system including the plant(s), equipment(s), vessel(s), pipeline, machinery(ies), or any other section or sub-section of installation(s) pertaining to the work of the CONTRACTOR after



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successful testing and trial runs of the same.

- "COMMISSIONING" can be either for a completed system or a part of system of a combination of systems or sub-systems and can be performed in any sequence as desired by EMPLOYER and in a manner established to be made suited according to availability of pre-requisites. Any such readjustments made by EMPLOYER in performance of "COMMISSIONING" activity will not be construed to be violating CONTRACT provisions and CONTRACTOR shall be deemed to have provided for the same.

**Section-II General Information**

**2. General Information**

2.1 a) Location of Site: The proposed location of Project site is defined in the Special Conditions of Contract.

b) Access by Road: CONTRACTOR, if necessary, shall build other temporary access roads to the actual site of construction for his own work at his own cost. The CONTRACTOR shall be required to permit the use of the roads so constructed by him for vehicles of any other parties who may be engaged on the project site. The CONTRACTOR shall also facilitate the construction of the permanent roads should the construction there of start while he is engaged on this work. He shall make allowance in his tender for any inconvenience he anticipates on such account.

Non-availability of access roads, railway siding and railway wagons for the use of the CONTRACTOR shall in no case condone any delay in the execution of WORK nor be the cause for any claim for compensation against the EMPLOYER.

2.2 Scope of Work: The scope of WORK is defined in the Technical Part of the tender document. The CONTRACTOR shall provide all necessary materials, equipment, labour etc. for the execution and maintenance of the WORK till completion unless otherwise mentioned in the Tender Document.

2.3 Water Supply: Contractor will have to make his own arrangements for supply of water to his labour camps and for works. All pumping installations, pipe net work and distribution system will have to be carried out by the Contractor at his own risk and cost.

Alternatively the Employer at his discretion may endeavour to provide water to the Contractor at the Employer's source of supply provided the Contractor makes his own arrangement for the water meter which shall be in custody of the Employer and other pipe net works from source of supply and such distribution pipe network shall have prior approval of the Engineer-in-Charge so as not to interfere with the layout and progress of the other construction works. In such case, the rate for water shall be deducted from the running account bills.

However, the Employer does not guarantee the supply of water and this does not relieve the Contractor of his responsibility in making his own arrangement and for the timely completion of the various works as stipulated.

2.4 Power Supply:



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- 2.4.1 Subject to availability, EMPLOYER will supply power at 400/440 V at only one point at the nearest sub-station, from where the CONTRACTOR will make his own arrangement for temporary distribution. The point of supply will not be more than 500 m away from the CONTRACTOR'S premises. All the works will be done as per the applicable regulations and passed by the ENGINEER-IN-CHARGE. The temporary line will be removed forthwith after the completion of work or if there is any hindrance caused to the other works due to the alignment of these lines, the CONTRACTOR will re-route or remove the temporary lines at his own cost. The CONTRACTOR at his cost will also provide suitable electric meters, fuses, switches, etc. for purposes of payment to the EMPLOYER which should be in the custody and control of the EMPLOYER. The cost of power supply shall be payable to the EMPLOYER every month for Construction Works power which would be deducted from the running account bills. The EMPLOYER shall not, however, guarantee the supply of electricity nor have any liability in respect thereof. No claim for compensation for any failure or short supply of electricity will be admissible.
- 2.4.2 It shall be the responsibility of the CONTRACTOR to provide and maintain the complete installation on the load side of the supply with due regard to safety requirement at site. All cabling, equipment, installations etc. shall comply in all respects with the latest statutory requirements and safety provisions i.e., as per the Central/State Electricity Acts and Rules etc. The CONTRACTOR will ensure that his equipment and Electrical Wiring etc., are installed, modified, maintained by a licensed Electrician/Supervisor. A test certificate is to be produced to the ENGINEER-IN-CHARGE for his approval, before power is made available.
- 2.4.3 At all times, IEA regulations shall be followed failing which the EMPLOYER has a right to disconnect the power supply without any reference to the CONTRACTOR. No claim shall be entertained for such disconnection by the ENGINEER-IN-CHARGE. Power supply will be reconnected only after production of fresh certificate from authorized electrical supervisors.
- 2.4.4 The EMPLOYER is not liable for any loss or damage to the CONTRACTOR's equipment as a result of variation in voltage or frequency or interruption in power supply or other loss to the CONTRACTOR arising therefrom.
- 2.4.5 The CONTRACTOR shall ensure that the Electrical equipment installed by him are such that average power factors does not fall below 0.90 at his premises. In case power factor falls below 0.90 in any month, he will reimburse to the EMPLOYER at the penal rate determined by the EMPLOYER for all units consumed during the month.
- 2.4.6 The power supply required for CONTRACTOR's colony near the plant site will be determined by the EMPLOYER and shall be as per State Electricity Board's Rules and other statutory provisions applicable for such installations from time to time. In case of power supply to CONTRACTOR's colony, the power will be made available at a single point and the CONTRACTOR shall make his own arrangement at his own cost for distribution to the occupants of the colony as per Electricity Rules and Acts. The site and colony shall be sufficiently illuminated to avoid accidents.
- 2.4.7 The CONTRACTOR will have to provide and install his own lights and power meters which will be governed as per Central/State Government Electricity Rules. The meters shall be sealed by the EMPLOYER.
- 2.4.8 In case of damage of any of the EMPLOYER's equipment on account of fault,



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intentional or unintentional on the part of the CONTRACTOR, the EMPLOYER reserves the right to recover the cost of such damage from the CONTRACTOR's bill. Cost of HRC Fuses replaced at the EMPLOYER's terminals due to any fault in the CONTRACTOR's installation shall be to CONTRACTOR's account at the rates decided by the ENGINEER-IN-CHARGE.

- 2.4.9 Only motors upto 3 HP will be allowed to be started direct on line. For motors above 3 HP and upto 100 HP a suitable Starting device approved by the ENGINEER- IN-CHARGE shall be provided by the CONTRACTOR. For motors above 100 HP slipring induction motors with suitable starting devices as approved by the ENGINEER- IN-CHARGE shall be provided by the CONTRACTOR.
- 2.4.10 The CONTRACTOR shall ensure at his cost that all electrical lines and equipment and all installations are approved by the State Electricity Inspector before power can be supplied to the EMPLOYER.
- 2.4.11 The total requirement of power shall be indicated by the tenderer alongwith his tender.
- 2.5 Land for Contractor's Field Office, Godown and Workshop: The EMPLOYER will, at his own discretion and convenience and for the duration of the execution of the work make available near the site, land for construction of CONTRACTOR's Temporary Field Office, godowns workshops and assembly yard required for the execution of the CONTRACT. The CONTRACTOR shall at his own cost construct all these temporary buildings and provide suitable water supply and sanitary arrangement and get the same approved by the ENGINEER-IN-CHARGE.



On completion of the works undertaken by the CONTRACTOR, he shall remove all temporary works erected by him and have the SITE cleaned as directed by ENGINEER-IN-CHARGE. If the CONTRACTOR shall fail to comply with these requirements, the ENGINEER-IN-CHARGE may at he expenses of the CONTRACTOR remove such surplus, and rubbish materials and dispose off the same as he deems fit and get the site cleared as aforesaid; and CONTRACTOR shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such surplus materials disposed off as aforesaid. But the EMPLOYER reserves the right to ask the CONTRACTOR any time during the pendency of the CONTRACT to vacate the land by giving 7 days notice on security reasons or on national interest or otherwise. Rent may be charged for the land so occupied from contractor by the Employer.

The CONTRACTOR shall put up temporary structures as required by them for their office, fabrication shop and construction stores only in the area allocated to them on the project site by the EMPLOYER or his authorized representative. No tea stalls/canteens should be put up or allowed to be put up by any CONTRACTOR in the allotted land or complex area without written permission of the EMPLOYER.

No unauthorized buildings, constructions or structures should be put up by the CONTRACTOR anywhere on the project site.

For uninterrupted fabrication work, the CONTRACTOR shall put up temporary covered structures at his cost within Area in the location allocated to them in the project site by the EMPLOYER or his authorized representative.

No person except for authorized watchman shall be allowed to stay in the plant area/CONTRACTOR's area after completion of the day's job without prior written permission from ENGINEER-IN-CHARGE.

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2.6 Land for Residential Accommodation:-:No Land shall be made available for residential accommodation for staff and labour of CONTRACTOR.

### Section-III. General Instructions to Tenderers

#### 3. Submission of Tender:

- 3.1 TENDER must be submitted without making any additions, alterations, and as per details given in other clauses hereunder. The requisite details shall be filled in by the TENDERER at space provided under "Submission of Tender" at the beginning of GCC of Tender Document. The rate shall be filled only in the schedule given in this Tender Document.
- 3.2 Addenda/ Corrigenda to this Tender Document, if issued, must be signed, submitted along with the Tender Document. the tenderer should write clearly the revised quantities in Schedule of Rates of Tender Document and should price the WORK based on revised quantities when amendments of quantities are issued in addenda.
- 3.3 Covering letter along with its enclosures accompanying the Tender Document and all further correspondence shall be submitted in duplicate.
- 3.4 Tenderers are advised to submit quotations based strictly on the terms and conditions and specifications contained in the Tender Documents and not to stipulate any deviations.
- 3.5 ~~Tenders should always be placed in double sealed covers, super scribing ["QUOTATION DO NOT OPEN" Tender for \_\_\_\_\_ Project of Talcher Fertilizers Ltd. due for opening on \_\_\_\_\_]. The Full Name, Address and Telegraphic Address, Fax No. of the Tenderers shall be written on the bottom left hand corner of the sealed cover.~~

#### 4. Documents:

##### 4.1 General:

The tenders as submitted, will consist of the following:

- i) Complete set of Tender Documents (Original) as sold duly filled in and signed by the tenderer as prescribed in different clauses of the Tender Documents.
- ii) Earnest money in the manner specified in Clause 6 hereof.
- iii) Power of Attorney or a true copy thereof duly attested by a Gazetted Officer in case an authorized representative has signed the tender, as required by Clause 14 hereof.
- iv) Information regarding tenderers in the proforma enclosed.
- v) Details of work of similar type and magnitude carried out by the Tenderer in the proforma provided in the tender document.
- vi) Organization chart giving details of field management at site, the tenderer proposes to have for this job.
- vii) Details of construction plant and equipments available with the tenderer for using in this work.
- viii) Solvency Certificate from Scheduled Bank to prove the financial ability to carry out the work tendered for.





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- ix) Latest Balance Sheet and Profit & Loss Account duly audited.
- x) Details of present commitment as per proforma enclosed to tender.
- xi) Data required regarding SUB-CONTRACTOR(s)/ Supplier/ Manufacturers and other technical information the tenderer wish to furnish.
- xii) Provident fund registration certificate
- xiii) List showing all enclosures to tender.

4.2 All pages are to be Initiated: All signatures in Tender Documents shall be dated, as well as, all the pages of all sections of Tender Documents shall be initialed at the lower right hand corner and signed wherever required in the tender papers by the TENDERER or by a person holding power of attorney authorizing him to sign on behalf of the tenderer before submission of tender.

4.3 Rates to be in Figures and Words: The tender should quote in English both in figures as well as in words the rates and amounts tendered by him in the Schedule of Rates of Tender submitted by the CONTRACTOR for each item and in such a way that interpolation is not possible. The amount for each item should be worked out and entered and requisite total given of all items, both in figures and in words. The tendered amount for the work shall be entered in the tender and duly signed by the Tenderer.

If some discrepancies are found between the RATES in FIGURES and WORDS or the AMOUNT shown in the tender, the following procedure shall be followed:

- a) When there is difference between the rates in figures and words, the rate which corresponds to the amount worked out by the tenderer shall be taken as correct.
- b) When the rate quoted by the tenderer in figures and words tally but the amount is incorrect the rate quoted by the tenderer shall be taken as correct.
- c) When it is not possible to ascertain the correct rate by either of above methods, the rate quoted in words shall be taken as correct.

4.4 Corrections and Erasures: All correction(s) and alteration(s) in the entries of tender paper shall be signed in full by the TENDERER with date. No erasure or over writing is permissible.

4.5 Signature of Tenderer:

4.5.1 The TENDERER shall contain the name, residence and place of business of person or persons making the tender and shall be signed by the TENDERER with his usual signature. Partnership firms shall furnish the full names of all partners in the tender. It should be signed in the partnership's name by all the partners or by duly authorized representatives followed by the name and designation of the person signing. Tender by a corporation shall be signed by an authorized representative, and a Power of Attorney in that behalf shall accompany the tender. A copy of the constitution of the firm with names of all partners shall be furnished.

4.5.2 When a tenderer signs a tender in a language other than English, the total amount tendered should, in addition, be written in the same language. The signature should be attested by at least one witness.

4.6 Witness: Witness and sureties shall be persons of status and property and their names,



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occupation and address shall be stated below their signature.

4.7 Details of Experience: The tenderer should furnish, along with his tender, details of previous experience in having successfully completed in the recent past works of this nature, together with the names of Employers, location of sites and value of contract, date of commencement and completion of work, delays if any, reasons of delay and other details along with documentary evidence(s).

4.8 Liability of Government of India: It is expressly understood and agreed by and between Bidder or/Contractor and M/s Talcher Fertilizers Ltd., and that M/s Talcher Fertilizers Ltd., is entering into this agreement solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this agreement and has no liabilities, obligations or rights hereunder. It is expressly understood and agreed that M/s Talcher Fertilizers Ltd. is an independent legal entity with power and authority to enter into contracts solely on its own behalf under the applicable Laws of India and general principles of Contract Law. The Bidder/Contractor expressly agrees, acknowledges and understands that M/s Talcher Fertilizers Ltd. is not an agent, representative or delegate of the Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the contract. Accordingly, Bidder/Contractor hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Government of India arising out of this contract and covenants not to sue to Government of India as to any manner, claim, cause of action or thing whatsoever arising of or under this agreement.

**5. Transfer of Tender Documents:**

5.1 Transfer of Tender Documents purchased by one intending tenderer to another is not permissible.

**6. Earnest Money:**

6.1 The bidder must pay Earnest Money as given in the letter /notice inviting tenders and attach the official receipt with the tender failing which the tender is liable to be rejected and representatives of such tenderers will not be allowed to attend the tender opening. Earnest Money can be paid in Demand Drafts or Bank Guarantee or Banker's Cheque or Letter of Credit from any Indian scheduled bank or a branch of an International bank situated in India and registered with Reserve Bank of India as scheduled foreign bank. However, other than the Nationalized Indian Banks, the banks whose BGs are furnished, must be commercial banks having net worth in excess of Rs. 100 crores and a declaration to this effect should be made by such commercial bank either in the bank guarantee itself or separately on a letter head.

The bid guarantee shall be submitted in the prescribed format.

Note: The Bank Guarantee so furnished by the tenderer shall be in the proforma prescribed by the EMPLOYER. No interest shall be paid by the EMPLOYER on the Earnest Money deposited by the tenderer. The Bank Guarantee furnished in lieu of Earnest Money shall be kept valid for a period of "SIX MONTHS" from the date of opening of tender.(TWO MONTHS beyond the bid due date).

The Earnest Money deposited by successful tenderer shall be forfeited if the Contractor fails to furnish the requisite Contract Performance Security as per clause 24 hereof and /or fails to start work within a period of 15 days or fails to execute the AGREEMENT within 15 days of the receipt by him of the Notification of Acceptance of Tender.



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Note: The Earnest Money of the unsuccessful bidder will be returned by EMPLOYER/CONSULTANT, directly to the tenderer(s), within a reasonable period of time but not later than 30 days after the expiration of the period of bid validity prescribed by EMPLOYER.

- 7 Validity:**
- 7.1 Tender submitted by tenderers shall remain valid for acceptance for a period of "4 MONTHS" from the date of opening of the tender. The tenderers shall not be entitled during the said period of 4 months, without the consent in writing of the EMPLOYER, to revoke or cancel his tender or to vary the tender given or any term thereof. In case of tender revoking or canceling his tender or varying any term in regard thereof without the consent of EMPLOYER in writing, the EMPLOYER shall forfeit Earnest Money paid by him alongwith tender.
- 8 Addenda/Corrigenda**
- 8.1 Addenda/ Corrigenda to the Tender Documents will be issued in duplicate prior to the date of opening of the tenders to clarify documents or to reflect modification in design or CONTRACT terms.
- 8.2 Each addenda/ corrigendum issued will be issued in duplicate to each person or organization to whom set of Tender Documents has been issued. Recipient will retain tenderer's copy of each Addendum/ Corrigendum and attach original copy duly signed along with his offer. All Addenda/ Corrigenda issued shall become part of Tender Documents.
- 9 Right of Employer to Accept or Reject Tender:**
- 9.1 The right to accept the tender will rest with the EMPLOYER. The EMPLOYER, however, does not bind himself to accept the lowest tender, and reserves to itself the authority to reject any or all the tenders received without assigning any reason whatsoever. At the option of the Employer, the work for which the tender had been invited, may be awarded to one Contractor or split between more than one bidders, in which case the award will be made for only that part of the work, in respect of which the bid has been accepted. The quoted rates should hold good for such eventualities.
- Tenders in which any of the particulars and prescribed information are missing or are incomplete in any respect and/or the prescribed conditions are not fulfilled are liable to be rejected. The Tender containing uncalled for remarks or any additional conditions are liable to be rejected.
- Canvassing in connection with tenders is strictly prohibited and tenders submitted by the Tenderers who resort to canvassing will be liable to rejection.
- 10 Time Schedule**
- 10.1 The WORK shall be executed strictly as per the TIME SCHEDULE specified in TENDER/ CONTRACT Document. The period of construction given in Time Schedule includes the time required for mobilization as well as testing, rectifications if any, retesting and completion in all respects to the entire satisfaction of the ENGINEER-IN- CHARGE.
- 10.2 A joint program of execution of the WORK will be prepared by the ENGINEER-IN-CHARGE and CONTRACTOR based on priority requirement of this project. This program will take into account the time of completion mentioned in 10.1 above and the time allowed for the priority works by the ENGINEER-IN-CHARGE.
- 10.3 Monthly/ Weekly construction program will; be drawn up by the



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ENGINEER-IN-CHARGE jointly with the CONTRACTOR, based on availability of work fronts and the joint construction program as per 10.2 above. The CONTRACTOR shall scrupulously adhere to these targets/ programs by deploying adequate personnel, construction tools and tackles and he shall also supply himself all materials of his scope of supply in good time to achieve the targets/program. In all matters concerning the extent of targets set out in the weekly and monthly programs and the degree of achievements the decision of the ENGINEER-IN-CHARGE will be final and binding on the CONTRACTOR.

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|--|------|---|
| <b>11 Tenderer's Responsibility</b>                                  | 11.1 | The intending tenderers shall be deemed to have visited the SITE and familiarized submitting the tender. Non-familiarity with the site conditions will not be considered a reason either for extra claims or for not carrying out the works in strict conformity with the DRAWINGS and SPECIFICATIONS or for any delay in performance.  |
| <b>12 Retired Government or Company Officers</b>                     | 12.1 | No Engineer of Gazetted rank or other Gazetted Officer employed in Engineering or Administrative duties in an Engineering Department of the States/ Central Government or of the EMPLOYER is allowed to work as a CONTRACTOR for a period of two years after his retirement from Government Service, or from the employment of the EMPLOYER without the previous permission of the EMPLOYER. The CONTRACT, if awarded, is liable to be cancelled if either the CONTRACTOR or any of his employees is found at any time to be such a person, who has not obtained the permission of the State/ Central Government or of the EMPLOYER as aforesaid before submission of tender, or engagement in the CONTRACTOR'S service as the case may be. |
| <b>13 Signing of the Contract:</b>                                   | 13.1 | The successful tenderer shall be required to execute an AGREEMENT in the proforma attached with TENDER DOCUMENT within 15 days of the receipt by him of the Notification of Acceptance of Tender. In the event of failure on the part of the successful tenderer to sign the AGREEMENT within the above stipulated period, the Earnest Money or his initial deposit will be forfeited and the acceptance of the tender shall be considered as cancelled.  |
| <b>14 Field Management &amp; Controlling/Coordinating Authority:</b> | 14.1 | The field management will be the responsibility of the ENGINEER-IN-CHARGE, who will be nominated by the EMPLOYER. The ENGINEER-IN-CHARGE may also authorize his representatives to assist in performing his duties and functions.   |
|  | 14.2 | The ENGINEER-IN-CHARGE shall coordinate the works of various agencies engaged at site to ensure minimum disruption of work carried out by different agencies. It shall be the responsibility of the CONTRACTOR to plan and execute the work strictly in accordance with site instructions to avoid hindrance to the work being executed by other agencies.  |
| <b>15 Note to Schedule of Rates:</b>                                 | 15.1 | The Schedule of Rates should be read in conjunction with all the other sections of the tender.  |
|  | 15.2 | The tenderer shall be deemed to have studied the DRAWINGS, SPECIFICATIONS and details of work to be done within TIME SCHEDULE and to have acquainted himself of the condition prevailing at site.   |
|  | 15.3 | Rates must be filled in the Schedule of Rates of original Tender Documents. If quoted in separate typed sheets no variation in item description or specification shall be accepted. Any exceptions taken by the tenderer to the Schedule of Rates shall be brought out in the terms and conditions of the offer.  |



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- 15.4 The quantities shown against the various items are only approximate. Any increase or decrease in the quantities shall not form the basis of alteration of the rates quoted and accepted.
- 15.5 The EMPLOYER reserves the right to interpolate the rates for such items of work falling between similar items of lower and higher magnitude.
- 16 Policy for Tenders Under Consideration:**
- 16.1 Only Those Tenders which are complete in all respects and are strictly in accordance with the Terms and Conditions and Technical Specifications of Tender Document, shall be considered for evaluation. Such Tenders shall be deemed to be under consideration immediately after opening of Tender and until such time an official intimation of acceptance/ rejection of Tender is made by TFL to the Bidder.
- 16.2 Zero Deviation: Bidders to note that this is a ZERO DEVIATION TENDER. TFL will appreciate submission of offer based on the terms and conditions in the enclosed General Conditions of Contract (GCC), Special Conditions of Contract (SCC), Instructions to Bidders (ITB), Scope of Work, technical specifications etc. to avoid wastage of time and money in seeking clarifications on technical/commercial aspects of the offer. Bidder may note that no technical and commercial clarifications will be sought for after the receipt of the bids. In case of any deviation/ nonconformity observed in the bid, it will be liable for rejection.
- 17 Award of Contract:**
- 17.1 The Acceptance of Tender will be intimated to the successful Tenderer by TFL either by Telex/ Telegram/ Fax or by Letter or like means-defined as LETTER OF ACCEPTANCE OF TENDER.
- 17.2 TFL will be the sole judge in the matter of award of CONTRACT and the decision of TFL shall be final and binding.
- 18 Clarification of Tender Document:**
- 18.1 The Tender is required to carefully examine the Technical Specifications, Conditions of Contract, Drawings and other details relating to WORK and given in Tender Document and fully inform himself as to all conditions and matters which may in any way affect the WORK or the cost thereof. In case the Tenderer is in doubt about the completeness or correctness of any of the contents of the Tender Documents he should request in writing for an interpretation/ clarification to TFL in triplicate. TFL will then issue interpretation/ clarification to Tenderer in writing. Such clarifications and or interpretations shall form part of the Specifications and Documents and shall accompany the tender which shall be submitted by tenderer within time and date as specified in invitations to tender.
- 18.2 Verbal clarification and information given by TFL or its employee(s) or its representatives shall not in any way be binding on TFL.
- 19 Local Conditions:**
- 19.1 It will be imperative on each tenderer to inform himself of all local conditions and factors which may have any effect on the execution of WORK covered under the Tender Document. In their own interest, the tenderer are requested to familiarize themselves with the Indian Income Tax Act 1961, Indian Companies Act 1956, Indian Customs Act 1962 and other related Acts and Laws and Regulations of India with their latest amendments, as applicable TFL shall not entertain any requests for clarifications from the tenderer regarding such local conditions.
- 19.2 It must be understood and agreed that such factors have properly been investigated and considered while submitting the tender. No claim for financial or any other adjustments to VALUE OF CONTRACT, on lack of clarity of such factors shall be entertained.



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**20 Abnormal Rates:**

20.1 The tenderer is expected to quote rate for each item after careful analysis of cost involved for the performance of the completed item considering all specifications and Conditions of Contract. This will avoid loss of profit or gain in case of curtailment or change of specification for any item. In case it is noticed that the rates quoted by the tenderer for any item are unusually high or unusually low, it will be sufficient cause for the rejection of the tender unless the EMPLOYER is convinced about the reasonableness after scrutiny of the analysis for such rate(s) to be furnished by the tenderer (on demand).

**Section-IV. General Obligations**

**21 Priority of Contract Documents**

21.1 Except if and the extent otherwise provided by the Contract, the provisions of the General Conditions of Contract and Special Conditions shall prevail over those of any other documents forming part of the CONTRACT. Several documents forming the CONTRACT are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies the same shall be explained and adjusted by the ENGINEER-IN-CHARGE who shall thereupon issue to the Contractor instructions thereon and in such event, unless otherwise provided in the Contract, the priority of the documents forming the Contract shall be as follows :

- 1) The Contract Agreement ;
- 2) The Letter of Acceptance;
- 3) The Instructions to Bidders (ITB);
- 4) Special Conditions of Contract (SCC);
- 5) General Conditions of Contract (GCC)
- 6) Any other document forming part of the Contract.

Works shown in the DRAWING but not mentioned in the SPECIFICATIONS OR described in the SPECIFICATIONS without being shown in the DRAWINGS shall nevertheless be deemed to be included in the same manner as if they had been specifically shown upon the DRAWINGS and described in the SPECIFICATIONS.

21.2 Headings and Marginal Notes: All headings and marginal notes to the clauses of these General Conditions of Contract or to the SPECIFICATIONS or to any other Tender Document are solely for the purpose of giving a concise indication and not a summary of the contents thereof, and they shall never be deemed to be part thereof or be used in the interpretation or construction thereof the CONTRACT.

21.3 Singular and Plural: In CONTRACT DOCUMENTS unless otherwise stated specifically, the singular shall include the plural and vice versa wherever the context so requires.

21.4 Interpretation: Words implying 'Persons' shall include relevant 'Corporate Companies / Registered Associations/ Body of Individuals/ Firm of Partnership' as the case may be.

**22 Special Conditions of Contract:**

22.1 Special Conditions of Contract shall be read in conjunction with the General Conditions of Contract, specification of Work, Drawings and any other documents forming part of this CONTRACT wherever the context so requires.

22.2 Notwithstanding the sub-division of the documents into these separate sections and volumes every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the CONTRACT so far as it may be practicable to do so.



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- 22.3 Where any portion of the General Condition of Contract is repugnant to or at variance with any provisions of the Special Conditions of Contract, unless a different intention appears the provisions of the Special Conditions of Contract shall be deemed to over-ride the provisions of the General Conditions of Contract and shall to the extent of such repugnancy, or variations, prevail.
- 22.4 Wherever it is mentioned in the specifications that the CONTRACTOR shall perform certain WORK or provide certain facilities, it is understood that the CONTRACTOR shall do so at his cost and the VALUE OF CONTRACT shall be deemed to have included cost of such performance and provisions, so mentioned.
- 22.5 The materials, design and workmanship shall satisfy the relevant INDIAN STANDARDS, the JOB SPECIFICATIONS contained herein and CODES referred to. Where the job specification stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.
- 23 Contractor to obtain his own Information:**
- 23.1 The CONTRACTOR in fixing his rate shall for all purpose whatsoever reason may be, deemed to have himself independently obtained all necessary information for the purpose of preparing his tender and his tender as accepted shall be deemed to have taken into account all contingencies as may arise due to such information or lack of same. The correctness of the details, given in the Tender Document to help the CONTRACTOR to make up the tender is not guaranteed.
- The CONTRACTOR shall be deemed to have examined the CONTRACT DOCUMENTS, to have generally obtained his own information in all matters whatsoever that might affect the carrying out of the works at the schedules rates and to have satisfied himself to the sufficiency of his tender. Any error in description of quantity or omission there from shall not vitiate the CONTRACT or release the CONTRACTOR from executing the work comprised in the CONTRACT according to DRAWINGS and SPECIFICATIONS at the scheduled rates. He is deemed to have known the scope, nature and magnitude of the WORKS and the requirements of materials and labour involved etc., and as to what all works he has to complete in accordance with the CONTRACT documents whatever be the defects, omissions or errors that may be found in the DOCUMENTS. The CONTRACTOR shall be deemed to have visited surroundings, to have satisfied himself to the nature of all existing structures, if any, and also as to the nature and the conditions of the Railways, Roads, Bridges and Culverts, means of transport and communication, whether by land, water or air, and as to possible interruptions thereto and the access and egress from the site, to have made enquiries, examined and satisfied himself as to the sites for obtaining sand, stones, bricks and other materials, the sites for disposal of surplus materials, the available accommodation as to whatever required, depots and such other buildings as may be necessary for executing and completing the works, to have made local independent enquiries as to the sub-soil, subsoil water and variations thereof, storms, prevailing winds, climatic conditions and all other similar matters effecting these works. He is deemed to have acquainted himself as to his liability of payment of Government Taxes, Customs duty and other charges, levies etc.
- Any neglect or omission or failure on the part of the CONTRACTOR in obtaining necessary and reliable information upon the foregoing or any other matters affecting the CONTRACT shall not relieve him from any risks or liabilities or the entire responsibility from completion of the works at the scheduled rates and times in strict accordance with the CONTRACT.



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It is, therefore, expected that should the CONTRACTOR have any doubt as to the meaning of any portion of the CONTRACT DOCUMENT he shall set forth the particulars thereof in writing to EMPLOYER in duplicate, before submission of tender. The EMPLOYER may provide such clarification as may be necessary in writing to CONTRACT, such clarifications as provided by EMPLOYER shall form part of CONTRACT DOCUMENTS.

No verbal agreement or inference from conversation with any effect or employee of the EMPLOYER either before, during or after the execution of the CONTRACT agreement shall in any way affect or modify and of the terms or obligations herein contained.

Any change in layout due to site conditions or technological requirement shall be binding on the CONTRACTOR and no extra claim on this account shall be entertained.

**24 Contract Performance  
Security:**

24.1 The CONTRACTOR shall furnish to the EMPLOYER, within 30 days from the date of notification of award, a security in the sum of 3% of the accepted value of the tender or the actual value of work to be done whichever is applicable due to any additional work or any other reasons, in the form of a Bank draft/Banker's cheque or Bank Guarantee or irrevocable Letter of credit (as per proforma enclosed) as Contract Performance Security with the EMPLOYER which will be refunded after the expiry of DEFECTS LIABILITY PERIOD.

24.2 CONTRACTOR can furnish the Contract Performance Security in the form of Demand Draft or through a Bank Guarantee or through an irrevocable Letter of Credit from any Indian scheduled bank or a branch of an International bank situated in India and registered with Reserve Bank of India as scheduled foreign bank. However, other than the Nationalized Indian Banks, the banks whose BGs are furnished, must be commercial banks having net worth in excess of Rs. 100 crores and a declaration to this effect should be made by such commercial bank either in the bank guarantee itself or separately on a letter head.

The bank guarantee or the Letter of Credit shall be submitted in the prescribed format.

24.3 If the CONTRACTOR/SUB-CONTRACTOR or their employees or the CONTRACTOR's agents and representatives shall damage, break, deface or destroy any property belonging to the EMPLOYER or others during the execution of the CONTRACT, the same shall be made good by the CONTRACTOR at his own expenses and in default thereof, the ENGINEER-IN-CHARGE may cause the same to be made good by other agencies and recover expenses from the CONTRACTOR (for which the certificate of the ENGINEER- IN-CHARGE shall be final).

24.4 All compensation or other sums of money payable by the CONTRACTOR to the EMPLOYER under terms of this CONTRACT may be deducted from or paid by the encashment or sale of a sufficient part of his Contract Performance Security or from any sums which may be due or may become due to the CONTRACTOR by the EMPLOYER of any account whatsoever and in the event of his Contract Performance Security being reduced by reasons of any such deductions or sale of aforesaid, the CONTRACTOR shall within ten days thereafter make good in cash, bank drafts as aforesaid any sum or sums which may have been deducted from or realized by sale of his Contract Performance Security, or any part thereof. No interest shall be payable by the EMPLOYER for sum deposited as Contract Performance Security.





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24.5 Failure of the successful bidder to comply with the requirements of this Clause shall constitute sufficient grounds for the annulment of the award and the forfeiture of bid security.

**25 Time of Performance:**

**25.1 Time for Mobilization**

The work covered by this CONTRACT shall be commenced within fifteen (15) days, the date of letter/Fax of Intent and be completed in stages on or before the dates as mentioned in the TIME SCHEDULE OF COMPLETION OF WORK. The CONTRACTOR should bear in mind that time is the essence of this agreement. Request for revision of construction time after tenders are opened will not receive consideration. The above period of fifteen (15) days is included within the overall COMPLETION SCHEDULE, not over and above the completion time to any additional work or any other reasons.

**25.2 Time Schedule of Construction:**

25.2.1 The general Time Schedule of construction is given in the TENDER DOCUMENT. CONTRACTOR should prepare a detailed monthly or weekly construction program jointly with the ENGINEER-IN-CHARGE within 15 days of receipt of LETTER/FAX OF INTENT or ACCEPTANCE OF TENDER. The WORK shall be executed strictly as per the Time Schedule given in the CONTRACT DOCUMENT. The period of construction given includes the time required for mobilization testing, rectifications, if any, retesting and completion in all respects in accordance with CONTRACT DOCUMENT to the entire satisfaction of the ENGINEER-IN-CHARGE.

25.2.2 The CONTRACTOR shall submit a detailed PERT network within the time frame agreed above consisting of adequate number of activities covering various key phases of the WORK such as design, procurement, manufacturing, shipment and field erection activities within fifteen (15) days from the date of LETTER/FAX OF INTENT. This network shall also indicate the interface facilities to be provided by the EMPLOYER and the dates by which such facilities are needed.

25.2.3 CONTRACTOR shall discuss the network so submitted with the EMPLOYER and the agreed network which may be in the form as submitted with the EMPLOYER or in revised form in line with the outcome of discussions shall form part of the CONTRACT, to be signed within fifteen (15) days from the date of LETTER OF ACCEPTANCE OF TENDER. During the performance of the CONTRACT, if in the opinion of the EMPLOYER proper progress is not maintained suitable changes shall be made in the CONTRACTOR's operation to ensure proper progress.

The above PERT network shall be reviewed periodically and reports shall be submitted by the CONTRACTOR as directed by EMPLOYER.

**26 Force Majeure:**

**26.1 CONDITIONS FOR FORCE MAJEURES**

In the event of either party being rendered unable by Force Majeure to perform any obligations required to be performed by them under the CONTRACT the relative obligation of the party affected by such Force Majeures shall upon notification to the other party be suspended for the period during which Force Majeures event lasts. The cost and loss sustained by the either party shall be borne by the respective parties.

The term "Force Majeures" as employed herein shall mean acts of God,



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earthquake, war (declared or undeclared), revolts, riots, fires, floods, rebellions, explosions, hurricane, sabotage, civil commotions and acts and regulations of respective Government of the two parties, namely the EMPLOYER and the CONTRACTOR.

Upon the occurrence of such cause(s) and upon its termination, the party alleging that it has been rendered unable as aforesaid thereby, shall notify the other party in writing immediately but not later than 72 (Seventy-two) hours of the alleged beginning and ending thereof giving full particulars and satisfactory evidence in support of its claim.

Time for performance of the relative obligation suspended by the Force Majeures shall then stand extended by the period for which such cause lasts.

If deliveries of bought out items and/or works to be executed by the CONTRACTOR are suspended by Force Majeure conditions lasting for more than 2 (two) months the EMPLOYER shall have the option to terminate the CONTRACT or re-negotiate the contract provisions.

**26.2 OUTBREAK OF WAR**

26.2.1 If during the currency of the CONTRACT there shall be an out-break of war whether declared or not, in that part of the World which whether financially or otherwise materially affect the execution of the WORK the CONTRACTOR shall unless and until the CONTRACT is terminated under the provisions in this clause continue to use his best Endeavour to complete the execution of the WORK, provided always that the EMPLOYER shall be entitled, at any time after such out-break of war to terminate or re-negotiate the CONTRACT by giving notice in writing to the CONTRACTOR and upon such notice being given the CONTRACT shall, save as to the rights of the parties under this clause and to the operation of the clauses entitled settlement of Disputes and Arbitration hereof, be terminated but without prejudice to the right of either party in respect of any antecedent breach thereof.

26.2.2 If the CONTRACT shall be terminated under the provisions of the above clause, the CONTRACTOR shall with all reasonable diligence remove from the SITE all the CONTRACTOR's equipment and shall give similar facilities to his SUB-CONTRACTORS to do so.

**27 Price reduction schedule:**

27.1 Time is the essence of the CONTRACT. In case the CONTRACTOR fails to complete the WORK within the stipulated period, then, unless such failure is due to Force Majeure as defined in Clause 26 here above or due to EMPLOYER's defaults, the Total Contract price shall be reduced by ½ % of the total Contract Price per complete week of delay or part thereof subject to a maximum of 5 % of the Total Contract Price, by way of reduction in price for delay and not as penalty. The said amount will be recovered from amount due to the Contractor/ Contractor's Contract Performance Security payable on demand.

The decision of the OWNER in regard to applicability of Price Reduction Schedule shall be final and binding on the CONTRACTOR.

27.2 All sums payable under this clause is the reduction in price due to delay in completion period at the above agreed rate.

**27.3 BONUS FOR EARLY COMPLETION**



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**Bonus For Early Completion  
27.3 (\*)**

*(Clause not applicable for this  
Tender)*

If the Contractor achieves completion of Works in all respect prior to the time schedule stipulated in the SCC, the Employer shall pay to the Contractor the relevant sum, if mentioned specifically in SCC, as bonus for early completion. The bonus for early completion, if provided specifically in SCC, shall be payable to the maximum ceiling of 2 ½ % of the total contract price.

(\*) Partial earlier completion may not always produce net benefits to the Employer, for example where utilization of the completed Works requires (a) the fulfillment of all parts of the Contract (e.g. the training of personnel); or (b) the completion of all Sections (e.g. in pipeline laying, where early completion of the laying of pipeline would not be useful if the compressor is still under installation); or (c) certain seasonal effects to take place (e.g. onset of the rainy season, for impounding a reservoir); or (d) other circumstances. Also a more rapid drawdown of budgeted funds may be required. All such factors should be considered prior to the inclusion of a bonus clause in the Contract.

**28 Rights of the employer to  
forfeit contract performance  
security:**

28.1 Whenever any claim against the CONTRACTOR for the payment of a sum of money arises out or under the CONTRACT, the EMPLOYER shall be entitled to recover such sum by appropriating in part or whole the Contract Performance Security of the CONTRACTOR. In the event of the security being insufficient or if no security has been taken from the CONTRACTOR, then the balance or the total sum recoverable, as the case may be shall be deducted from any sum then due or which at any time thereafter may become due to the CONTRACTOR. The CONTRACTOR shall pay to the EMPLOYER on demand any balance remaining due.

28.2 In .case of forfeiture of Contract Performance Security/ Security Deposit, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by TFL. The forfeiture amount will be subject to final decision of TFL based on other terms and conditions of order/ contract.

**29 Failure by the contractor to  
comply with the provisions  
of the contract:**

29.1 If the CONTRACTOR refuses or fails to execute the WORK or any separate part thereof with such diligence as will ensure its completion within the time specified in the CONTRACT or extension thereof or fails to perform any of his obligation under the CONTRACT or in any manner commits a breach of any of the provisions of the CONTRACT it shall be open to the EMPLOYER at its option by written notice to the CONTRACTOR:

a) TO DETERMINE THE CONTRACT in which event the CONTRACT shall stand terminated and shall cease to be in force and effect on and from the date appointed by the EMPLOYER on that behalf, whereupon the CONTRACTOR shall stop forthwith any of the CONTRACTOR's work then in progress, except such WORK as the EMPLOYER may, in writing, require to be done to safeguard any property or WORK, or installations from damage, and the EMPLOYER, for its part, may take over the work remaining unfinished by the CONTRACTOR and complete the same through a fresh contractor or by other means, at the risk and cost of the CONTRACTOR, and any of his sureties if any, shall be liable to the EMPLOYER for any excess cost occasioned by such work having to be so taken over and completed by the EMPLOYER over and above the cost at the rates specified in the schedule of quantities and rate/prices.

b) WITHOUT DETERMINING THE CONTRACT to take over the work of the CONTRACTOR or any part thereof and complete the same through a fresh contractor or by other means at the risk and cost of



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the CONTRACTOR. The CONTRACTOR and any of his sureties are liable to the EMPLOYER for any excess cost over and above the cost at the rates specified in the Schedule of Quantities/ rates, occasioned by such works having been taken over and completed by the EMPLOYER.

29.2 In such events of Clause 29.1(a) or (b) above.

a) The whole or part of the Contract Performance Security furnished by the CONTRACTOR is liable to be forfeited without prejudice to the right of the EMPLOYER to recover from the CONTRACTOR the excess cost referred to in the sub-clause aforesaid, the EMPLOYER shall also have the right of taking possession and utilizing in completing the works or any part thereof, such as materials equipment and plants available at work site belonging to the CONTRACTOR as may be necessary and the CONTRACTOR shall not be entitled for any compensation for use or damage to such materials, equipment and plant.

b) The amount that may have become due to the CONTRACTOR on account of work already executed by him shall not be payable to him until after the expiry of Six (6) calendar months reckoned from the date of termination of CONTRACT or from the taking over of the WORK or part thereof by the EMPLOYER as the case may be, during which period the responsibility for faulty materials or workmanship in respect of such work shall, under the CONTRACT, rest exclusively with the CONTRACTOR. This amount shall be subject to deduction of any amounts due from the CONTRACT to the EMPLOYER under the terms of the CONTRACT authorized or required to be reserved or retained by the EMPLOYER.

29.3 Before determining the CONTRACT as per Clause 29.1(a) or (b) provided in the judgment of the EMPLOYER, the default or defaults committed by the CONTRACTOR is/are curable and can be cured by the CONTRACTOR if an opportunity given to him, then the EMPLOYER may issue Notice in writing calling the CONTRACTOR to cure the default within such time specified in the Notice.

29.4 The EMPLOYER shall also have the right to proceed or take action as per 29.1(a) or (b) above, in the event that the CONTRACTOR becomes bankrupt, insolvent, compounds with his creditors, assigns the CONTRACT in favour of his creditors or any other person or persons, or being a company or a corporation goes into voluntary liquidation, provided that in the said events it shall not be necessary for the EMPLOYER to give any prior notice to the CONTRACTOR.

29.5 Termination of the CONTRACT as provided for in sub-clause 29.1(a) above shall not prejudice or affect their rights of the EMPLOYER which may have accrued upto the date of such termination.

**30 Contractor remains liable to pay compensation if action not taken under clause 29:**

30.1 In any case in which any of the powers conferred upon the EMPLOYER BY CLAUSE 29.0 thereof shall have become exercisable and the same had not been exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any further case of default by the CONTRACTOR for which by any clause or clauses hereof he is declared liable to pay compensation amounting to the whole of his Contract Performance Security, and the liability of the CONTRACTOR for past and future compensation shall remain unaffected. In the event of the EMPLOYER putting in force the power under above sub-clause (a),



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(b) or (c) vested in him under the preceding clause he may, if he so desired, take possession of all or any tools, and plants, materials and stores in or upon the works or the site thereof belonging to the CONTRACTOR or procured by him and intended to be used for the execution of the WORK or any part thereof paying or allowing for the same in account at the CONTRACT rates or in case of these not being applicable at current market rates to be certified by the ENGINEER-IN-CHARGE whose certificate thereof shall be final, otherwise the ENGINEER-IN-CHARGE may give notice in writing to the CONTRACTOR or his clerk of the works, foreman or other authorized agent, requiring him to remove such tools, plant, materials or stores from the premises (within a time to be specified in such notice), and in the event of the CONTRACTOR failing to comply with any such requisition, the ENGINEER-IN-CHARGE may remove them at the CONTRACTOR's expense or sell them by auction or private sale on account of the CONTRACTOR and at his risk in all respects without any further notice as to the date, time or place of sale and the certificate of the ENGINEER-IN-CHARGE as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the CONTRACTOR.

**31 Change in constitution:**

31.1

Where the CONTRACTOR is a partnership firm, the prior approval of the EMPLOYER shall be obtained in writing, before any change is made in the constitution of the firm. Where the CONTRACTOR is an individual or a Hindu undivided family business concern, such approval as aforesaid shall, likewise be obtained before such CONTRACTOR enters into any agreement with other parties, where under, the reconstituted firm would have the right to carry out the work hereby undertaken by the CONTRACTOR. In either case if prior approval as aforesaid is not obtained, the CONTRACT shall be deemed to have been allotted in contravention of clause 37 hereof and the same action may be taken and the same consequence shall ensue as provided in the said clause.

**32 Termination of contract**

32(A)

**TERMINATION OF CONTRACT FOR DEATH:**

If the CONTRACTOR is an individual or a proprietary concern and the individual or the proprietor dies or if the CONTRACTOR is a partnership concern and one of the partner dies then unless, the EMPLOYER is satisfied that the legal representative of the individual or the proprietary concern or the surviving partners are capable of carrying out and completing CONTRACT, he (the EMPLOYER) is entitled to cancel the CONTRACT for the uncompleted part without being in any way liable for any compensation payment to the estate of the deceased CONTRACTOR and/or to the surviving partners of the CONTRACTOR'S firm on account of the cancellation of CONTRACT. The decision of the EMPLOYER in such assessment shall be final and binding on the parties. In the event of such cancellation, the EMPLOYER shall not hold the estate of the deceased CONTRACTOR and/or the surviving partners of the CONTRACTOR'S firm liable for any damages for non-completion of CONTRACT.

32(B)

**TERMINATION OF CONTRACT IN CASE OF LIQUIDATION / BANKRUPTCY ETC.**

If the Contractor shall dissolve or become bankrupt or insolvent or cause or suffer any receiver to be appointed of his business or any assets thereof compound with his Creditors, or being a corporation commence to be wound up, not being a member's voluntary winding up for the purpose of amalgamation or reconstruction, or carry on its business under a Receiver for the benefits of its Creditors any of them, EMPLOYER shall be at liberty :-



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To terminate the contract forthwith upon coming to know of the happening of any such event as aforesaid by notice in writing to the Contractor or to give the Receiver or liquidator or other person, the option of carrying out the contract subject to his providing a guarantee up to an amount to be agreed upon by EMPLOYER for due and faithful performance of the contract.

- 32 (C) In case of termination of CONTRACT herein set forth (under clause 29.0) except under conditions of Force Majeure and termination after expiry of contract, the CONTRACTOR shall be put under holiday [i.e. neither any enquiry will be issued to the party by Talcher Fertilizers Ltd. against any type of tender nor their offer will be considered by TFL against any ongoing tender (s) where contract between TFL and that particular CONTRACTOR (as a bidder) has not been finalized] for three years from the date of termination by Talcher Fertilizers Ltd. to such CONTRACTOR.
- 33 Members of the employer not individually liable :** 33.1 No Director, or official or employee of the EMPLOYER/ CONSULTANT shall in any way be personally bound or liable for the acts or obligations of the EMPLOYER under the CONTRACT or answerable for any default or omission in the observance or performance of any of the acts, matters or things which are herein contained.
- 34 Employer not bound by personal representations:** 34.1 The CONTRACTOR shall not be entitled to any increase on the scheduled rates or any other right or claim whatsoever by reason of any representation, explanation statement or alleged representation, promise or guarantees given or alleged to have been given to him by any person.
- 35 Contractor's office at site:** 35.1 The CONTRACTOR shall provide and maintain an office at the site for the accommodation of his agent and staff and such office shall be open at all reasonable hours to receive instructions, notice or other communications. The CONTRACTOR at all time shall maintain a site instruction book and compliance of these shall be communicated to the ENGINEER-IN CHARGE from time to time and the whole document to be preserved and handed over after completion of works.
- 36 Contractor's subordinate staff and their conduct** 36.1 The CONTRACTOR, on or after award of the WORK shall name and depute a qualified engineer having sufficient experience in carrying out work of similar nature, to whom the equipments, materials, if any, shall be issued and instructions for works given. The CONTRACTOR shall also provide to the satisfaction of the ENGINEER-IN-CHARGE sufficient and qualified staff to superintend the execution of the WORK, competent sub-agents, foremen and leading hands including those specially qualified by previous experience to supervise the types of works comprised in the CONTRACT in such manner as will ensure work of the best quality, expeditious working. Whenever in the opinion of the ENGINEER-IN- CHARGE additional properly qualified supervisory staff is considered necessary, they shall be employed by the CONTRACTOR without additional charge on accounts thereof. The CONTRACTOR shall ensure to the satisfaction of the ENGINEER-IN-CHARGE that SUB-CONTRACTORS, if any, shall provide competent and efficient supervision, over the work entrusted to them.
- 36.2 If and whenever any of the CONTRACTOR's or SUB- CONTRACTOR'S agents, sub-agents, assistants, foremen, or other employees shall in the opinion of ENGINEER-IN- CHARGE be guilty of any misconduct or be incompetent or



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insufficiently qualified or negligent in the performance of their duties of that in the opinion of the EMPLOYER or the ENGINEER-IN-CHARGE, it is undesirable for administrative or any other reason for such person or persons to be employed in the works, the CONTRACTOR, is so directed by the ENGINEER-IN-CHARGE, shall at once remove such person or persons from employment thereon. Any person or persons so removed from the works shall not again be employed in connection with the WORKS without the written permission of the ENGINEER-IN-CHARGE. Any person so removed from the WORK shall be immediately re-placed at the expense of the CONTRACTOR by a qualified and competent substitute. Should the CONTRACTOR be requested to repatriate any person removed from the works he shall do so and shall bear all costs in connection herewith.

- 36.3 The CONTRACTOR shall be responsible for the proper behavior of all the staff, foremen, workmen, and others, and shall exercise a proper degree of control over them and in particular and without prejudice to the said generality, the CONTRACTOR shall be bound to prohibit and prevent any employees from trespassing or acting in any way detrimental or prejudicial to the interest of the community or of the properties or occupiers of land and properties in the neighborhood and in the event of such employee so trespassing, the CONTRACTOR shall be responsible therefore and relieve the EMPLOYER of all consequent claims or actions for damages or injury or any other grounds whatsoever. The decision of the ENGINEER-IN-CHARGE upon any matter arising under this clause shall be final. The CONTRACTOR shall be liable for any liability to EMPLOYER on account of deployment of CONTRACTOR's staff etc. or incidental or arising out of the execution of CONTRACT.

The CONTRACTOR shall be liable for all acts or omissions on the part of his staff, Foremen and Workmen and others in his employment, including misfeasance or negligence of whatever kind in the course of their work or during their employment, which are connected directly or indirectly with the CONTRACT.

- 36.4 If and when required by the EMPLOYER and CONTRACTOR's personnel entering upon the EMPLOYER's premises shall be properly identified by badges of a type acceptable to the EMPLOYER which must be worn at all times on EMPLOYER's premises. CONTRACTOR may be required to obtain daily entry passes for his staff/employees from EMPLOYER to work within operating areas. These being safety requirements, no relaxations on this account shall be given to CONTRACTOR.

**37 Sub-letting of works:**

- 37.1 No part of the CONTRACT nor any share or interest therein shall in any manner or degree be transferred, assigned or sublet by the CONTRACTOR directly or indirectly to any person, firm or corporation whatsoever without the consent in writing, of the ENGINEER/ EMPLOYER except as provided for in the succeeding sub-clause.

**i) SUB-CONTRACTS FOR TEMPORARY WORKS ETC.:**

The EMPLOYER may give written consent to Sub- contract for the execution of any part of the WORK at the site, being entered in to by CONTRACTOR provided each individual Sub- contract is submitted to the ENGINEER-IN-CHARGE before being entered into and is approved by him.



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ii) LIST OF SUB-CONTRACTORS TO BE SUPPLIED:

At the commencement of every month the CONTRACTOR shall furnish to the ENGINEER-IN- CHARGE list of all SUB-CONTRACTORS or other persons or firms engaged by the CONTRACTOR and working at the SITE during the previous month with particulars of the general nature of the Subcontract or works done by them.

iii) CONTRACTOR'S LIABILITY NOT LIMITED BY SUB-CONTRACTORS:

Notwithstanding any sub-letting with such approval as aforesaid and notwithstanding that the ENGINEER-IN-CHARGE shall have received copies of any Subcontracts, the contractor shall be and shall remain solely responsible for the quality, proper and expeditious execution of the Contract in all respects as if such sub-letting or Subcontracting had not taken place, and as if such work had been done directly by the CONTRACTOR. The CONTRACTOR shall bear all responsibility for any act or omission on the part of sub-contractors in regard to work to be performed under the CONTRACT.

iv) EMPLOYER MAY TERMINATE SUB-CONTRACTS:

If any SUB-CONTRACTOR engaged upon the works at the site executes any works which in the opinion of the ENGINEER-IN-CHARGE is not in accordance with the CONTRACT documents, the EMPLOYER may by written notice to the CONTRACTOR request him to terminate such subcontract and the CONTRACTOR upon the receipt of such notice shall terminate such Subcontract and dismiss the SUB-CONTRACTOR(S) and the later shall forthwith leave the works, failing which the EMPLOYER shall have the right to remove such SUB- CONTRACTOR(S) from the site.

v) NO REMEDY FOR ACTION TAKEN UNDER THIS CLAUSE:

No action taken by the EMPLOYER under the clause shall relieve the CONTRACTOR of any of his liabilities under the CONTRACT or give rise to any right or compensation, extension of time or otherwise failing which the EMPLOYER shall have the right to remove such SUB-CONTRACTOR(S) from the site.

**38 Power of entry:**

38.1 If the CONTRACTOR shall not commence the WORK in the manner previously described in the CONTRACT documents or if he shall at any time in the opinion of the ENGINEER-IN-CHARGE.

- i) fail to carry out the WORK in conformity with the CONTRACT documents, or
- ii) fail to carry out the WORK in accordance with the Time Schedule, or
- iii) substantially suspend work or the WORK for a period of fourteen days without authority from the





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ENGINEER-IN-CHARGE, or

- iv) fail to carry out and execute the WORK to the satisfaction of the ENGINEER-IN-CHARGE, or
- v) fail to supply sufficient or suitable construction plant, temporary works, labour, materials or things, or
- vi) Commit, suffer, or permit any other breach of any of the provisions of the CONTRACT on his part to be performed or observed or persist in any of the above mentioned breaches of the CONTRACT for fourteen days, after notice in writing shall have been given to the CONTRACTOR by the ENGINEER-IN-CHARGE requiring such breach to be remedied, or
- vii) if the CONTRACTOR shall abandon the WORK or
- viii) If the CONTRACTOR during the continuance of the CONTRACT shall become bankrupt, make any arrangement or composition with his creditors, or permit any execution to be levied or go into liquidation whether compulsory or voluntary not being merely a voluntary liquidation for the purpose of amalgamation or reconstruction

then in any such case, the EMPLOYER shall have the power to enter upon the WORK and take possession thereof and of the materials, temporary WORK, construction plant, and stock thereon, and to revoke the CONTRACTOR's license to use the same, and to complete the WORK by his agents, other CONTRACTORS or workmen or to relate the same upon any terms and to such other person, firm or corporation as the EMPLOYER in his absolute discretion may think proper to employ and for the purpose aforesaid to use or authorize the use of any materials, temporary work, CONSTRUCTION PLANT, and stock as aforesaid, without making payment or allowance to the CONTRACTOR for the said materials other than such as may be certified in writing by the ENGINEER-IN-CHARGE to be reasonable, and without making any payment or allowance to the CONTRACTOR for the use of the temporary said works, construction plant and stock or being liable for any loss or damage thereto, and if the EMPLOYER shall by reason of his taking possession of the WORK or of the WORK being completed by other CONTRACTOR (due account being taken of any such extra work or works which may or be omitted) then the amount of such excess as certified by the ENGINEER-IN- CHARGE shall be deducted from any money which may be due for work done by the CONTRACTOR under the CONTRACT and not paid for. Any deficiency shall forthwith be made good and paid to the EMPLOYER by the CONTRACTOR and the EMPLOYER shall have power to sell in such manner and for such price as he may think fit all or any of the construction plant, materials etc. constructed by or belonging to and to recoup and retain the said deficiency or any part thereof out of proceeds of the sale.

**39 Contractor's responsibility with the mechanical, electrical, intercommunication system, air-conditioning contractors and other agencies:**

39.1

Without repugnance of any other condition, it shall be the responsibility of the CONTRACTOR executing the work of civil construction, to work in close cooperation and coordinate the WORK with the Mechanical, Electrical, Air-conditioning and Intercommunication Contractor's and other agencies or their authorized representatives, in providing the necessary grooves, recesses, cuts and opening etc., in wall, slabs beams and columns etc. and making good the same to



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the desired finish as per specification, for the placement of electrical, intercommunication cables, conduits, air-conditioning inlets and outlets grills and other equipments etc. where required. For the above said requirements in the false ceiling and other partitions, the CONTRACTOR before starting-up the work shall in consultation with the Electrical, Mechanical, Intercommunication, Air-conditioning contractor and other agencies prepare and put-up a joint scheme, showing the necessary openings, grooves, recesses, cuts, the methods of fixing required for the WORK of the aforesaid, and the finishes therein, to the ENGINEER-IN-CHARGE and get the approval. The CONTRACTOR before finally submitting the scheme to the ENGINEER-IN-CHARGE, shall have the written agreement of the other agencies. The ENGINEER- IN-CHARGE, before communicating his approval to the scheme, with any required modification, shall get the final agreement of all the agencies, which shall be binding. No claim shall be entertained on account of the above.

The CONTRACTOR shall confirm in all respects with provision of any statutory regulations, ordinances or byelaws of any local or duly constituted authorities or public bodies which may be applicable from time to time to the WORK or any temporary works. The CONTRACTOR shall keep the EMPLOYER indemnified against all penalties and liabilities of every kind, arising out of non- adherence to such stains, ordinances, laws, rules, regulations, etc.

- 40 Other agencies at site:** 40.1 The CONTRACTOR shall have to execute the WORK in such place and conditions where other agencies will also be engaged for other works such as site grading, filling, and leveling, electrical and mechanical engineering works, etc. No claim shall be entertained due to WORK being executed in the above circumstances.
- 41 Notice:** 41.1 TO THE CONTRACTOR:  
Any notice hereunder may be served on the CONTRACTOR or his duly authorized representative at the job site or may be served by registered mail direct to the address furnished by the CONTRACTOR. Proof of issue of any such notice could be conclusive of the CONTRACTOR having been duly informed of all contents therein.
- 41.2 TO THE EMPLOYER:  
Any notice to be given to the EMPLOYER under the terms of the CONTRACTOR shall be served by sending the same by Registered mail to or delivering the same at the respective site offices of M/s Talcher Fertilizers Ltd. addressed to the HEAD/SITE-IN-CHARGE.
- 42 Right of various interests:** i) The EMPLOYER reserves the right to distribute the work between more than one agency(ies). The CONTRACTOR shall cooperate and afford other agency(ies) reasonable opportunity for access to the WORK for the carriage and storage of materials and execution of their works.
- ii) Wherever the work being done by any department of the EMPLOYER or by other agency(ies) employed by the EMPLOYER is contingent upon WORK covered by this CONTRACT, the respective rights of the various interests involved shall be determined by the ENGINEER-IN-CHARGE to secure the completion of the various portions of the work in general harmony.
- 43 Patents and royalties:** 43.1 The CONTRACTOR, if licensed under any patent covering equipment,



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machinery, materials or compositions of matter to be used or supplied or methods and process to be practiced or employed in the performance of this CONTRACT, agrees to pay all royalties and license fees which may be due with respect thereto. If any equipment, machinery, materials, composition of matters, be used or supplied or methods and processes to be practiced or employed in the performance of this CONTRACT, is covered by a patent under which the CONTRACTOR is not licensed then the CONTRACTOR before supplying or using the equipment, machinery materials, composition method or processes shall obtain such licenses and pay such royalties and license fees as may be necessary for performance of this CONTRACT. In the event the CONTRACTOR fails to pay any such royalty or obtain any such license, any suit for infringement of such patents which is brought against the CONTRACTOR or the EMPLOYER as a result such failure will be defended by the CONTRACTOR at his own expense and the CONTRACTOR will pay any damages and costs awarded in such suit. The CONTRACTOR shall promptly notify the EMPLOYER if the CONTRACTOR has acquired the knowledge of any plant under which a suit for infringement could be reasonably brought because of the use by the EMPLOYER of any equipment, machinery, materials, process, methods to be supplied hereunder. The CONTRACTOR agrees to and does hereby grant to EMPLOYER, together with the right to extend the same to any of the subsidiaries of the EMPLOYER as irrevocable, royalty free license to use in any country, any invention made by the CONTRACTOR or his employee in or as result of the performance of the WORK under the CONTRACT.

- 43.2 All charges on account of royalty, tollage, rent, octroi terminal or sales tax and/ or other duties or any other levy on materials obtained for the work or temporary work or part thereof (excluding materials provided by the EMPLOYER) shall be borne by the CONTRACTOR.
- 43.3 The CONTRACTOR shall not sell or otherwise dispose of or remove except for the purpose of this CONTRACT, the sand, stone, clay, ballast, earth, rock or other substances, or materials obtained from any excavation made for the purpose of the WORK or any building or produce upon the site at the time of delivery of the possession thereof, but all such substances, materials, buildings and produce shall be the property of the EMPLOYER provided that the CONTRACTOR may with the permission of the ENGINEER-IN-CHARGE, use the same for the purpose of the work by payment of cost of the same at such a rate as may be determined by the ENGINEER-IN- CHARGE.
- 43.4 The EMPLOYER shall indemnify and save harmless the CONTRACTOR from any loss on account of claims against CONTRACTOR for the contributory infringement of patent rights arising out and based upon the claim that the use of the EMPLOYER of the process included in the design prepared by the EMPLOYER and used in the operation of the plant infringes on any patent right. With respect to any subcontract entered into by CONTRACTOR pursuant to the provisions of the relevant clause hereof, the CONTRACTOR shall obtain from the SUB-CONTRACTOR an undertaking to provide the EMPLOYER with the same patent protection that CONTRACTOR is required to provide under the provisions of this clause.

**44 Liens:**

- 44.1 If, at any time there should be evidence or any lien or claim for which the EMPLOYER might have become liable and which is chargeable to the CONTRACTOR, the EMPLOYER shall have the right to retain out of any payment then due or thereafter to become due an amount sufficient to completely indemnify the EMPLOYER against such lien or claim and if such lien or claim be valid, the EMPLOYER may pay and discharge the same and deduct the amount so



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paid from any money which may be or may become due and payable to the CONTRACTOR. If any lien or claim remain unsettled after all payments are made, the CONTRACTOR shall refund or pay to the EMPLOYER all money that the latter may be compelled to pay in discharging such lien or claim including all costs and reasonable expenses. EMPLOYER reserves the right to do the same.

44.2 The EMPLOYER shall have lien on all materials, equipments including those brought by the CONTRACTOR for the purpose of erection, testing and commissioning of the WORK.

44.3 The final payment shall not become due until the CONTRACTOR delivers to the ENGINEER-IN-CHARGE a complete release or waiver of all liens arising or which may arise out of his agreement or receipt in full or certification by the CONTRACTOR in a form approved by ENGINEER-IN-CHARGE that all invoices for labour, materials, services have been paid in lien thereof and if required by the ENGINEER-IN-CHARGE in any case an affidavit that so far as the CONTRACTOR has knowledge or information the releases and receipts include all the labour and material for which a lien could be filled.

44.4 CONTRACTOR will indemnify and hold the EMPLOYER harmless, for a period of two years after the issue of FINAL CERTIFICATE, from all liens and other encumbrances against the EMPLOYER on account of debts or claims alleged to be due from the CONTRACTOR or his SUB-CONTRACTOR to any person including SUB- CONTRACTOR and on behalf of EMPLOYER will defend at his own expense, any claim or litigation brought against the EMPLOYER or the CONTRACTOR in connection therewith. CONTRACTOR shall defend or contest at his own expense any fresh claim or litigation by any person including his SUB-CONTRACTOR, till its satisfactory settlement even after the expiry of two years from the date of issue of FINAL CERTIFICATE.

**45 Delays by employer or his authorized agents:**

45.1 In case the CONTRACTOR's performance is delayed due to any act or omission on the part of the EMPLOYER or his authorized agents, then the CONTRACTOR shall be given due extension of time for the completion of the WORK, to the extent such omission on the part of the EMPLOYER has caused delay in the CONTRACTOR's performance of his WORK.



45.2 No adjustment in CONTRACT PRICE shall be allowed for reasons of such delays and extensions granted except as provided in TENDER DOCUMENT, where the EMPLOYER reserves the right to seek indulgence of CONTRACTOR to maintain the agreed Time Schedule of Completion.

In such an event the CONTRACTOR shall be obliged for working by CONTRACTOR's personnel for additional time beyond stipulated working hours as also Sundays and Holidays and achieve the completion date/interim targets.

**46 Payment if the contract is terminated:**

46.1 If the CONTRACT shall be terminated as per Tender pursuant to Clause no. 29 of GCC, the CONTRACTOR shall be paid by the EMPLOYER in so far as such amounts or items shall not have already been covered by payments of amounts made to the CONTRACTOR for the WORK executed and accepted by ENGINEER-IN-CHARGE prior to the date of termination at the rates and prices provided for in the CONTRACT and in addition to the following:

a) The amount payable in respect of any preliminary items, so far as the Work or service comprised therein has been carried out or performed and an appropriate portion as certified by ENGINEER-IN-CHARGE of any such items or service comprised in which has been

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partially carried out or performed.

b) Any other expenses which the CONTRACTOR has expended for performing the WORK under the CONTRACT subject to being duly recommended by ENGINEER-IN-CHARGE and approved by EMPLOYER for payment, based on documentary evidence of his having incurred such expenses.

46.2 The CONTRACTOR will be further required to transfer the title and provide the following in the manner and as directed by the EMPLOYER.

a) Any and all completed works.

b) Such partially completed WORK including drawings, information's and CONTRACT rights as the CONTRACTOR has specially performed, produced or acquired for the performance of the CONTRACTOR.

**47 No waiver of rights:**

47.1 Neither the inspection by the EMPLOYER or any of their officials, employees, or agents nor any order by the EMPLOYER for payment of money or any payment for or acceptance of the whole or any part of the Work by the EMPLOYER nor any extension of time, nor any possession taken by EMPLOYER shall operate as a waiver of any provision of the CONTRACT, or of any power herein reserved to the EMPLOYER, or any right to damages herein provided, nor shall any waiver of any breach in the CONTRACT be held to be a waiver of any other subsequent breach.

**48 Certificate not to affect right of employer and liability of contractor:**

48.1 No interim payment certificate(s) issued by the Engineer-in-Charge of the EMPLOYER, nor any sum paid on account by the EMPLOYER, nor any extension of time for execution of the work granted by EMPLOYER shall affect or prejudice the rights of the Employer against the CONTRACTOR or relieve the CONTRACTOR of his obligations for the due performance of the CONTRACT, or be interpreted as approval of the WORK done or of the equipment supplied and no certificate shall create liability for the EMPLOYER to pay for alterations, amendments, variations or additional works not ordered, in writing, by EMPLOYER or discharge the liability of the CONTRACTOR for the payment of damages whether due, ascertained, or certified or not or any sum against the payment of which he is bound to indemnify the EMPLOYER.

**49 Language and measures:**

49.1 All documents pertaining to the CONTRACT including Specifications, Schedules, Notices, Correspondence, operating and maintenance Instructions, DRAWINGS, or any other writing shall be written in English language. The Metric System of measurement shall be used in the CONTRACT unless otherwise specified.

**50 Transfer of title:**

50.1 The title of Ownership of supplies furnished by the CONTRACTOR shall not pass on to the EMPLOYER for all Supplies till the same are finally accepted by the EMPLOYER after the successful completion of PERFORMANCE TEST and GUARANTEE TEST and issue of FINAL CERTIFICATE.

50.2 However, the EMPLOYER shall have the lien on all such works performed as soon as any advance or progressive payment is made by the EMPLOYER to the CONTRACTOR and the CONTRACTOR shall not subject these works for use other than those intended under this CONTRACT.



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- 51 Release of information:** 51.1 The CONTRACTOR shall not communicate or use in advertising, publicity, sales releases or in any other medium, photographs, or other reproduction of the Work under this CONTRACT or description of the site dimensions, quantity, quality or other information, concerning the Work unless prior written permission has been obtained from the EMPLOYER.
- 52 Brand names:** 52.1 The specific reference in the SPECIFICATIONS and documents to any material by trade name, make or catalogue number shall be construed as establishing standard or quality and performance and not as limited competition. However, TENDERER may offer other similar equipments provided it meets the specified standard design and performance requirements.
- 53 Completion of contract:** 53.1 Unless otherwise terminated under the provisions of any other relevant clause, this CONTRACT shall be deemed to have been completed at the expiration of the PERIOD OF LIABILITY as provided for under the CONTRACT.
- 54 Spares:** 54.1 The CONTRACTOR shall furnish to the EMPLOYER all spares required for COMMISSIONING of the plants, recommendatory and/or mandatory spares, which are required essential by the manufacturer/supplier. The same shall be delivered at SITE, 3(Three) months before COMMISSIONING.
- Also the CONTRACTOR should furnish the manufacturing drawings for fast wearing spares.
- 54.2 The CONTRACTOR guarantees the EMPLOYER that before the manufacturers of the equipments, plants and machineries go out of production of spare parts for the equipment furnished and erected by him, he shall give at least twelve (12) months' advance notice to the EMPLOYER, so that the latter may order his requirement of spares in one lot, if he so desires.

**SECTION-V Performance of Work**

- 55 Execution of work:** 55.1 All the Works shall be executed in strict conformity with the provisions of the CONTRACT Documents and with such explanatory detailed drawings, specification and instructions as may be furnished from time to time to the CONTRACTOR by the ENGINEER-IN-CHARGE whether mentioned in the CONTRACT or not. The CONTRACTOR shall be responsible for ensuring that works throughout are executed in the most substantial, proper and workmanlike manner with the quality of material and workmanship in strict accordance with the SPECIFICATIONS and to the entire satisfaction of the ENGINEER-IN-CHARGE. The CONTRACTOR shall provide all necessary materials equipment labour etc. for execution and maintenance of WORK till completion unless otherwise mentioned in the CONTRACT.
- 56 Co-ordination and inspection of work:** 56.1 The coordination and inspection of the day-to-day work under the CONTRACT shall be the responsibility of the ENGINEER-IN-CHARGE. The written instruction regarding any particular job will normally be passed by the ENGINEER-IN-CHARGE or his authorized representative. A work order book will be maintained by the CONTRACTOR for each sector in which the aforesaid written instructions will be entered. These will be signed by the CONTRACTOR or his authorized representative by way of acknowledgement within 12 hours.
- 57 Work in monsoon and dewatering:** 57.1 Unless otherwise specified elsewhere in the tender, the execution of the WORK may entail working in the monsoon also. The CONTRACTOR must maintain a minimum labour force as may be required for the job and plan and execute the



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construction and erection according to the prescribed schedule. No extra rate will be considered for such work in monsoon.

- 57.2 During monsoon and other period, it shall be the responsibility of the CONTRACTOR to keep the construction work site free from water at his own cost.
- 58 Work on sundays and holidays:**
- 58.1 For carrying out Work on Sundays, and Holidays, the CONTRACTOR will approach the ENGINEER-IN-CHARGE or his representative at least two days in advance and obtain permission in writing. The CONTRACTOR shall observe all labour laws and other statutory rules and regulations in force. In case of any violations of such laws, rules and regulations, consequence if any, including the cost thereto shall be exclusively borne by the CONTRACTOR and the EMPLOYER shall have no liability whatsoever on this account.
- 59 General conditions for construction and erection work:**
- 59.1 The working time at the site of work is 48 hours per week. Overtime work is permitted in cases of need and the EMPLOYER will not compensate the same. Shift working at 2 or 3 shifts per day will become necessary and the CONTRACTOR should take this aspect into consideration for formulating his rates for quotation. No extra claims will be entertained by the EMPLOYER on this account. For carrying out work beyond working hours the CONTRACTOR will approach the ENGINEER-IN-CHARGE or his authorized representative and obtain his prior written permission.
- 59.2 The CONTRACTOR must arrange for the placement of workers in such a way that the delayed completion of the WORK or any part thereof for any reason whatsoever will not affect their proper employment. The EMPLOYER will not entertain any claim for idle time payment whatsoever.
- 59.3 The CONTRACTOR shall submit to the EMPLOYER/ ENGINEER-IN-CHARGE reports at regular intervals regarding the state and progress of WORK. The details and proforma of the report will mutually be agreed after the award of CONTRACT. The CONTRACTOR shall provide display boards showing progress and labour strengths at worksite, as directed by the ENGINEER-IN-CHARGE.
- 60 Alterations in specifications, design and extra works:**
- 60.1 The WORK covered under this CONTRACT having to be executed by the CONTRACTOR on a lumpsum firm price/item rate quoted by him, the EMPLOYER will not accept any proposals for changes in VALUE OF CONTRACT or extension in time on account of any such changes which may arise to the CONTRACTOR's scope of WORK as a result of detailed Engineering and thereafter during the execution of WORK. The only exception to this will be a case where the EMPLOYER requests in writing to the CONTRACTOR to upgrade the SPECIFICATIONS or the size of any major pieces of equipments, plant or machinery beyond what is normally required to meet the scope of WORK as defined in the CONTRACT DOCUMENT.
- In such cases, a change order will be initialled by the CONTRACTOR at the appropriate time for the EMPLOYER's prior approval giving the full back-up data for their review and for final settlement of any impact on price within 30 (thirty) days thereafter.
- 60.2 The ENGINEER-IN-CHARGE shall have to make any alterations in, omission from, additions to or substitutions for, the Schedule of Rates, the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the WORK and the CONTRACTOR



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shall be bound to carry out the such altered/ extra/ new items of WORK in accordance with any instructions which may be given to him in writing signed by the ENGINEER-IN- CHARGE, and such alterations, omissions, additions or substitutions shall not invalidate the CONTRACT and any altered, additional or substituted work which the CONTRACTOR may be directed to do in the manner above specified as part of the WORK shall be carried out by the CONTRACTOR on the same conditions in all respects on which he agreed to do the main WORK. The time of completion of WORK may be extended for the part of the particular job at the discretion of the ENGINEER-IN- CHARGE, for only such alterations, additions or substitutions of the WORK, as he may consider as just and reasonable. The rates for such additional, altered or substituted WORK under this clause shall be worked out in accordance with the following provisions:-

I. For Item Rate Contract

- a) If the rates for the additional, altered or substituted WORK are specified in the CONTRACT for the WORK, the CONTRACTOR is bound to carry on the additional, altered or substituted WORK at the same rates as are specified in the CONTRACT.
- b) If the rates for the additional, altered or substituted WORK are not specifically provided in the CONTRACT for the WORK, the rates will be derived from the rates for similar class of WORK as are specified in the CONTRACT for the WORK. The opinion of the ENGINEER-IN- CHARGE, as to whether or not the rates can be reasonably so derived from the items in this CONTRACT will be final and binding on the CONTRACTOR.
- c) If the rates for the altered, additional or substituted WORK cannot be determined in the manner specified in sub-clause(s) (a) and (b) above, then the CONTRACTOR shall, within 7 days of the date of receipt of order to carry out the WORK, inform the ENGINEER-IN-CHARGE of the rates which it is his intention to charge for such class of WORK, supported by analysis of the rate or rates claimed, and the ENGINEER-IN-CHARGE shall determine the rate or rates on the basis of the prevailing market rates, labour cost at schedule of labour rates plus 10% to cover contractor's supervision, overheads and profit and pay the CONTRACTOR accordingly. The opinion of the ENGINEER- IN-CHARGE as to current market rates of materials and the quantum of labour involved per unit of measurement will be final and binding on the CONTRACTOR.
- d) Where the item of work will be executed through nominated specialist agency as approved by the ENGINEER-IN-CHARGE, then the actual amount paid to such nominated agency supported by documentary evidence and as certified by ENGINEER-IN-CHARGE shall be considered plus 10% (ten percent) to cover all contingencies, overhead, profits to arrive at the rates.
- e) Provisions contained in the Sub-clause (a) & (d) above shall, however, not apply for the following:-





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Where the value of additions of new items together with the value of alterations, additions/ deletions or substitutions does not exceed by or is not less than plus/minus ()25% of the VALUE OF CONTRACT. The item rates in the Schedule of Rates shall hold good for all such variations between the above mentioned limits, irrespective of any increase/decrease of quantities in the individual items of Schedule of Rates.

Where the value of addition of new items together with the value of alterations, additions/ deletions or substitutions reduces more than 25% of the contract value but is within the following limits the tenderer shall be paid compensation for decrease in the value of work, as follows:

S.No.	Range of Variation	Percentage compensation for decrease in the value of work in the respective range.
a)	Beyond (+) 25% upto & inclusive of (+) 50%	No increase and/ or decrease shall be applicable for the Schedule of Rates (The rates quoted for this increase shall be valid).
b)	Beyond (-) 25% upto & inclusive of (-) 50%	For reduction beyond 25% contractor shall be compensated by an amount equivalent to 10% of the reduction in value of the contract as awarded. For example if the actual contract value is 70% of awarded value then compensation shall be 10% of (75-70) i.e. 0.5% of awarded contract value.

**II. For Lumpsum Contracts**

CONTRACTOR shall, within 7 days of the date of receipt of order to carry out the WORK, inform the ENGINEER-IN- CHARGE of the rates which it is his intention to charge for such class of WORK, supported by analysis of the rate or rates claimed, and the ENGINEER-IN-CHARGE shall determine the rate or rates on the basis of the prevailing market rates, labour cost at schedule of labour rates plus 10% to cover contractor's supervision, overheads and profit and pay the CONTRACTOR accordingly. The opinion of the ENGINEER-IN-CHARGE as to current market rates of materials and the quantum of labour involved per unit of measurement will be final and binding on the CONTRACTOR.

**61 Drawings to be supplied by the employer**

- 61.1 The drawings attached with tender are only for the general guidance to the CONTRACTOR to enable him to visualize the type of work contemplated and scope of work involved. The CONTRACTOR will be deemed to have studied the DRAWINGS and formed an idea about the WORK involved.
- 61.2 Detailed working drawings on the basis of which actual execution of the WORK is to proceed, will be furnished from time to time during the progress of the work. The CONTRACTOR shall be deemed to have gone through the DRAWINGS supplied to him thoroughly and carefully and in conjunction with all other



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connected drawings and bring to the notice of the ENGINEER-IN-CHARGE discrepancies, if any, therein before actually carrying out the Work.

- 61.3 Copies of all detailed working drawings relating to the WORK shall be kept at the CONTRACTOR's office on the site and shall be made available to the ENGINEER-IN-CHARGE at any time during the CONTRACT. The drawings and other documents issued by the EMPLOYER shall be returned to the EMPLOYER on completion of the WORK.
- 62 Drawings to be supplied by the contractor:**
- 62.1 The drawings/date which are to be furnished by the CONTRACTOR are enumerated in the special conditions of contract, and shall be furnished within the specified time.
- 62.2 Where approval/review of drawings before manufacture/ construction/fabrication has been specified, it shall be CONTRACTOR's responsibility to have these drawings prepared as per the directions of ENGINEER-IN-CHARGE and got approved before proceeding with manufacture/construction/fabrication as the case may be. Any change that may have become necessary in these drawings during the execution of the work shall have to be carried out by the CONTRACTOR to the satisfaction of ENGINEER-IN-CHARGE at no extra cost. All final drawings shall bear the certification stamp as indicated below duly signed by both the CONTRACTOR and ENGINEER-IN-CHARGE.
- "Certified true for \_\_\_\_\_ (Name of Work)
- Agreement No. \_\_\_\_\_
- Signed: \_\_\_\_\_ (CONTRACTOR) \_\_\_\_\_ (ENGINEER-IN-CHARGE)
- 62.3 The DRAWINGS submitted by the CONTRACTOR shall be reviewed by the ENGINEER-IN-CHARGE as far as practicable within 3 (Three) weeks and shall be modified by the CONTRACTOR, if any modifications and/or corrections are required by the ENGINEER-IN-CHARGE. The CONTRACTOR shall incorporate such modifications and/or corrections and submit the final drawings for approval. Any delays arising out of failure by the CONTRACTOR to rectify the drawing in good time shall not alter the Contract Completion Time.
- 62.4 As built drawings showing all corrections, adjustments etc. shall be furnished by the CONTRACTOR in six copies and one transparent for record purposed to the EMPLOYER.
- 63 Setting out works:**
- 63.1 The ENGINEER-IN-CHARGE shall furnish the CONTRACTOR with only the four corners of the Works site and a level bench mark and the CONTRACTOR shall set out the Works and shall provide an efficient staff for the purpose and shall be solely responsible for the accuracy of such setting out.
- 63.2 The CONTRACTOR shall provide, fix and be responsible for the maintenance of all stakes, templates, level marks, profiles and other similar things and shall take all necessary precautions to prevent their removal or disturbance and shall be responsible for the consequence of such removal or disturbance should the same take place and for their efficient and timely reinstatement. The CONTRACTOR shall also be responsible for the maintenance of all existing survey marks, boundary marks, distance marks and center line marks, either existing or supplied and fixed by the CONTRACTOR. The work shall be set out to the satisfaction of the ENGINEER-IN-CHARGE. The approval there of joining with the

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CONTRACTOR by the ENGINEER- IN-CHARGE in setting out the work, shall not relieve the CONTRACTOR of any of his responsibility.

- 63.3 Before beginning the Works, the CONTRACTOR shall at his own cost, provide all necessary reference and level posts, pegs, bamboos, flags, ranging rods, strings and other materials for proper layout of the works in accordance with the schemes for bearing marks acceptable to the ENGINEER-IN-CHARGE. The center, longitudinal or face lines and cross lines shall be marked by means of small masonry pillars. Each pillar shall have distinct mark at the centre to enable theodolite to be set over it. No work shall be started until all these points are checked and approved by the ENGINEER-IN-CHARGE in writing but such approval shall not relieve the CONTRACTOR of any of his responsibilities. The CONTRACTOR shall also provide all labour, material and other facilities, as necessary, for the proper checking of layout and inspection of the points during construction.
- 63.4 Pillars bearing geodetic marks located at the sites of units of WORKS under construction should be protected and fenced by the CONTRACTOR.
- 63.5 On completion of WORK, the CONTRACTOR must submit the geodetic documents according to which the WORK was carried out.
- 64 Responsibility for level and alignment:**
- 64.1 The CONTRACTOR shall be entirely and exclusively responsible for the horizontal and vertical alignment, the levels and correctness of every part of the WORK and shall rectify effectively any errors or imperfections therein, such rectifications shall be carried out by the CONTRACTOR, at his own cost, when instructions are issued to that effect by the ENGINEER- IN-CHARGE.
- 65 Materials to be supplied by contractor:**
- 65.1 The CONTRACTOR shall procure and provide within the VALUE OF CONTRACT the whole of the materials required for the construction including steels, cement and other building materials, tools, tackles, construction plant and equipment for the completion and maintenance of the WORK except the materials which will be issued by the EMPLOYER and shall make his own arrangement for procuring such materials and for the transport thereof. The EMPLOYER may give necessary recommendation to the respective authority if so desired by the CONTRACTOR but assumes no further responsibility of any nature. The EMPLOYER will insist on the procurement of materials which bear ISI stamp and/or which are supplied by reputed suppliers.
- 65.2 The CONTRACTOR shall properly store all materials either issued to him or brought by him to the SITE to prevent damages due to rain, wind, direct exposure to sun, etc. as also from theft, pilferage, etc. for proper and speedy execution of his works. The CONTRACTOR shall maintain sufficient stocks of all materials required by him.
- 65.3 No material shall be dispatched from the CONTRACTOR's stores before obtaining the approval in writing of the ENGINEER-IN-CHARGE.
- 66 Stores supplied by the employer:**
- 66.1 If the SPECIFICATION of the WORK provides for the use of any material of special description to be supplied from the EMPLOYER's stores or it is required that the CONTRACTOR shall use certain stores to be provided by the ENGINEER-IN-CHARGE, such materials and stores, and price to be charged there for as hereinafter mentioned being so far as practicable for the convenience of the CONTRACTOR, but not so as in any way to control the meaning or effect of the CONTRACT, the CONTRACTOR shall be bound to purchase and shall be supplied such materials and stores as are from time to time required to be used by
- (Clause not applicable for this Tender)*



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him for the purpose of the CONTRACT only. The sums due from the CONTRACTOR for the value of materials supplied by the EMPLOYER will be recovered from the running account bill on the basis of the actual consumption of materials in the works covered and for which the running account bill has been prepared. After the completion of the WORK, however, the CONTRACTOR has to account for the full quantity of materials supplied to him as per relevant clauses in this document.

66.2 The value of the stores/materials as may be supplied to the CONTRACTOR by the EMPLOYER will be debited to the CONTRACTOR's account at the rates shown in the schedule of materials and if they are not entered in the schedule, they will be debited at cost price, which for the purpose of the CONTRACT shall include the cost of carriage and all other expenses whatsoever such as normal storage supervision charges which shall have been incurred in obtaining the same at the EMPLOYER's stores. All materials so supplied to the CONTRACTOR shall remain the absolute property of the EMPLOYER and shall not be removed on any account from the SITE of the WORK, and shall be at all times open for inspection to the ENGINEER-IN-CHARGE. Any such materials remaining unused at the time of the completion or termination of the CONTRACT shall be returned to the EMPLOYER's stores or at a place as directed by the ENGINEER-IN-CHARGE in perfectly good condition at CONTRACTOR's cost.

**67 Conditions for issue of materials:**

*(Clause not applicable for this Tender)*

- 67.1 i) Materials specified as to be issued by the EMPLOYER will be supplied to the CONTRACTOR by the EMPLOYER from his stores. It shall be responsibility of the CONTRACTOR to take delivery of the materials and arrange for its loading, transport and unloading at the SITE of WORK at his own cost. The materials shall be issued between the working hours and as per the rules of the EMPLOYER as framed from time to time.
- ii) The CONTRACTOR shall bear all incidental charges for the storage and safe custody of materials at site after these have been issued to him.
- iii) Materials specified as to be issued by the EMPLOYER shall be issued in standard sizes as obtained from the manufacturers.
- iv) The CONTRACTOR shall construct suitable Godowns at the SITE of WORK for storing the materials safe against damage by rain, dampness, fire, theft etc. He shall also employ necessary watch and ward establishment for the purpose.
- v) It shall be duty of the CONTRACTOR to inspect the materials supplied to him at the time of taking delivery and satisfy himself that they are in good condition. After the materials have been delivered by the EMPLOYER, it shall be the responsibility of the CONTRACTOR to keep them in good condition and if the materials are damaged or lost, at any time, they shall be repaired and/or replaced by him at his own cost according to the instructions of the ENGINEER-IN-CHARGE.
- vi) The EMPLOYER shall not be liable for delay in supply or non-supply of any materials which the EMPLOYER has undertaken to supply where such failure or delay is due to natural calamities, act of enemies, transport and procurement difficulties and any circumstances beyond the control of the EMPLOYER. In no case, the CONTRACTOR shall be entitled to claim any compensation or loss suffered by him on this account.



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- vii) It shall be responsibility of the CONTRACTOR to arrange in time all materials required for the WORK other than those to be supplied by the EMPLOYER. If, however, in the opinion of the ENGINEER-IN-CHARGE the execution of the WORK is likely to be delayed due to the CONTRACTOR's inability to make arrangements for supply of materials which normally he has to arrange for, the ENGINEER-IN-CHARGE shall have the right at his own discretion to issue such materials, if available with the EMPLOYER or procure the materials from the market or as elsewhere and the CONTRACTOR will be bound to take such materials at the rates decided by the ENGINEER-IN-CHARGE. This, however, does not in any way absolve the CONTRACTOR from responsibility of making arrangements for the supply of such materials in part or in full, should such a situation occur nor shall this constitute a reason for the delay in the execution of the WORK.
- viii) None of the materials supplied to the CONTRACTOR will be utilized by the CONTRACTOR for manufacturing item which can be obtained as supplied from standard manufacturer in finished form.
- ix) The CONTRACTOR shall, if desired by the ENGINEER-IN-CHARGE, be required to execute an Indemnity Bond in the prescribed form for safe custody and accounting of all materials issued by the EMPLOYER.
- x) The CONTRACTOR shall furnish to the ENGINEER-IN-CHARGE sufficiently in advance a statement showing his requirement of the quantities of the materials to be supplied by the EMPLOYER and the time when the same will be required by him for the works, so as to enable the ENGINEER-IN-CHARGE to make necessary arrangements for procurement and supply of the material.
- xi) Account of the materials issued by the EMPLOYER shall be maintained by CONTRACTOR indicating the daily receipt, consumption and balance in hand. This account shall be maintained in a manner prescribed by the ENGINEER-IN-CHARGE along with all connected papers viz. requisitions, issues, etc., and shall be always available for inspection in the CONTRACTOR's office at SITE.
- xii) The CONTRACTOR should see that only the required quantities of materials are got issued. The CONTRACTOR shall not be entitled to cartage and incidental charges for returning the surplus materials, if any, to the stores wherefrom they were issued or to the place as directed by the ENGINEER-IN-CHARGE.
- xiii) Materials/ Equipment(s) supplied by EMPLOYER shall not be utilized for any purpose(s) than issued for.

**68 Material procured with assistance of employer/ return of surplus:**

**(Clause not applicable for this Tender)**

68.1

Notwithstanding anything contained to the contrary in any or all the clauses of this CONTRACT where any materials for the execution of the CONTRACT are procured with the assistance of the EMPLOYER either by issue from EMPLOYER's stock or purchases made under order or permits or licenses issued by Government, the CONTRACTOR shall hold the said materials as trustee for the EMPLOYER and use such materials economically and solely for the purpose of the CONTRACT and not dispose them off without the permission of the



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EMPLOYER and return, if required by the ENGINEER-IN-CHARGE, shall determine having due regard to the condition of the materials. The price allowed to the CONTRACTOR, however, shall not exceed the amount charged to him excluding the storage charges, if any. The decision of the ENGINEER-IN-CHARGE shall be final and conclusive in such matters. In the event of breach of the aforesaid condition, the CONTRACTOR shall, in terms of the licenses or permits and/or criminal breach of trust, be liable to compensate the EMPLOYER at double rate or any higher rate, in the event of those materials at that time having higher rate or not being available in the market, then any other rate to be determined by the ENGINEER-IN-CHARGE and his decision shall be final and conclusive.

- |           |   |      |   |
|-----------|---|------|---|
| <b>69</b> | <b>Materials obtained from dismantling:</b>     | 69.1 | If the CONTRACTOR in the course of execution of the WORK is called upon to dismantle any part for reasons other than those stipulated in Clauses 74 and 77 hereunder, the materials obtained in the WORK of dismantling etc., will be considered as the EMPLOYER's property and will be disposed off to the best advantage of the EMPLOYER.   |
| <b>70</b> | <b>Articles of value found:</b>                 | 70.1 | All gold, silver and other minerals of any description and all precious stones, coins, treasure relics, antiquities and other similar things which shall be found in, under or upon the SITE, shall be the property of the EMPLOYER and the CONTRACTOR shall duly preserve the same to the satisfaction of the ENGINEER-IN-CHARGE and shall from time to time deliver the same to such person or persons indicated by the EMPLOYER.   |
| <b>71</b> | <b>Discrepancies between instructions:</b>      | 71.1 | Should any discrepancy occur between the various instructions furnished to the CONTRACTOR, his agent or staff or any doubt arises as to the meaning of any such instructions or should there be any misunderstanding between the CONTRACTOR's staff and the ENGINEER-IN-CHARGE's staff, the CONTRACTOR shall refer the matter immediately in writing to the ENGINEER-IN-CHARGE whose decision thereon shall be final and conclusive and no claim for losses alleged to have been caused by such discrepancies between instructions, doubts, or misunderstanding shall in any event be admissible.   |
| <b>72</b> | <b>Action where no specification is issued:</b> | 72.1 | In case of any class of WORK for which there is no SPECIFICATION supplied by the EMPLOYER as mentioned in the Tender Documents such WORK shall be carried out in accordance with Indian Standard Specifications and if the Indian Standard Specifications do not cover the same, the WORK should be carried out as per standard Engineering Practice subject to the approval of the ENGINEER-IN-CHARGE.   |
| <b>73</b> | <b>Inspection of works:</b>                     | 73.1 | The ENGINEER-IN-CHARGE will have full power and authority to inspect the WORK at any time wherever in progress either on the SITE or at the CONTRACTOR's premises/workshops wherever situated, premises/ workshops of any person, firm or corporation where WORK in connection with the CONTRACT may be in hand or where materials are being or are to be supplied, and the CONTRACTOR shall afford or procure for the ENGINEER-IN-CHARGE every facility and assistance to carry out such inspection. The CONTRACTOR shall, at all time during the usual working hours and at all other time at which reasonable notice of the intention of the ENGINEER-IN-CHARGE or his representative to visit the WORK shall have been given to the CONTRACTOR, either himself be present or receive orders and instructions, or have a responsible agent duly accredited in writing, present for the purpose. Orders given to the CONTRACTOR's agent shall be considered to have the same force as if they had been given to the CONTRACTOR himself. The CONTRACTOR shall give not less than seven days notice in writing to the |



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ENGINEER-IN-CHARGE before covering up or otherwise placing beyond reach of inspection and measurement of any work in order that the same may be inspected and measured. In the event of breach of above the same shall be uncovered at CONTRACTOR's expense for carrying out such measurement or inspection.

73.2 No material shall be dispatched from the CONTRACTOR's stores before obtaining the approval in writing of the Engineer-in-Charge.

The CONTRACTOR is to provide at all time during the progress of the WORK and the maintenance period, proper means of access with ladders, gangways etc. and the necessary attendance to move and adopt as directed for inspection or measurements of the WORK by the ENGINEER- IN-CHARGE.

73.3 The CONTRACTOR shall make available to the ENGINEER-IN- CHARGE free of cost all necessary instruments and assistance in checking or setting out of WORK and in the checking of any WORK made by the CONTRACTOR for the purpose of setting out and taking measurements of WORK.

**74 Tests for quality of work:**

74.1 All workmanship shall be of the respective kinds described in the CONTRACT DOCUMENTS and in accordance with the instructions of the ENGINEER-IN-CHARGE and shall be subjected from time to time to such test at CONTRACTOR's cost as the ENGINEER-IN-CHARGE may direct at the place of manufacture or fabrication or on the site or at all or any such places. The CONTRACTOR shall provide assistance, instruments, labour and materials as are normally required for examining, measuring and testing any workmanship as may be selected and required by the ENGINEER-IN-CHARGE.

74.2 All the tests that will be necessary in connection with the execution of the WORK as decided by the ENGINEER- IN-CHARGE shall be carried out at the field testing laboratory of the EMPLOYER by paying the charges as decided by the EMPLOYER from time to time. In case of non- availability of testing facility with the EMPLOYER, the required test shall be carried out at the cost of CONTRACTOR at Government or any other testing laboratory as directed by ENGINEER-IN-CHARGE.

74.3 If any tests are required to be carried out in conjunction with the WORK or materials or workmanship not supplied by the CONTRACTOR, such tests shall be carried out by the CONTRACTOR as per instructions of ENGINEER-IN-CHARGE and cost of such tests shall be reimbursed by the EMPLOYER.

**75 Samples for approval:**

75.1 The CONTRACTOR shall furnish to the ENGINEER-IN-CHARGE for approval, when requested or if required by the specifications, adequate samples of all materials and finished to be used in the WORK. Such samples shall be submitted before the WORK is commenced and in ample time to permit tests and examinations thereof. All materials furnished and finishes applied in actual WORK shall be fully equal to the approved samples.

**76 Action and compensation in case of bad work:**

76.1 If it shall appear to the ENGINEER-IN-CHARGE that any work has been executed with unsound, imperfect or unskilled workmanship, or with materials of any inferior description, or that any materials or articles provided by the CONTRACTOR for the execution of the WORK are unsound, or of a quality inferior to that contracted for, or otherwise not in accordance with the CONTRACT, the CONTRACTOR shall on demand in writing from the ENGINEER-IN-CHARGE or his authorized representative specifying the



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WORK, materials or articles complained of notwithstanding that the same may have been inadvertently passed, certified and paid for, forthwith rectify or remove and reconstruct the WORK so specified and provide other proper and suitable materials or articles at his own cost and in the event of failure to do so within the period specified by the ENGINEER-IN-CHARGE in his demand aforesaid, the CONTRACTOR shall be liable to pay compensation at the rate of 1% (One percent) of the estimated cost of the whole WORK, for every week limited to a maximum of 10% (ten percent) of the value of the whole WORK, while his failure to do so shall continue and in the case of any such failure the ENGINEER-IN-CHARGE may on expiry of notice period rectify or remove and re-execute the WORK or remove and replaced with others, the materials or articles complained of to as the case may be at the risk and expense in all respects of the CONTRACTOR. The decision of the Engineering-in-charge as to any question arising under this clause shall be final and conclusive.

- 77 Suspension of works:** 77.1 i) Subject to the provisions of sub-para (ii) of this clause, the CONTRACTOR shall, if ordered in writing by the ENGINEER-IN-CHARGE, or his representative, temporarily suspend the WORKS or any part thereof for such written order, proceed with the WORK therein ordered to be suspended until, he shall have received a written order to proceed therewith. The CONTRACTOR shall not be entitled to claim compensation for any loss or damage sustained by him by reason of temporary suspension of the WORKS aforesaid. An extension of time for completion, corresponding with the delay caused by any such suspension of the WORKS as aforesaid will be granted to the CONTRACTOR should he apply for the same provided that the suspension was not consequent to any default or failure on the part of the CONTRACTOR.
- ii) In case of suspensions of entire WORK, ordered in writing by ENGINEER-IN-CHARGE, for a period of more than two months, the CONTRACTOR shall have the option to terminate the CONTRACT.
- 78 Employer may do part of work:** 78.1 Upon failure of the CONTRACTOR to comply with any instructions given in accordance with the provisions of this CONTRACT the EMPLOYER has the alternative right, instead of assuming charge of entire WORK, to place additional labour force, tools, equipments and materials on such parts of the WORK, as the EMPLOYER may designate or also engage another CONTRACTOR to carry out the WORK. In such cases, the EMPLOYER shall deduct from the amount which otherwise might become due to the CONTRACTOR, the cost of such work and material with ten percent (10%) added to cover all departmental charges and should the total amount thereof exceed the amount due to the CONTRACTOR, the CONTRACTOR shall pay the difference to the EMPLOYER.
- 79 Possession prior to completion:** 79.1 The ENGINEER-IN-CHARGE shall have the right to take possession of or use any completed or partially completed WORK or part of the WORK. Such possession or use shall not be deemed to be an acceptance of any work completed in accordance with the CONTRACT agreement. If such prior possession or use by the ENGINEER-IN-CHARGE delays the progress of WORK, equitable adjustment in the time of completion will be made and the CONTRACT agreement shall be deemed to be modified accordingly.
- 80 (Defects liability period) twelve months period of liability from the date of** 80.1 The CONTRACTOR shall guarantee the installation/WORK for a period of 12 months from the date of completion of WORK as certified by the ENGINEER-IN-CHARGE which is indicated in the Completion Certificate. Any





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damage or defect that may arise or lie undiscovered at the time of issue of Completion Certificate, connected in any way with the equipment or materials supplied by him or in the workmanship, shall be rectified or replaced by the CONTRACTOR at his own expense as deemed necessary by the ENGINEER-IN-CHARGE or in default, the ENGINEER- IN-CHARGE may carry out such works by other work and deduct actual cost incurred towards labour, supervision and materials consumables or otherwise plus 100% towards overheads (of which the certificate of ENGINEER-IN-CHARGE shall be final) from any sums that may then be or at any time thereafter, become due to the CONTRACTOR or from his Contract Performance Security, or the proceeds of sale thereof or a sufficient part on thereof.

80.2 If the CONTRACTOR feels that any variation in WORK or in quality of materials or proportions would be beneficial or necessary to fulfil the guarantees called for, he shall bring this to the notice of the ENGINEER- IN-CHARGE in writing.

If during the period of liability any portion of the WORK/equipment, is found defective and is rectified/ replaced, the period of liability for such equipment/ portion of WORK shall be operative from the date such rectification/ replacement are carried out and Contract Performance Guarantee shall be furnished separately for the extended period of liability for that portion of WORK/ equipment only. Notwithstanding the above provisions the supplier's, guarantees/warrantees for the replaced equipment shall also be passed on to the EMPLOYER.

80.3 LIMITATION OF LIABILITY

Notwithstanding anything contrary contained herein, the aggregate total liability of CONTRACTOR under the Agreement or otherwise shall be limited to 100% of Agreement / Contract Value. However, neither party shall be liable to the other party for any indirect and consequential damages, loss of profits or loss of production.

**81 Care of works:**

81.0 From the commencement to completion of the WORK, the CONTRACTOR shall take full responsibility for the care for all works including all temporary works and in case any damages, loss or injury shall happen to the WORK or to any part thereof or to any temporary works from any cause whatsoever, shall at his own cost repair and make good the same so that at completion the WORK shall be in good order and in conformity in every respects with the requirement of the CONTRACT and the ENGINEER-IN-CHARGE's instructions.

81.1 DEFECTS PRIOR TO TAKING OVER:

If at any time, before the WORK is taken over, the ENGINEER-IN-CHARGE shall:

- a) Decide that any works done or materials used by the CONTRACTOR or by any SUB-CONTRACTOR is defective or not in accordance with the CONTRACT, or that the works or any portion thereof are defective, or do not fulfill the requirements of CONTRACT (all such matters being hereinafter, called 'Defects' in this clause), and
- b) As soon as reasonably practicable, gives to the CONTRACTOR notice in writing of the said decision, specifying particulars of the defects alleged to exist or to have occurred, then the CONTRACTOR shall at his own expenses and with all speed make good the defects so specified.



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In case CONTRACTOR shall fail to do so, the EMPLOYER may take, at the cost of the CONTRACTOR, such steps as may in all circumstances, be reasonable to make good such defects. The expenditure so incurred by the EMPLOYER will be recovered from the amount due to the CONTRACTOR. The decision of the ENGINEER-IN-CHARGE with regard to the amount to be recovered from the CONTRACTOR will be final and binding on the CONTRACTOR. As soon as the WORK has been completed in accordance with the CONTRACT (except in minor respects that do not affect their use for the purpose for which they are intended and except for maintenance there of provided in clause 80.1 of General Conditions of Contract) and have passed the tests on completion, the ENGINEER-IN-CHARGE shall issue a certificate (hereinafter called Completion Certificate) in which he shall certify the date on which the WORK have been so completed and have passed the said tests and the EMPLOYER shall be deemed to have taken over the WORK on the date so certified. If the WORK has been divided into various groups in the CONTRACT, the EMPLOYER shall be entitled to take over any group or groups before the other or others and there upon the ENGINEER-IN-CHARGE shall issue a Completion Certificate which will, however, be for such group or groups so taken over only. In such an event if the group /section/ part so taken over is related, to the integrated system of the work, notwithstanding date of grant of Completion Certificate for group/ section/ part. The period of liability in respect of such group/ section/ part shall extend 12 (twelve) months from the date of completion of WORK.

81.2 DEFECTS AFTER TAKING OVER:

In order that the CONTRACTOR could obtain a COMPLETION CERTIFICATE he shall make good, with all possible speed, any defect arising from the defective materials supplied by the CONTRACTOR or workmanship or any act or omission of the CONTRACTOR or that may have been noticed or developed, after the works or groups of the works has been taken over, the period allowed for carrying out such WORK will be normally one month. If any defect be not remedied within a reasonable time, the EMPLOYER may proceed to do the WORK at CONTRACTOR's risk and expense and deduct from the final bill such amount as may be decided by the EMPLOYER.

If by reason of any default on the part of the CONTRACTOR a COMPLETION CERTIFICATE has not been issued in respect of any portion of the WORK within one month after the date fixed by the CONTRACT for the completion of the WORK, the EMPLOYER shall be at liberty to use the WORK or any portion thereof in respect of which a completion certificate has not been issued, provided that the WORK or the portion thereof so used as aforesaid shall be afforded reasonable opportunity for completing these works for the issue of Completion Certificate.

**82 Guarantee/transfer of guarantee:**

82.1

For works like water-proofing, acid and alkali resisting materials, pre-construction soil treatment against termite or any other specialized works etc. the CONTRACTOR shall invariably engage SUB-CONTRACTORS who are specialists in the field and firms of repute and such a SUB-CONTRACTOR shall furnish guarantees for their workmanship to the EMPLOYER, through the CONTRACTOR. In case such a SUB-CONTRACTOR/ firm is not prepared to furnish a guarantee to the EMPLOYER, the CONTRACTOR shall give that guarantee to the EMPLOYER directly.

**83 Training of employer's personnel:**

83.1

The CONTRACTOR undertakes to provide training to Engineering personnel selected and sent by the EMPLOYER at the works of the CONTRACTOR



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without any cost to the EMPLOYER. The period and the nature of training for the individual personnel shall be agreed upon mutually between the CONTRACTOR and the EMPLOYER. These engineering personnel shall be given special training at the shops, where the equipment will be manufactured and/ or in their collaborator's works and where possible, in any other plant where equipment manufactured by the CONTRACTOR or his collaborators is under installation or test to enable those personnel to become familiar with the equipment being furnished by the CONTRACTOR. EMPLOYER shall bear only the to and fro fare of the said engineering personnel.

**84 Replacement of defective parts and materials:**

84.1 If during the progress of the WORK, EMPLOYER shall decide and inform in writing to the CONTRACTOR, that the CONTRACTOR has manufactured any plant or part of the plant unsound or imperfect or has furnished plant inferior to the quality specified, the CONTRACTOR on receiving details of such defects or deficiencies shall at his own expenses within 7 (seven) days of his receiving the notice, or otherwise within such time as may be reasonably necessary for making it good, proceed to alter, re-construct or remove such work and furnish fresh equipments up to the standards of the specifications. In case the CONTRACTOR fails to do so, EMPLOYER may on giving the CONTRACTOR 7 (seven) day's notice in writing of his intentions to do so, proceed to remove the portion of the WORK so complained of and at the cost of CONTRACTOR's, perform all such works or furnish all such equipments provided that nothing in the clause shall be deemed to deprive the EMPLOYER of or affect any rights under the CONTRACT, the EMPLOYER may otherwise have in respect of such defects and deficiencies.

84.2 The CONTRACTOR's full and extreme liability under this clause shall be satisfied by the payments to the EMPLOYER of the extra cost, of such replacements procured including erection/installation as provided for in the CONTRACT; such extra cost being the ascertained difference between the price paid by the EMPLOYER for such replacements and the CONTRACT price portion for such defective plants and repayments of any sum paid by the EMPLOYER to the CONTRACTOR in respect of such defective plant. Should the EMPLOYER not so replace the defective plant the CONTRACTOR's extreme liability under this clause shall be limited to the repayment of all such sums paid by the EMPLOYER under the CONTRACT for such defective plant.

**85 Indemnity**

85.1 If any action is brought before a Court, Tribunal or any other Authority against the Employer or an officer or agent of the EMPLOYER, for the failure, omission or neglect on the part of the CONTRACTOR to perform any acts, matters, covenants or things under the CONTRACT, or damage or injury caused by the alleged omission or negligence on the part of the CONTRACTOR, his agents, representatives or his SUB- CONTRACTOR's, or in connection with any claim based on lawful demands of SUB-CONTRACTOR's workmen suppliers or employees, the CONTRACTOR, shall in such cases indemnify and keep the EMPLOYER and/or their representatives harmless from all losses, damages, expenses or decrees arising out of such action.

**86 Construction aids, equipments, tools & tackles:**

86.1 CONTRACTOR shall be solely responsible for making available for executing the WORK, all requisite CONSTRUCTION EQUIPMENTS, Special Aids, Barges, Cranes and the like, all Tools, Tackles and Testing Equipment and Appliances, including imports of such equipment etc. as required. In case of import of the same the rates applicable for levying of Custom Duty on such Equipment, Tools, & Tackles and the duty drawback applicable thereon shall be ascertained by the CONTRACTOR from the concerned authorities of Government of India. It shall be clearly understood that EMPLOYER shall not in any way be



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responsible for arranging to obtain Custom Clearance and/or payment of any duties and/or duty draw backs etc. for such equipments so imported by the CONTRACTOR and the CONTRACTOR shall be fully responsible for all taxes, duties and documentation with regard to the same. Tenderer in his own interest may contact, for any clarifications in the matter, concerned agencies/Dept./Ministries of Govt. of India. All clarifications so obtained and interpretations thereof shall be solely the responsibility of the CONTRACTOR.

**SECTION-VI Certificates and Payments**

**87 Schedule of rates and payments:**

**87.1 i) CONTRACTOR'S REMUNERATION:**

The price to be paid by the EMPLOYER to CONTRACTOR for the whole of the WORK to be done and for the performance of all the obligations undertaken by the CONTRACTOR under the CONTRACT DOCUMENTS shall be ascertained by the application of the respective Schedule of Rates (the inclusive nature of which is more particularly defined by way of application but not of limitation, with the succeeding sub-clause of this clause) and payment to be made accordingly for the WORK actually executed and approved by the ENGINEER-IN-CHARGE. The sum so ascertained shall (excepting only as and to the extent expressly provided herein) constitute the sole and inclusive remuneration of the CONTRACTOR under the CONTRACT and no further or other payment whatsoever shall be or become due or payable to the CONTRACTOR under the CONTRACT.

**ii) SCHEDULE OF RATES TO BE INCLUSIVE:**

The prices/rates quoted by the CONTRACTOR shall remain firm till the issue of FINAL CERTIFICATE and shall not be subject to escalation. Schedule of Rates shall be deemed to include and cover all costs, expenses and liabilities of every description and all risks of every kind to be taken in executing, completing and handing over the WORK to the EMPLOYER by the CONTRACTOR. The CONTRACTOR shall be deemed to have known the nature, scope, magnitude and the extent of the WORK and materials required though the CONTRACT DOCUMENT may not fully and precisely furnish them. Tenderer's shall make such provision in the Schedule of Rates as he may consider necessary to cover the cost of such items of WORK and materials as may be reasonable and necessary to complete the WORK. The opinion of the ENGINEER-IN-CHARGE as to the items of WORK which are necessary and reasonable for COMPLETION OF WORK shall be final and binding on the CONTRACTOR, although the same may not be shown on or described specifically in CONTRACT DOCUMENTS.

Generality of this present provision shall not be deemed to cut down or limit in any way because in certain cases it may and in other cases it may not be expressly stated that the CONTRACTOR shall do or perform a work or supply articles or perform services at his own cost or without addition of payment or without extra charge or words to the same effect or that it may be stated or not stated that the same are included in and covered by the Schedule of Rates.

**iii) SCHEDULE OF RATES TO COVER CONSTRUCTION EQUIPMENTS, MATERIALS, LABOUR ETC.:**



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Without in any way limiting the provisions of the preceding sub-clause the Schedule of Rates shall be deemed to include and cover the cost of all construction equipment, temporary WORK (except as provided for herein), pumps, materials, labour, insurance, fuel, consumables, stores and appliances to be supplied by the CONTRACTOR and all other matters in connection with each item in the Schedule of Rates and the execution of the WORK or any portion thereof finished, complete in every respect and maintained as shown or described in the CONTRACT DOCUMENTS or as may be ordered in writing during the continuance of the CONTRACT.

iv) SCHEDULE OF RATES TO COVER ROYALTIES, RENTS AND CLAIMS:

The Schedule of Rates (i.e., VALUE OF CONTRACT) shall be deemed to include and cover the cost of all royalties and fees for the articles and processes, protected by letters, patent or otherwise incorporated in or used in connection with the WORK, also all royalties, rents and other payments in connection with obtaining materials of whatsoever kind for the WORK and shall include an indemnity to the EMPLOYER which the CONTRACTOR hereby gives against all actions, proceedings, claims, damages, costs and expenses arising from the incorporation in or use on the WORK of any such articles, processes or materials, octroi or other municipal or local Board Charges, if levied on materials, equipment or machineries to be brought to site for use on WORK shall be borne by the CONTRACTOR.

v) SCHEDULE OF RATES TO COVER TAXES AND DUTIES:

No exemption or reduction of Customs Duties, Excise Duties, Sales Tax, Sales Tax on works Contract quay or any port dues, transport charges, stamp duties or Central or State Government or local Body or Municipal Taxes or duties, taxes or charges (from or of any other body), whatsoever, will be granted or obtained, all of which expenses shall be deemed to be included in and covered by the Schedule or Rates. The CONTRACTOR shall also obtain and pay for all permits or other privileges necessary to complete the WORK.

vi) SCHEDULE OF RATES TO COVER RISKS OF DELAY:

The Schedule of Rates shall be deemed to include and cover the risk of all possibilities of delay and interference with the CONTRACTOR's conduct of WORK which occur from any causes including orders of the EMPLOYER in the exercise of his power and on account of extension of time granted due to various reasons and for all other possible or probable causes of delay.

vii) SCHEDULE OF RATES CANNOT BE ALTERED:

For WORK under unit rate basis, no alteration will be allowed in the Schedule of Rates by reason of works or any part of them being modified, altered, extended, diminished or committed. The Schedule of Rates are fully inclusive of rates which have been fixed by the CONTRACTOR and agreed to by the EMPLOYER and cannot be altered.



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For lumpsum CONTRACTS, the payment will be made according to the WORK actually carried out, for which purpose an item wise, or work wise Schedule of Rates shall be furnished, suitable for evaluating the value of WORK done and preparing running account bill. Payment for any additional work which is not covered in the Schedule of Rates, shall only be released on issuance of change order.

**88 Procedure for measurement and billing of work in progress:**

**88.1 BILLING PROCEDURE:**

Following procedures shall be adopted for billing of works executed by the CONTRACTOR.

88.1.1 All measurements shall be recorded in sixuplicate on standard measurement sheets supplied by EMPLOYER and submitted to EMPLOYER/CONSULTANT for scrutiny and passing.

88.1.2 EMPLOYER/CONSULTANT shall scrutinize and check the measurements recorded on the sheets and shall certify correctness of the same on the measurement sheets.

88.1.3 ENGINEER-IN-CHARGE shall pass the bills after carrying out the comprehensive checks in accordance with the terms and conditions of the CONTRACTS, within 7 days of submission of the bills, complete in all respects and send the same to the Employer to effect payment to the CONTRACTOR.

88.1.4 TFL shall make all Endeavour to make payments of undisputed amount of the bills submitted based on the joint measurements within 15 (Fifteen) days from the date of certification by the Engineer-in-Charge.

88.1.5 Measurements shall be recorded as per the methods of measurement spelt out in EMPLOYER/CONSULTANT SPECIFICATIONS / CONTRACT DOCUMENT. EMPLOYER/CONSULTANT shall be fully responsible for checking the measurements quantitatively and qualitatively as recorded in the Measurement Books/ Bills.

88.1.6 While preparing the final bills overall measurements will not be taken again. Only volume of work executed since the last measured bill along with summary of final measurements will be considered for the final bill. However, a detailed check shall be made as to missing measurements and in case there are any missing items or measurements the same shall be recorded.

**88.2 SECURED ADVANCE ON MATERIAL:**

Unless otherwise provided elsewhere in the tender, no 'Secured Advance' on security of materials brought to site for execution of contracted items(s) shall be paid to the Contractor whatsoever.

**88.3 DISPUTE IN MODE OF MEASUREMENT:**

In case of any dispute as to the mode of measurement not covered by the CONTRACT to be adopted for any item of WORK, mode of measurement as per latest Indian Standard Specifications shall be followed.

**88.4 ROUNDING OF AMOUNTS:**



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In calculating the amount of each item due to the CONTRACTOR in every certificate prepared for payment, sum of less than 50 paise shall be omitted and the total amount on each certificate shall be rounded off to the nearest rupees, i.e., sum of less than 50 paise shall be omitted and sums of 50 paise and more upto one rupee shall be reckoned as one rupee.

- 89 Lumpsum in tender:** 89.1 The payment against any Lumpsum item shall be made only on completion of that item as per the provision of the CONTRACT after certification by ENGINEER-IN-CHARGE.
- 90 Running account payments to be regarded as advance:** 90.1 All running account payments shall be regarded as payment by way of advance against the final payment only and not as payments for WORK actually done and completed and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed or re-erected or be considered as an admission of the due performance of the CONTRACT, or any part thereof, in this respect, or of the accruing of any claim by the CONTRACTOR, nor shall it conclude, determine or affect in any way the powers of the EMPLOYER under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise, or in any other way vary or affect the CONTRACT. The final bill shall be submitted by the CONTRACTOR within one month of the date of physical completion of the WORK, otherwise, the ENGINEER-IN-CHARGE's certificate of the measurement and of total amount payable for the WORK accordingly shall be final and binding on all parties
- 91 Notice of claims for additional payments:** 91.1 Should the CONTRACTOR consider that he is entitled to any extra payment for any extra/additional WORKS or MATERIAL change in original SPECIFICATIONS carried out by him in respect of WORK he shall forthwith give notice in writing to the ENGINEER-IN-CHARGE that he claims extra payment. Such notice shall be given to the ENGINEER-IN-CHARGE upon which CONTRACTOR bases such claims and such notice shall contain full particulars of the nature of such claim with full details of amount claimed. Irrespective of any provision in the CONTRACT to the contrary, the CONTRACTOR must intimate his intention to lodge claim on the EMPLOYER within 10 (ten) days of the commencement of happening of the event and quantify the claim within 30 (thirty) days, failing which the CONTRACTOR will lose his right to claim any compensation/reimbursement/damages etc. or refer the matter to arbitration. Failure on the part of CONTRACTOR to put forward any claim without the necessary particulars as above within the time above specified shall be an absolute waiver thereof. No omission by EMPLOYER to reject any such claim and no delay in dealing therewith shall be waiver by EMPLOYER of any of this rights in respect thereof.
- 91.2 ENGINEER-IN-CHARGE shall review such claims within a reasonably period of time and cause to discharge these in a manner considered appropriate after due deliberations thereon. However, CONTRACTOR shall be obliged to carry on with the WORK during the period in which his claims are under consideration by the EMPLOYER, irrespective of the outcome of such claims, where additional payments for WORKS considered extra are justifiable in accordance with the CONTRACT provisions, EMPLOYER shall arrange to release the same in the same manner as for normal WORK payments. Such of the extra works so admitted by EMPLOYER shall be governed by all the terms, conditions, stipulations and specifications as are applicable for the CONTRACT. The rates for extra works shall generally be the unit rates provided for in the CONTRACT. In



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the event unit rates for extra works so executed are not available as per CONTRACT, payments may either be released on day work basis for which daily/hourly rates for workmen and hourly rates for equipment rental shall apply, or on the unit rate for WORK executed shall be derived by interpolation/extrapolation of unit rates already existing in the CONTRACT. In all the matters pertaining to applicability of rate and admittance of otherwise of an extra work claim of CONTRACTOR the decision of ENGINEER-IN-CHARGE shall be final and binding.

- 92 Payment of contractor's bill:**
- 92.1 No payment shall be made for works estimated to cost less than Rs.10,000/- till the whole of the work shall have been completed and a certificate of completion given. But in case of works estimated to cost more than Rs.10,000/-, that CONTRACTOR on submitting the bill thereof be entitled to receive a monthly payment proportionate to the part thereof approved and passed by the ENGINEER-IN-CHARGE, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the CONTRACTOR. This payment will be made after making necessary corrections/deductions as stipulated elsewhere in the CONTRACT DOCUMENT for materials, Contract Performance Security, taxes etc.
- 92.2 Payment due to the CONTRACTOR shall be made by the EMPLOYER by Account Payee cheque forwarding the same to registered office or the notified office of the CONTRACTOR. In no case will EMPLOYER be responsible if the cheque is mislaid or misappropriated by unauthorized person/persons. In all cases, the CONTRACTOR shall present his bill duly pre-receipted on proper revenue stamp payment shall be made in Indian Currency.
- 92.3 In general payment of final bill shall be made to CONTRACTOR within 60 days of the submission of bill on joint measurements, after completion of all the obligations under the CONTRACT.
- 93 Receipt for payment:**
- 93.1 Receipt for payment made on account of work when executed by a firm, must be signed by a person holding due power of attorney in this respect on behalf of the CONTRACTOR, except when the CONTRACTOR's are described in their tender as a limited company in which case the receipts must be signed in the name of the company by one of its principal officers or by some other person having authority to give effectual receipt for the company.
- 94 Completion certificate:**
- 94.1 APPLICATION FOR COMPLETION CERTIFICATE:
- When the CONTRACTOR fulfils his obligation under Clause 81.1 he shall be eligible to apply for COMPLETION CERTIFICATE.
- The ENGINEER-IN-CHARGE shall normally issue to the CONTRACTOR the COMPLETION CERTIFICATE within one month after receiving any application therefore from the CONTRACTOR after verifying from the completion documents and satisfying himself that the WORK has been completed in accordance with and as set out in the construction and erection drawings, and the CONTRACT DOCUMENTS.
- The CONTRACTOR, after obtaining the COMPLETION CERTIFICATE, is eligible to present the final bill for the WORK executed by him under the terms of CONTRACT.
- 94.2 COMPLETION CERTIFICATE:





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Within one month of the completion of the WORK in all respects, the CONTRACTOR shall be furnished with a certificate by the ENGINEER-IN-CHARGE of such completion, but no certificate shall be given nor shall the WORK be deemed to have been executed until all scaffolding, surplus materials and rubbish is cleared off the SITE completely nor until the WORK shall have been measured by the ENGINEER-IN-CHARGE whose measurement shall be binding and conclusive. The WORKS will not be considered as complete and taken over by the EMPLOYER, until all the temporary works, labour and staff colonies are cleared to the satisfaction of the ENGINEER-IN-CHARGE.

If the CONTRACTOR fails to comply with the requirements of this clause on or before the date fixed for the completion of the WORK, the ENGINEER-IN-CHARGE may at the expense of the CONTRACTOR remove such scaffolding, surplus materials and rubbish and dispose off the same as he thinks fit and clean off such dirt as aforesaid, and the CONTRACTOR shall forthwith pay the amount of all expenses so incurred and shall have no claim in respect of any such scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

94.3 COMPLETION CERTIFICATE DOCUMENTS:



For the purpose of Clause 94.0 the following documents will be deemed to form the completion documents:

- i) The technical documents according to which the WORK was carried out.
- ii) Six (6) sets of construction drawings showing therein the modification and correction made during the course of execution and signed by the ENGINEER-IN-CHARGE.
- iii) COMPLETION CERTIFICATE for 'embedded' and 'covered' up work.
- iv) Certificates of final levels as set out for various works.
- v) Certificates of tests performed for various WORKS.
- vi) Material appropriation, Statement for the materials issued by the EMPLOYER for the WORK and list of surplus materials returned to the EMPLOYER's store duly supported by necessary documents.

**95 Final decision and final certificate:**

95.1

Upon expiry of the period of liability and subject to the ENGINEER-IN-CHARGE being satisfied that the WORKS have been duly maintained by the CONTRACTOR during monsoon or such period as hereinbefore provided in Clause 80 & 81 and that the CONTRACTOR has in all respect duly made-up any subsidence and performed all his obligations under the CONTRACT, the ENGINEER-IN-CHARGE shall (without prejudice to the rights of the EMPLOYER to retain the provisions of relevant Clause hereof) otherwise give a certificate herein referred to as the FINAL CERTIFICATE to that effect and the CONTRACTOR shall not be considered to have fulfilled the whole of his obligations under CONTRACT until FINAL CERTIFICATE shall have been given by the ENGINEER-IN-CHARGE notwithstanding any previous entry upon the WORK and taking possession, working or using of the same or any part

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thereof by the EMPLOYER.



- 96 Certificate and payments on evidence of completion:** 96.1 Except the FINAL CERTIFICATE, no other certificates or payments against a certificate or on general account shall be taken to be an admission by the EMPLOYER of the due performance of the CONTRACT or any part thereof or of occupancy or validity of any claim by the CONTRACTOR.
- 97 Deductions from the contract price:** 97.1 All costs, damages or expenses which EMPLOYER may have paid or incurred, which under the provisions of the CONTRACT, the CONTRACTOR is liable/will be liable, will be claimed by the EMPLOYER. All such claims shall be billed by the EMPLOYER to the CONTRACTOR regularly as and when they fall due. Such claims shall be paid by the CONTRACTOR within 15 (fifteen) days of the receipt of the corresponding bills and if not paid by the CONTRACTOR within the said period, the EMPLOYER may, then, deduct the amount from any moneys due i.e., Contract Performance Security or becoming due to the CONTRACTOR under the CONTRACT or may be recovered by actions of law or otherwise, if the CONTRACTOR fails to satisfy the EMPLOYER of such claims.

#### SECTION-VII Taxes and Insurance

- 98 Taxes, Duties, Octroi etc:** 98.1 The CONTRACTOR agrees to and does hereby accept full and exclusive liability for the payment of any and all Taxes, Duties, including Excise duty, octroi etc. now or hereafter imposed, increased, modified, all the sales taxes, duties, octrois etc. now in force and hereafter increased, imposed or modified, from time to time in respect of WORKS and materials and all contributions and taxes for unemployment compensation, insurance and old age pensions or annuities now or hereafter imposed by any Central or State Government authorities which are imposed with respect to or covered by the wages, salaries, or other compensations paid to the persons employed by the CONTRACTOR and the CONTRACTOR shall be responsible for the compliance of all SUB-CONTRACTORS, with all applicable Central, State, Municipal and local law and regulation and requirement of any Central, State or local Government agency or authority. CONTRACTOR further agrees to defend, indemnify and hold EMPLOYER harmless from any liability or penalty which may be imposed by the Central, State or Local authorities by reason or any violation by CONTRACTOR or SUB-CONTRACTOR of such laws, suits or proceedings that may be brought against the EMPLOYER arising under, growing out of, or by reason of the work provided for by this CONTRACT, by third parties, or by Central or State Government authority or any administrative sub-division thereof.

Tax deductions will be made as per the rules and regulations in force in accordance with acts prevailing from time to time.

- 99 Sales tax/turnover tax:** 99.1 Tenderer should quote all inclusive prices including the liability of Sales Tax/Turnover Tax whether on the works contract as a whole or in respect of bought out components used by the CONTRACTOR in execution of the CONTRACT. EMPLOYER shall not be responsible for any such liability of the CONTRACTOR in respect of this CONTRACT.
- 100 Statutory variations** 100.1 Tenderer should quote prices inclusive of excise-duty and sales tax applicable on finished product. Any statutory variations in Excise Duty and sales tax on finished product during the contractual completion period, shall be to the Employer's account for which the Contractor will furnish documentary evidence(s) in support of their claims to TFL. However, any increase in the rate of these taxes and duties (E.D. and S.T.) beyond the contractual completion period shall be to Contractor's account and any decrease shall be passed on to

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**101 Insurance:**

101.1 GENERAL

CONTRACTOR shall at his own expense arrange secure and maintain insurance with reputable insurance companies to the satisfaction of the EMPLOYER as follows:

CONTRACTOR at his cost shall arrange, secure and maintain insurance as may be necessary and to its full value for all such amounts to protect the WORKS in progress from time to time and the interest of EMPLOYER against all risks as detailed herein. The form and the limit of such insurance, as defined here in together with the under works thereof in each case should be as acceptable to the EMPLOYER. However, irrespective of work acceptance the responsibility to maintain adequate insurance coverage at all times during the period of CONTRACT shall be that of CONTRACTOR alone. CONTRACTOR's failure in this regard shall not relieve him of any of his responsibilities and obligations under CONTRACT.

Any loss or damage to the equipment, during ocean transportation, port/custom clearance, inland and port handling, inland transportation, storage, erection and commissioning till such time the WORK is taken over by EMPLOYER, shall be to the account of CONTRACTOR. CONTRACTOR shall be responsible for preferring of all claims and make good for the damage or loss by way of repairs and/or replacement of the parts of the Work damaged or lost. CONTRACTOR shall provide the EMPLOYER with a copy of all insurance policies and documents taken out by him in pursuance of the CONTRACT. Such copies of document shall be submitted to the EMPLOYER immediately upon the CONTRACTOR having taken such insurance coverage. CONTRACTOR shall also inform the EMPLOYER at least 60(Sixty) days in advance regarding the expiry cancellation and/or changes in any of such documents and ensure revalidation/renewal etc., as may be necessary well in time.

Statutory clearances, if any, in respect of foreign supply required for the purpose of replacement of equipment lost in transit and/or during erection, shall be made available by the EMPLOYER. CONTRACTOR shall, however, be responsible for obtaining requisite licenses, port clearances and other formalities relating to such import. The risks that are to be covered under the insurance shall include, but not be limited to the loss or damage in handling, transit, theft, pilferage, riot, civil commotion, weather conditions, accidents of all kinds, fire, war risk (during ocean transportation only) etc. The scope of such insurance shall cover the entire value of supplies of equipments, plants and materials to be imported from time to time.

All costs on account of insurance liabilities covered under CONTRACT will be to CONTRACTOR's account and will be included in VALUE OF CONTRACT. However, the EMPLOYER may from time to time, during the currency of the CONTRACT, ask the CONTRACTOR in writing to limit the insurance coverage risk and in such a case, the parties to the CONTRACT will agree for a mutual settlement, for reduction in VALUE OF CONTRACT to the extent of reduced premium amounts.

CONTRACTOR as far as possible shall cover insurance with Indian Insurance Companies, including marine Insurance during ocean transportation.

i) EMPLOYEES STATE INSURANCE ACT:



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The CONTRACTOR agrees to and does hereby accept full and exclusive liability for the compliance with all obligations imposed by the Employee State Insurance Act 1948 and the CONTRACTOR further agrees to defend, indemnify and hold EMPLOYER harmless for any liability or penalty which may be imposed by the Central, State or Local authority by reason of any asserted violation by CONTRACTOR or SUB-CONTRACTOR of the Employees' State Insurance Act, 1948, and also from all claims, suits or proceeding that may be brought against the EMPLOYER arising under, growing out of or by reasons of the work provided for by this CONTRACTOR, by third parties or by Central or State Government authority or any political sub- division thereof.

The CONTRACTOR agrees to fill in with the Employee's State Insurance Corporation, the Declaration Forms, and all forms which may be required in respect of the CONTRACTOR's or SUB-CONTRACTOR's employees, who are employed in the WORK provided for or those covered by ESI from time to time under the Agreement. The CONTRACTOR shall deduct and secure the agreement of the SUB- CONTRACTOR to deduct the employee's contribution as per the first schedule of the Employee's State Insurance Act from wages and affix the Employees Contribution Card at wages payment intervals. The CONTRACTOR shall remit and secure the agreement of SUB-CONTRACTOR to remit to the State Bank of India, Employee's State Insurance Corporation Account, the Employee's contribution as required by the Act. The CONTRACTOR agrees to maintain all cards and Records as required under the Act in respect of employees and payments and the CONTRACTOR shall secure the agreement of the SUB- CONTRACTOR to maintain such records. Any expenses incurred for the contributions, making contributions or maintaining records shall be to the CONTRACTOR's or SUB-CONTRACTOR's account.

The EMPLOYER shall retain such sum as may be necessary from the total VALUE OF CONTRACT until the CONTRACTOR shall furnish satisfactory proof that all contributions as required by the Employees State Insurance Act, 1948, have been paid. This will be pending on the CONTRACTOR when the ESI Act is extended to the place of work.

ii) WORKMEN COMPENSATION AND EMPLOYER'S LIABILITY INSURANCE:

Insurance shall be effected for all the CONTRACTOR's employees engaged in the performance of this CONTRACT. If any of the work is sublet, the CONTRACTOR shall require the SUB-CONTRACTOR to provide workman's Compensation and employer's liability insurance for the later's employees if such employees are not covered under the CONTRACTOR's Insurance.

iii) ACCIDENT OR INJURY TO WORKMEN:

The EMPLOYER shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workman or other person in the Employment of the CONTRACTOR or any SUB-CONTRACTOR save and except an accident or injury resulting from any act or default of the EMPLOYER, his agents or servants and the CONTRACTOR shall indemnify and keep



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indemnified the EMPLOYER against all such damages and compensation (save and except and aforesaid) and against all claims, demands, proceeding, costs, charges and expenses, whatsoever in respect or in relation thereto.

iv) TRANSIT INSURANCE



In respect of all items to be transported by the CONTRACTOR to the SITE of WORK, the cost of transit insurance should be borne by the CONTRACTOR and the quoted price shall be inclusive of this cost.

v) COMPREHENSIVE AUTOMOBILE INSURANCE

This insurance shall be in such a form as to protect the Contractor against all claims for injuries, disability, disease and death to members of public including EMPLOYER's men and damage to the property of others arising from the use of motor vehicles during on or off the 'site' operations, irrespective of the Employership of such vehicles.

VI) COMPREHENSIVE GENERAL LIABILITY INSURANCE

- a) This insurance shall protect the Contractor against all claims arising from injuries, disabilities, disease or death of member of public or damage to property of others due to any act or omission on the part of the Contractor, his agents, his employees, his representatives and Sub-Contractor's or from riots, strikes and civil commotion.
- b) Contractor shall take suitable Group Personal Accident Insurance Cover for taking care of injury, damage or any other risks in respect of his Engineers and other Supervisory staff who are not covered under Employees State Insurance Act.
- c) The policy shall cover third party liability. The third party (liability shall cover the loss/ disablement of human life (person not belonging to the Contractor) and also cover the risk of damage to others materials/ equipment/ properties during construction, erection and commissioning at site. The value of third party liability for compensation for loss of human life or partial/full disablement shall be of required statutory value but not less than Rs. 2 lakhs per death, Rs. 1.5 lakhs per full disablement and Rs. 1 lakh per partial disablement and shall nevertheless cover such compensation as may be awarded by Court by Law in India and cover for damage to others equipment/ property as approved by the Purchaser. However, third party risk shall be maximum to Rs. 10(ten) lakhs to death.
- d) The Contractor shall also arrange suitable insurance to cover damage, loss, accidents, risks etc., in respect of all his plant, equipments and machinery, erection tools & tackles and all other temporary attachments brought by him at site to execute the work.

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e) The Contractor shall take out insurance policy in the joint name of EMPLOYER and Contractor from one or more nationalized insurance company from any branch office at Project site.

f) Any such insurance requirements as are hereby established as the minimum policies and coverage which Contractor must secure and keep in force must be complied with, Contractor shall at all times be free to obtain additional or increased coverage at Contractor's sole expenses.

vii) ANY OTHER INSURANCE REQUIRED UNDER LAW OR REGULATIONS OR BY EMPLOYER:

CONTRACTOR shall also carry and maintain any and all other insurance(s) which he may be required under any law or regulation from time to time without any extra cost to EMPLOYER. He shall also carry and maintain any other insurance which may be required by the EMPLOYER.

**102 Damage to Property or to any Person or any Third Party**

102.1 i)

CONTRACTOR shall be responsible for making good to the satisfaction of the EMPLOYER any loss or any damage to structures and properties belonging to the EMPLOYER or being executed or procured or being procured by the EMPLOYER or of other agencies within in the premises of all the work of the EMPLOYER, if such loss or damage is due to fault and/or the negligence or willful acts or omission of the CONTRACTOR, his employees, agents, representatives or SUB-CONTRACTORS.

ii)

The CONTRACTOR shall take sufficient care in moving his plants, equipments and materials from one place to another so that they do not cause any damage to any person or to the property of the EMPLOYER or any third party including overhead and underground cables and in the event of any damage resulting to the property of the EMPLOYER or of a third party during the movement of the aforesaid plant, equipment or materials the cost of such damages including eventual loss of production, operation or services in any plant or establishment as estimated by the EMPLOYER or ascertained or demanded by the third party shall be borne by the CONTRACTOR. Third party liability risk shall be Rupees One lakh for single accident and limited to Rupees Ten lakhs.

iii)

The CONTRACTOR shall indemnify and keep the EMPLOYER harmless of all claims for damages to property other than EMPLOYER's property arising under or by reason of this agreement, if such claims result from the fault and/or negligence or willful acts or omission of the CONTRACTOR, his employees, agents, representative of SUB-CONTRACTOR.

#### SECTION-VIII Labour Laws

**103 Labour laws:**

103.1 i)

No labour below the age of 18 (eighteen) years shall be employed on the WORK.

ii)

The CONTRACTOR shall not pay less than what is provided under law



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to labourers engaged by him on the WORK.

- iii) The CONTRACTOR shall at his expense comply with all labour laws and keep the EMPLOYER indemnified in respect thereof.
- iv) The CONTRACTOR shall pay equal wages for men and women in accordance with applicable labour laws.
- v) If the CONTRACTOR is covered under the Contract labour (Regulation and Abolition) Act, he shall obtain a licence from licensing authority (i.e. office of the labour commissioner) by payment of necessary prescribed fee and the deposit, if any, before starting the WORK under the CONTRACT. Such fee/deposit shall be borne by the CONTRACTOR.
- vi) The CONTRACTOR shall employ labour in sufficient numbers either directly or through SUB- CONTRACTOR's to maintain the required rate of progress and of quality to ensure workmanship of the degree specified in the CONTRACT and to the satisfaction of the ENGINEER-IN-CHARGE.
- vii) The CONTRACTOR shall furnish to the ENGINEER-IN- CHARGE the distribution return of the number and description, by trades of the work people employed on the works. The CONTRACTOR shall also submit on the 4th and 19th of every month to the ENGINEER-IN-CHARGE a true statement showing in respect of the second half of the preceding month and the first half of the current month (1) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them and (2) the number of female workers who have been allowed Maternity Benefit as provided in the Maternity Benefit Act 1961 on Rules made there under and the amount paid to them.
- viii) The CONTRACTOR shall comply with the provisions of the payment of Wage Act 1936, Employee Provident Fund Act 1952, Minimum Wages Act 1948. Employers Liability Act 1938. Workmen's Compensation Act 1923, Industrial Disputes Act 1947, the Maternity Benefit Act 1961 and Contract Labour Regulation and Abolition Act 1970, Employment of Children Act 1938 or any modifications thereof or any other law relating thereto and rules made there under from time to time.
- ix) The ENGINEER-IN-CHARGE shall on a report having been made by an Inspecting Officer as defined in Contract Labour (Regulation and Abolition) Act 1970 have the power to deduct from the money due to the CONTRACTOR any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the Conditions of the Contract for the benefit of workers, non-payment of wages or of deductions made from his or their wages which are not justified by the terms of the Contract or non-observance of the said regulations.
- x) The CONTRACTOR shall indemnify the EMPLOYER against any payments to be made under and for the observance of the provisions of the aforesaid Acts without prejudice to his right to obtain indemnity



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from his SUB-CONTRACTOR's. In the event of the CONTRACTOR committing a default or breach of any of the provisions of the aforesaid Acts as amended from time to time, of furnishing any information or submitting or filling and Form/ Register/ Slip under the provisions of these Acts which is materially incorrect then on the report of the inspecting Officers, the CONTRACTOR shall without prejudice to any other liability pay to the EMPLOYER a sum not exceeding Rs.50.00 as Liquidated Damages for every default, breach or furnishing, making, submitting, filling materially incorrect statement as may be fixed by the ENGINEER-IN- CHARGE and in the event of the CONTRACTOR's default continuing in this respect, the Liquidated Damages may be enhanced to Rs.50.00 per day for each day of default subject to a maximum of one percent of the estimated cost of the WORK put to tender. The ENGINEER-IN-CHARGE shall deduct such amount from bills or Contract Performance Security of the CONTRACTOR and credit the same to the Welfare Fund constitute under these acts. The decision of the ENGINEER-IN-CHARGE in this respect shall be final and binding.

**104 Implementation of apprentices act, 1961:**

104.1

The CONTRACTOR shall comply with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time. If he fails to do so, his failure will be a breach of the CONTRACT and the ENGINEER-IN-CHARGE may, at his discretion, cancel the CONTRACT. The CONTRACTOR shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions, of the Act.

**105 Contractor to indemnify the employer:**

105.1 i)

The CONTRACTOR shall indemnify the EMPLOYER and every member, office and employee of the EMPLOYER, also the ENGINEER-IN-CHARGE and his staff against all actions, proceedings, claims, demands, costs and expenses whatsoever arising out of or in connection with the matters referred to in Clause 102.0 and elsewhere and all actions, proceedings, claims, demands, costs and expenses which may be made against the EMPLOYER for or in respect of or arising out of any failure by the CONTRACTOR in the performance of his obligations under the CONTRACT DOCUMENT. The EMPLOYER shall not be liable for or in respect of or arising out of any failure by the CONTRACTOR in the performance of his obligations under the CONTRACT DOCUMENT. The EMPLOYER shall not be liable for or in respect of any demand or compensation payable by law in respect or in consequence of any accident or injury to any workmen or other person. In the employment of the CONTRACTOR or his SUB-CONTRACTOR the CONTRACTOR shall indemnify and keep indemnified the EMPLOYER against all such damages and compensations and against all claims, damages, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

ii)

**PAYMENT OF CLAIMS AND DAMAGES:**

Should the EMPLOYER have to pay any money in respect of such claims or demands as aforesaid the amount so paid and the costs incurred by the EMPLOYER shall be charged to and paid by the CONTRACTOR and the CONTRACTOR shall not be at liberty to dispute or question the right of the EMPLOYER to make such





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payments notwithstanding the same, may have been made without the consent or authority or in law or otherwise to the contrary.

- iii) In every case in which by virtue of the provisions of Section 12, Sub-section (i) of workmen's compensation Act, 1923 or other applicable provision of Workmen Compensation Act or any other Act, the EMPLOYER is obliged to pay compensation to a workman employed by the CONTRACTOR in execution of the WORK, the EMPLOYER will recover from the CONTRACTOR the amount of the compensation so paid, and without prejudice to the rights of EMPLOYER under Section 12, Sub- section (2) of the said act, EMPLOYER shall be at liberty to recover such amount or any part thereof by deducting it from the Contract Performance Security or from any sum due to the CONTRACTOR whether under this CONTRACT or otherwise. The EMPLOYER shall not be bound to contest any claim made under Section 12, Sub-section (i) of the said act, except on the written request of the CONTRACTOR and upon his giving to the EMPLOYER full security for all costs for which the EMPLOYER might become liable in consequence of contesting such claim.

**106 Health and sanitary  
arrangements for workers:**

- 106.1 In respect of all labour directly or indirectly employed in the WORKS for the performance of the CONTRACTOR's part of this agreement, the CONTRACTOR shall comply with or cause to be complied with all the rules and regulations of the local sanitary and other authorities or as framed by the EMPLOYER from time to time for the protection of health and sanitary arrangements for all workers.
- 106.2 The CONTRACTOR shall provide in the labour colony all amenities such as electricity, water and other sanitary and health arrangements. The CONTRACTOR shall also provide necessary surface transportation to the place of work and back to the colony for their personnel accommodated in the labour colony.

**SECTION-IX Applicable Laws and Settlement of Disputes**



**107 Arbitration:**

- 107.1 Unless otherwise specified, the matters where decision of the Engineer-in-Charge is deemed to be final and binding as provided in the Agreement and the issues/disputes which cannot be mutually resolved within a reasonable time, all disputes shall be referred to arbitration by Sole Arbitrator.

The Employer [Talcher Fertilizers Ltd.] shall suggest a panel of three independent and distinguished persons to the bidder/contractor/supplier/buyer (as the case may be) to select any one among them to act as the Sole Arbitrator.

In the event of failure of the other parties to select the Sole Arbitrator within 30 days from the receipt of the communication suggesting the panel of arbitrators, the right of selection of the sole arbitrator by the other party shall stand forfeited and the EMPLOYER (TFL) shall have discretion to proceed with the appointment of the Sole Arbitrator. The decision of Employer on the appointment of the sole arbitrator shall be final and binding on the parties.

The award of sole arbitrator shall be final and binding on the parties and unless directed/awarded otherwise by the sole arbitrator, the cost of arbitration proceedings shall be shared equally by the parties. The Arbitration proceedings shall be in English language and venue shall be New Delhi, India.

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Subject to the above, the provisions of (Indian) Arbitration & Conciliation ACT 1996 and the Rules framed there under shall be applicable. All matter relating to this contract are subject to the exclusive jurisdiction of the court situated in the state of Delhi.

Bidders/suppliers/contractors may please note that the Arbitration & Conciliation Act 1996 was enacted by the Indian Parliament and is based on United Nations Commission on International Trade Law (UNCITRAL model law), which were prepared after extensive consultation with Arbitral Institutions and centers of International Commercial Arbitration. The United Nations General Assembly vide resolution 31/98 adopted the UNCITRAL Arbitration rules on 15 December 1976.

107.2 FOR THE SETTLEMENT OF DISPUTES BETWEEN GOVERNMENT DEPARTMENT AND ANOTHER AND ONE GOVERNMENT DEPARTMENT AND PUBLIC ENTERPRISE AND ONE PUBLIC ENTERPRISE AND ANOTHER THE ARBITRATION SHALL BE AS FOLLOWS:

"In the event of any dispute or difference between the parties hereto, such dispute or difference shall be resolved amicably by mutual consultation or through the good offices of empowered agencies of the Government. If such resolution is not possible, then, the unresolved dispute or difference shall be referred to arbitration of an arbitrator to be nominated by Secretary, Department of Legal Affairs ("Law Secretary") in terms of the Office Memorandum No.55/3/1/75-CF, dated the 19th December 1975 issued by the Cabinet Secretariat (Department of Cabinet Affairs), as modified from time to time. The Arbitration Act 1940 (10 of 1940) shall not be applicable to the arbitration under this clause. The award of the Arbitrator shall be binding upon parties to the dispute. Provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to Law Secretary whose decision shall bind the parties finally and conclusively.

**108 Jurisdiction:**

The CONTRACT shall be governed by and constructed according to the laws in force in INDIA. The CONTRACTOR hereby submits to the jurisdiction of the Courts situated at DELHI for the purposes of disputes, actions and proceedings arising out of the CONTRACT, the courts at DELHI only will have the jurisdiction to hear and decide such disputed, actions and proceedings.

**SECTION-X Safety Codes**

**109 General:**

109.1 CONTRACTOR shall adhere to safe construction practice and guard against hazardous, and unsafe working conditions and shall comply with EMPLOYER's safety rules as set forth herein. Prior to start of construction, CONTRACTOR will be furnished copies of EMPLOYER's "Safety Code" for information and guidance, if it has been prepared.

**110 Safety regulations:**

110.1 i) In respect of all labour, directly employed in the WORK for the performance of CONTRACTOR's part of this agreement, the CONTRACTOR shall at his own expense arrange for all the safety provisions as per safety codes of C.P.W.D., Indian Standards Institution. The Electricity Act, The Mines Act and such other acts as applicable.



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- ii) The CONTRACTOR shall observe and abide by all fire and safety regulations of the EMPLOYER. Before starting construction work CONTRACTOR shall consult with EMPLOYER's safety Engineers or ENGINEER- IN-CHARGE and must make good to the satisfaction of the EMPLOYER any loss or damage due to fire to any portion of the work done or to be done under this agreement or to any of the EMPLOYER's existing property.
- 111 First aid and industrial injuries:** 111.0
- i) CONTRACTOR shall maintain first aid facilities for its employees and those of its SUB-CONTRACTOR.
- ii) CONTRACTOR shall make outside arrangements for ambulance service and for the treatment of industrial injuries. Names of those providing these services shall be furnished to EMPLOYER prior to start of construction and their telephone numbers shall be prominently posted in CONTRACTOR's field office.
- iii) All critical industrial injuries shall be reported promptly to EMPLOYER, and a copy of CONTRACTOR's report covering each personal injury requiring the attention of a physician shall be furnished to the EMPLOYER.
- 112 General rules:** 112.0
- Smoking within the battery area, tank farm or dock limits is strictly prohibited. Violators of the no smoking rules shall be discharged immediately.
- 113 Contractor's barricades:.** 113.0
- i) CONTRACTOR shall erect and maintain barricades required in connection with his operation to guard or protect:-
- a) Excavations
- b) Hoisting Areas.
- c) Areas adjudged hazardous by CONTRACTOR's or EMPLOYER's inspectors.
- d) EMPLOYER's existing property subject to damage by CONTRACTOR's Operations.
- e) Rail Road unloading spots.
- ii) CONTRACTOR's employees and those of his SUB-CONTRACTOR's shall become acquainted with EMPLOYER's barricading practice and shall respect the provisions thereof.
- iii) Barricades and hazardous areas adjacent to, but not located in normal routes of travel shall be marked by red flasher lanterns at nights.
- 114 Scaffolding:** 114.1
- i) Suitable scaffolding should be provided for workmen for all works that cannot safely be done from the ground or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying material as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1 in 4 (1 horizontal and 4 vertical).



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- ii) Scaffolding or staging more than 4 metres above the ground or floor, swing suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise retarded at least one metre high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
- iii) Working platform, gangway and stairway should be so constructed that they should not sag unduly or unequally and if the height of platform of the gangway or the stairway is more than 4 metres above the ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as in ii) above.
- iv) Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum heights shall be 1 metre.
- v) Safe-means of access shall be provided to all working platforms and other working places, every ladder shall be securely fixed. No portable single ladder shall be over 9 metres in length while the width between side rails in rung ladder shall in no case be less than 30 cms for ladder upto and including 3 metres in length. For longer ladder this width should be increased 5mm for each additional foot of length. Uniform steps spacing shall not exceed 30 cms. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed to cause danger or inconvenience to any person or public. The CONTRACTOR shall also provide all necessary fencing and lights to protect the workers and staff from accidents, and shall be bound to bear the expenses of defense of every suit, action or other proceeding of law that may be brought by any person for injury sustained owing to neglect of the above precautions and pay any damages and costs which may be awarded in any such suit or action or proceeding to any such person or which may with the consent of the CONTRACTOR be paid to compromise any claim by any such person.

**115 Excavation and trenching:** 115.1 All trenches 1.2 metres or more in depth, shall at all times be supplied with at least one ladder for each 50 metres length or fraction thereof.

Ladder shall be extended from bottom of the trenches to atleast 1 metre above the surface of the ground. The sides of the trenches which are 1.5M in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides to collapse. The excavated materials shall not be placed within 1.5 metres of the edge of the trench or half of the trench width whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or under-cutting shall be done.

**116 Demolition/general safety:** 116.1

- i) Before any demolition work is commenced and also during the progress of the demolition work
- a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.



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- b) No electric cable or apparatus which is liable to be a source of danger shall remain electrically charged.
- c) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.
- ii) All necessary personal safety equipment as considered adequate by the ENGINEER-IN-CHARGE, should be kept available for the use of the persons employed on the SITE and maintained in condition suitable for immediate use, and the CONTRACTOR shall take adequate steps to ensure proper use of equipment by those concerned.
- a) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective gloves.
- b) Those engaged in white washing and mixing or stacking or cement bags or any material which are injurious to the eyes be provided with protective goggles.
- c) Those engaged in welding and cutting works shall be provided with protective face & eye shield, hand gloves, etc.
- d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- e) When workers are employed in sewers and manholes, which are in use, the CONTRACTOR shall ensure that the manhole covers are opened and are ventilated atleast for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or board to prevent accident to the public.
- f) The CONTRACTOR shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 years are employed on the work of lead painting, the following precautions should be taken.
- 1) No paint containing lead or lead product shall be used except in the form of paste or readymade paint.
  - 2) Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
  - 3) Overalls shall be supplied by the CONTRACTOR to the workmen and adequate facilities shall be provided to enable the working painters to wash them during and on cessation of work.



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- iii) When the work is done near any place where there is risk of drowning, all necessary safety equipment should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- iv) Use of hoisting machines and tackles including their attachments, anchorage and supports shall conform to the following standards or conditions:
- a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good working order.
- b) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.
- c) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding, winch or give signals to the operator.
- d) In case of every hoisting machine and of every chain ring hook, shackle, swivel, and pulley block used in hoisting or lowering or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gears referred to above shall be plainly marked with the safe working load of the conditions under which it is applicable and the same shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.
- e) In case of departmental machine, the safe working load shall be notified by the ENGINEER- IN-CHARGE. As regards CONTRACTOR's machines, the CONTRACTOR shall notify the safe working load of the machine to the ENGINEER-IN-CHARGE whenever he brings any machinery to SITE of WORK and get it verified by the Engineer concerned.
- v) Motors, gears, transmission lines, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as to reduce to minimum the accidental descent of the load, adequate precautions should be taken to reduce the minimum risk of any part or parts of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves, and boots as may be necessary should be provided. The workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.
- vi) All scaffolds, ladders and other safety devices mentioned or described



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herein shall be maintained in safe conditions and no scaffolds, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

- vii) These safety provisions should be brought to the notice of all concerned by displaying on a notice board at a prominent place at the work-spot. The person responsible for compliance of the safety code shall be named therein by the CONTRACTOR.
- viii) To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the CONTRACTOR shall be open to inspection by the Welfare Officer, ENGINEER-IN-CHARGE or safety Engineer of the Administration or their representatives.
- ix) Notwithstanding the above clauses there is nothing in these to exempt the CONTRACTOR for the operations of any other Act or rules in force in the Republic of India. The work throughout including any temporary works shall be carried out in such a manner as not to interfere in any way whatsoever with the traffic on any roads or footpath at the site or in the vicinity thereto or any existing works whether the property of the Administration or of a third party.

In addition to the above, the CONTRACTOR shall abide by the safety code provision as per C.P.W.D. Safety code and Indian Standard Safety Code from time to time.

- 117 Care in handling inflammable gas:** 117.1 The CONTRACTOR has to ensure all precautionary measures and exercise utmost care in handling the inflammable gas cylinder/inflammable liquids/paints etc. as required under the law and/or as advised by the fire Authorities of the EMPLOYER
- 118 Temporary combustible structures:** 118.1 Temporary combustible structures will not be built near or around work site.
- 119 Precautions against fire:** 119.1 The CONTRACTOR will have to provide Fire Extinguishers, Fire Buckets and drums at worksite as recommended by ENGINEER-IN-CHARGE. They will have to ensure all precautionary measures and exercise utmost care in handling the inflammable gas cylinders/ inflammable liquid/ paints etc. as advised by ENGINEER-IN-CHARGE. Temporary combustible structures will not be built near or around the work-site.
- 120 Explosives:** 120.1 Explosives shall not be stored or used on the WORK or on the SITE by the CONTRACTOR without the permission of the ENGINEER-IN-CHARGE in writing and then only in the manner and to the extent to which such permission is given. When explosives are required for the WORK they will be stored in a special magazine to be provided at the cost of the CONTRACTOR in accordance with the Explosives Rules. The CONTRACTOR shall obtain the necessary licence for the storage and the use of explosives and all operations in which or for which explosives are employed shall be at sole risk and responsibility of the CONTRACTOR and the CONTRACTOR shall indemnify the EMPLOYER against any loss or damage resulting directly or indirectly therefrom.



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- 121 Mines act:**
- 121.1 SAFETY CODE: The CONTRACTOR shall at his own expense arrange for the safety provisions as required by the ENGINEER-IN-CHARGE in respect of all labour directly employed for performance of the WORKS and shall provide all facilities in connection therewith. In case the CONTRACTOR fails to make arrangements and provides necessary facilities as aforesaid, the ENGINEER-IN-CHARGE shall be entitled to do so and recover the costs thereof from the CONTRACTOR.
- 121.2 Failure to comply with Safety Code or the provisions relating to report on accidents and to grant of maternity benefits to female workers shall make the CONTRACTOR liable to pay Company Liquidated Damages an amount not exceeding Rs.50/- for each default or materially incorrect statement. The decision of the ENGINEER-IN-CHARGE in such matters based on reports from the Inspecting Officer or from representatives of ENGINEER-IN-CHARGE shall be final and binding and deductions for recovery of such Liquidated Damages may be made from any amount payable to the CONTRACTOR from all the provisions of the Mines Act, 1952 or any statutory modifications or re-enactment thereof of the time being in force and any Rules and Regulations made there under in respect of all the persons employed by him under this CONTRACT and shall indemnify the EMPLOYER from and against any claim under the Mines Act or the rules and regulations framed there under by or on behalf of any persons employed by him or otherwise.
- 122 Preservation of place:**
- 122.1 The CONTRACTOR shall take requisite precautions and use his best endeavors to prevent any riotous or unlawful behavior by or amongst his worker and others employed or the works and for the preservation of peace and protection of the inhabitants and security of property in the neighborhood of the WORK. In the event of the EMPLOYER requiring the maintenance of a Special Police Force at or in the vicinity of the site during the tenure of works, the expenses thereof shall be borne by the CONTRACTOR and if paid by the EMPLOYER shall be recoverable from the CONTRACTOR.
- 123 Outbreak of infectious diseases:**
- 123.1 The CONTRACTOR shall remove from his camp such labour and their facilities who refuse protective inoculation and vaccination when called upon to do so by the ENGINEER-IN-CHARGE's representative. Should Cholera, Plague or other infectious diseases break out the CONTRACTOR shall burn the huts, beddings, clothes and other belongings or used by the infected parties and promptly erect new huts on healthy sites as required by the ENGINEER-IN-CHARGE failing which within the time specified in the Engineer's requisition, the work may be done by the EMPLOYER and the cost thereof recovered from the CONTRACTOR.
- 124 Use of intoxicants:**
- 124.1 The unauthorized sale of spirits or other intoxicants, beverages upon the work in any of the buildings, encampments or tenements owned, occupied by or within the control of the CONTRACTOR or any of his employee is forbidden and the CONTRACTOR shall exercise his influence and authority to the utmost extent to secure strict compliance with this condition.



In addition to the above, the CONTRACTOR shall abide by the safety code provision as per C.P.W.D. safety code and Indian Standard Code framed from time to time.



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## SECTION-V

### SPECIAL CONDITIONS OF CONTRACT



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## SPECIAL CONDITIONS OF CONTRACT

### 1.0 INTRODUCTION:

- 1.1. Talcher Fertilizers Ltd. (TFL), hereinafter also referred to as "OWNER", A joint venture company of four major Public Sector Units – M/s. Gas Authority India Limited (GAIL), M/s. Rastriya Chemicals & Fertilizers Ltd. (RCF), M/s. Coal India Ltd. (CIL) and M/s. Fertilizers Corporation of India Ltd. (FCIL) has decided to build a world class Coal based fertilizer complex. The fertilizer complex is to be built at **Talcher, Angul District, Odisha (India)** and will consist of Coal Gasification Plant, Ammonia Plant and Urea Plant, along with Offsite and Utility Plants. Talcher Fertilizers Ltd. intend to invite quotations from eligible Contractors for **SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA**
- 1.2 Projects & Development India Ltd. (PDIL) has been retained as Consultant for providing Engineering Consultancy Services and Project Management Services for the aforesaid project.



### 2.0 LOCATION OF THE PROJECT SITE

A brief description of infrastructure at Talcher Fertilizer Plant Site is furnished below:

- The proposed project will be located within the premises of existing closed coal based Ammonia-Urea complex of FCI Ltd. Talcher Unit.
- The total land area of the site is 904.53 acres out of which lease hold land from Government of Odisha is 894.207 acres and land purchased from private parties is 10.33 acres.
- The area is not falling under coal bearing zone up to a depth of 200-250 meter.
- Talcher site is located at Vikrampur in Angul district of Odisha on the Cuttack-Sambalpur National Highway NH-42. NH-42 is passing at about 8 km from the site. The nearest railway station is Talcher at about 7 km from the site. Nearest air port Bhubaneswar is 150 km, 3 hours journey by road/ rail. Nearest sea port is Paradeep, 200 km by rail/road from the site. Talcher is situated at 21° 10" N Latitude and 82° 5" E Longitude.

### 3.0 GENERAL

- 3.1 Special Conditions of Contract shall be read in Conjunction with the General conditions of Contract, specification of work, Drawings and any other documents forming part of this Contract wherever the context so requires.
- 3.2 Notwithstanding the sub-division of the documents into these separate sections and volumes, every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the Contract so far as it may be practicable to do so.
- 3.3 Where any portion of the General Condition of Contract is repugnant to or at variance with any provisions of the Special Conditions of Contract, unless a different intention appears, the provisions of the Special Conditions of Contract shall be deemed to over-



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ride the provisions of the General Conditions of Contract and shall to the extent of such repugnancy, or variations, prevail.



- 3.4 Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his cost and the value of contract shall be deemed to have included cost of such performance and provisions, so mentioned.
- 3.5 The materials, design, and workmanship shall satisfy the relevant Indian Standards and CPWD specifications, the Job Specifications contained herein and Codes referred to. Where the job specification stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.
- 3.6 It will be the Contractor's responsibility to bring to the notice of Engineer-in-Charge/Project Manager any irreconcilable conflict in the contract documents before starting the work (s) or making the supply with reference which the conflict exists.
- 3.7 In the absence of any Specifications covering any material, design of work (s) the same shall be performed / supplies / executed in accordance with Standard Engineering Practice as per the instructions / directions of the Engineer-in-Charge/Project Manager, which will be binding on the Contractor.

#### **4.0 GENERAL PROVISION WITH REGARD TO MATERIALS**

- 4.1 The CONTRACTOR shall, within the scope of work, undertake the following activities and responsibilities with respect to and in addition and without prejudice to the activities and responsibilities under Clause 4.1 and associated clauses there under in respect of materials:
- i) The CONTRACTOR shall in taking delivery, ensure compliance of any condition for delivery applicable to deliveries from the concerned authority or carrier, and shall be exclusively responsible to pay and bear any detention, demurrage or penalty or other charges payable by virtue of any delay or failure by the CONTRACTOR in lifting the materials or in observing any of the conditions aforesaid, and shall keep the OWNER indemnified from and against all consequences there of
  - ii) The CONTRACTOR shall maintain a day-to-day account of all materials indicating the daily receipt(s), consumption(s) and balance of each material and category thereof. Such account shall be in the format, if any, prescribed by the ENGINEER-IN-CHARGE and shall be supported by all documents necessary to verify the correctness of the entries in the account. Such account shall be maintained at the CONTRACTOR MANAGER's office and site(s) and shall be open for inspection and verification (by verification of documents in support of the entry as also by feasible verification of the stock) at all times by the ENGINEER-IN-CHARGE with authority at all times without obstruction to enter into or upon any godown or other place(s) or premise(s) where the materials or any part of them are lying or stored and to inspect the same himself and or through his representative(s).

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- iii) All materials shall be taken delivery of, held, stored and utilised by the CONTRACTOR as Trustee of the OWNER, and delivery of the material to the CONTRACTOR shall constitute an entrustment thereof to the CONTRACTOR, with the intent that any utilization, application or disposal thereof by the CONTRACTOR otherwise than for permanent incorporation in the contractual works in terms of the contract shall constitute a breach of trust by the CONTRACTOR.
- iv) The CONTRACTOR shall at all times be exclusively responsible for any and all losses, damages, deterioration, misuse, wastage, theft, or other application or misapplication or disposal of the materials or any of them contrary to the provisions hereof and shall keep the OWNER indemnified from and against the same and shall forthwith at its own cost and expenses replace any such material, lost, damaged, deteriorated, misused, wasted, stolen, applied, misapplied and/or disposed as aforesaid with other material of equivalent quality and quantity delivered to site at the CONTRACTOR's risks and costs in all respects.
- v) The CONTRACTOR shall take out, at his own cost and keep in force at all times, during transit, handling, storage, and erection upto completion in all respect of the work, policy (ies) with Insurance Company (ies) approved by the OWNER for the full replacement value of the materials at site against the risks specified in the CONTRACT. Such policies shall be in the joint names of the OWNER and the CONTRACTOR, with exclusive right in the OWNER to receive all monies due in respect of such policy (ies) and with right in the OWNER (but without obligation to do so) to take out and pay the premia for any such policy (ies) and deduct the premia and any other costs and expense in this behalf from the monies for the time being due or in future becoming due to the CONTRACTOR. In case of Insurance claim, the GST leviable on the transfer of the claim money from OWNER to CONTRACTOR shall be over and above the GST cap indicated in the CONTRACT and shall be borne by OWNER.
- vi) If the CONTRACTOR shall default in replacing at the job SITE, without any additional cost to the OWNER, any material lost, damaged, deteriorated, misused, wasted, short, stolen, misapplied or disposed of within the provisions hereof above, the CONTRACTOR shall be liable to pay to the OWNER the cost of such materials.
- a) Notwithstanding anything herein provided, the CONTRACTOR shall be and remain solely and exclusively liable to repair, restore or replace, as the case may be, the materials damaged or destroyed as a result of any act or omission, notwithstanding the existence or otherwise of any policy(ies) of insurance aforesaid, with the intent that any policy(ies) of insurance aforesaid taken out by the CONTRACTOR or by the OWNER, on default by the CONTRACTOR, shall not anyway absolve the CONTRACTOR from his full liability up to and until issue of the Preliminary Acceptance Certificate as provided for herein in respect of the works, the work(s) and all materials incorporated therein shall be and remain at the risks of the CONTRACTOR in all respects, including (but not limited to) accident, lightning, earth-quake, fire, storm, flood, tempest, riot, civil commotion and/or war or otherwise with respect to the materials, but shall constitute merely an additional security and not a substitution of liability.

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- b) It shall be the exclusive responsibility of the CONTRACTOR to lodge and pursue any or all claims in respect of the insurance aforesaid.
- c) The CONTRACTOR shall, as a condition to the certification of any Running Account Bill, satisfy the OWNER/ Engineer-In-Charge of the existence of one or more policy(ies) of insurance, covering the materials as specified herein. The policy(ies) of insurance aforesaid shall cover all insurable risks, including but not limited to, any loss or damage commencing from the supplier's ware house in handling, transit, storage and during erection, theft, pilferage, riot, civil commotion, force majeure (including earth quake, flood, storm, cyclone, tidal wave, lightening and other adverse weather conditions), accidents of kinds, fire, war risks and explosion.
- vii) If the CONTRACTOR shall default in replacing at the job site, free of any cost to the OWNER, any material lost, damaged, deteriorated, misused, wasted, short, stolen, misapplied or disposed of within the provisions hereof above, the CONTRACTOR shall be liable to pay to the OWNER the cost of such materials.

## 4.2 SUPPLY OF MATERIALS

- 4.2.1 The CONTRACTOR shall supply the materials required to be supplied within the Contractor's scope of supply for incorporation in the permanent works in accordance with and to meet the requirements in quality, quantity and other particulars of the descriptions, specifications, plans, drawings, designs and other documents applicable thereto, and the CONTRACTOR shall be deemed to have undertaken that all materials selected, procured and supplied by the CONTRACTOR within the scope of supply shall be of the best quality and workmanship and shall be capable of producing the designed desired results and to perform the designed and desired functions to meet the contractual requirements in all respects for the project.
- 4.2.2 The CONTRACTOR shall undertake and complete the supply of materials within the scope of supply to meet the scheduled progress and requirements of the WORK within the scope of work.
- 4.2.3 All materials shall be deemed to have been accepted only when the material is received at the project SITE and accepted by the ENGINEER-IN-CHARGE. Such acceptance shall however be subject to the terms and conditions of CONTRACT, including the right of rejection and/or replacement as elsewhere herein specified.
- 4.2.4 Without prejudice to any other terms of the contract, it is clarified that the mere agreement, acceptance or prescription of a Delivery or other Schedule containing an extended time of commencement or completion in respect of the entire delivery(ies) or any of them shall not anyway constitute an extension of time in a terms of the CONTRACT so as to bind the OWNER or relieve the CONTRACTOR of all or any of his liabilities under CONTRACT, nor shall constitute a promise on behalf of the OWNER or a waiver by the OWNER of any of its rights in terms of the contract relative to the performance of the CONTRACT within the time specified or otherwise, but shall be deemed only (at the most) to be a guidance to the CONTRACTOR for better organising his work on a recognition that the CONTRACTOR has failed to organise his supplies and/or make the same within the time specified in the Delivery Schedule.
- 4.2.5 If the CONTRACTOR fails to supply the materials in accordance with the dates in this behalf specified in the Delivery Schedule which has an impact on the critical path of the schedule, the CONTRACTOR shall provide the OWNER with a suitable plan to

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recover the delay, but without prejudice to any other rights, discount or remedy available to the OWNER in respect of such delay or failure.

#### 4.2.6 MAKE OF MATERIALS

- i) All equipment and materials to be supplied under this CONTRACT shall be from approved vendors as indicated in the Bidding Document or as otherwise approved by the PMC / OWNER.
- ii) Where the makes of materials are not indicated in the Bidding document, the CONTRACTOR shall furnish details of proposed makes and supplies and supply the same after obtaining the OWNER's/PMC approval.

#### 5.0 OWNER'S OBLIGATIONS:

The OWNER'S obligations are limited to the following:

- a) Handing over the site in sections/ stages progressively.
- b) Approval of Construction drawings supplied by the Contractor.
- c) Payment to the contractor for performance of work under the contract as per the terms and conditions specified therein.
- d) A piece of land for setting up temporary office, Godown, etc., if available.



#### 6.0 POWER & WATER FOR CONSTRUCTION AND OTHER PURPOSES

Availability of water & power at site is very limited. Contractor shall have to make his own arrangements for Construction work.

#### 7.0 RATES

- 7.1 OWNER shall pay to contractor the total rates quoted by them for the due and faithful performance of contractor's obligation under the contract. The rates quoted by the contractor in SOR shall remain fixed and firm and not subject to any escalation unless and otherwise specified in the tender.
- 7.2 The rates shall be deemed to allow for all minor extras and constructional details which are not specifically shown on drawings or given in the specifications but are essential in the opinion of the Owner/ Consultant to the execution of work to conform to good workmanship and sound engineering practice. The Owner / Consultant reserve the right to make any minor changes during the execution without any extra payment.
- 7.3 The Owner / Consultant decision to classify any item 'minor changes', 'minor extras' and 'constructional details' shall be final conclusive and binding on the Contractor.
- 7.4 Rates quoted shall include for payment of royalties for obtaining earth, morrum, sand, aggregates, stones, etc. Nothing extra shall be paid to the Contractor on this account.
- 7.5 Contractor shall be responsible for making all necessary approach roads to the sites of execution for taking his rigs, cranes & equipments. No extra claim in this regard shall be entertained.
- 7.6 Schedule of rates submitted by the Tenderer shall be the true copy of the schedule of rates enclosed with the tender documents



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7.7 The quantities and items of work given in the Schedule of Rates are tentative and approximate. The OWNER reserves the right to order variation of work during the currency of the contract of its original contract value within the stipulated variation as per clause no. 60.2 of GCC.

The contractor shall not be entitled to any **increase** whatsoever **on the SOR rates** on account of any variation in the quantities and/or omission/addition of items **vis-à-vis the quantities mentioned** in the “Schedule of Rates (**Section VII**)” as long as the contract value finally determined on the basis of the certified final quantities and the contract item rates is within the stipulated variation as per clause no. 60.2 of GCC.

## 8.0 SPECIFICATIONS

8.1 If specification for an item of work is not covered by CPWD/ BIS specifications or Technical Specifications, the same shall be decided by the Owner/ Consultant and shall be binding on the Contractor.

8.2 The Owner/ Consultant shall have the right to cause the Contractor to purchase and use such materials of particular make or from a particular source which may in his opinion be necessary for proper and reasonable compliance with the specifications and execution of work.

8.3 (a) As and when required by the Owner/ Consultant, the Contractor shall provide all facilities at site or at manufacture’s works or in approved laboratory for testing of materials and/or workmanship. All the expenditure in respect of this shall be borne by the Contractor. The Contractor shall, when required to do so by the Owner/Consultant, confirm that the materials have been tested in accordance with requirements of the specifications.

(b) Neither the omission by the Owner/ Consultant to test the materials nor the production of manufacturer(s) certificate, etc. shall affect the right of the Owner/Consultant to reject, after delivery, the materials found not in accordance with the specifications.

## 9.0 GATE PASSES



All tools, plant and materials shall be brought by the Contractor to the works site through a covering note to be submitted in 3 copies. One copy of the covering note will be delivered to the security staff and one copy to the Owner/Consultant. The third copy shall be retained by the Contractor. The Contractor shall follow all rules and regulations for entry / exit of their men and materials in/from project site as framed by Owner/Consultant.

## 10.0 TIME SCHEDULE

10.1 Bidder shall be required to complete the WORK under the CONTRACT so as to achieve the GUARANTEED COMPLETION DATE in accordance with the following:

<b>Completion Period/ Completion Schedule</b>	<b>15 (Fifteen) Months from date of issuance of FOA (Fax of Acceptance)</b>
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10.2 The basic consideration and essence of the Contract is the strict adherence to the Time schedules for performing the specified works as stipulated in the Contract.

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10.3 If at any time, the Owner/Consultant is of opinion that the Contractor has fallen behind the approved construction schedule, the Owner/ Consultant may, without any cost to Owner/ Consultant, require the Contractor to take such steps as may be necessary to improve his progress, especially require him to employ overtime operations, increase the number of shifts, work on holidays and Sundays or increase the capacity of his construction plant and equipment and require him to submit evidence demonstrating the manner in which the Contractor proposes to comply with the construction schedule. Failure of the Contractor to comply with the above will be considered a failure to execute the work with due diligence.

#### **10.4 Time schedule network/ bar chart.**

10.4.1 Together with the Work Order/ Contract confirmation, Contractor shall submit to Owner/ Consultant, his time schedule regarding the documentation, supply of materials as well as information about of his Subcontracts to be placed with their parties, including the dates on which Contractor intends to issue such Subcontracts.

10.4.2 The time schedule will be in the form of a network or a bar chart clearly indicating all main or key events regarding documentation, supply of materials, delivery and site fabrication, erection, inspection, testing and completion.

10.4.3 The original issue and subsequent revisions of Contractor's time schedule and or Sub-contractor's time schedules shall be sent to Consultant in two copies (of which one shall be in Soft copy) and two copies to Owner.

10.4.4 The time schedule network/bar chart shall be updated at least every fortnight.

#### **10.5 Progress Trend Chart/ Monthly Report**

10.5.1 Contractor shall report weekly to Owner/ Consultant the progress of the execution of Work Order/ Contract and achievement of targets set out in time bar chart.

10.5.2 The progress will be expressed in percentages shown in the progress trend chart.

10.5.3 The first issue of the progress trend chart will be forwarded together with the time bar chart along with the Work Order confirmation.



10.5.4 The fortnightly reporting will bear the updating of the progress trend chart.

10.5.5 All reports shall be submitted through e-mail. Monthly reports to be also submitted in hard copy.

#### **11.0 ISSUE OF WORKING DRAWINGS**

All Working drawings shall be issued by the CONTRACTOR for review/approval by the OWNER/ PMC before issuance at work site. Working drawings shall be submitted by the CONTRACTOR during the period of the contract and shall be MARKED AS "Good for execution/ construction". The same shall be having sign & stamp of the CONTRACTOR. The Contractor shall not be entitled to put forth any claim whatsoever on account of delay in getting approval of the drawings to the Owner/ Consultant, if contractor fails to incorporate the OWNERS/PMC comments timely.

Fabrication drawing, if any shall be prepared by the contractor itself and submitted to the Owner/PMC for information

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## 12.0 SERVING OF NOTICES

The Contractor shall furnish to the Owner/ Consultant the name, designation and address of his authorized Agent for the purpose of serving of notice(s) regarding all complaints, communications and references and shall be deemed to have been duly given to the Contractor if delivered to the Contractor or his authorized agent or left at or posted to the address so given and shall be deemed to have reached such address in the ordinary course of post or on the day on which they were so delivered or left. In the case of contract by partnership firm, any change in the constitution of the firm shall be forthwith informed by the Contractor to the Owner/ Consultant.

- All correspondence from the CONTRACTOR to the OWNER shall be as per the correspondence distribution schedule. All communications including technical-commercial clarifications and/ or comments shall be addressed to OWNER/CONSULTANT and shall always bear reference of DLOA number.
- Correspondence on technical and commercial matters shall be dealt with in separate letters and each copy of the letter shall be complete with all Annexures, if any.
- Any notice to the CONTRACTOR under the terms of the CONTRACT shall be served by registered e-mail/Speed Post, fax or courier.
- Any notice to the OWNER shall be served from the CONTRACTOR's Principal office in the same manner.
- Any written order or instruction of OWNER or his duly authorised representative, communicated to authorised representative of the CONTRACTOR at site office shall be deemed to have been communicated to the CONTRACTOR at his legal address.

## 13.0 NOTHING EXTRA FOR ADVERSE SUB-SOIL CONDITION



There may be variation in nature of sub-soil both horizontally and vertically. The Contractor shall have to take necessary precaution during excavation against any happening like collapsing of sides etc. Any slip or fall in excavation shall have to be cleared by the Contractor at his own cost. In case of excessive heaving, it shall have to be cut and refilled with lean concrete by the Contractor at his own cost. The Contractor shall have to adopt underwater work in case of occurrence of piping/quick conditions without any cost to Owner/Consultant.

## 14.0 CONTRACTOR'S RESPONSIBILITY FOR THE MANNER OF EXECUTION OF WORK

The Contractor shall be responsible for the manner and the method of executing the work. The work shall be subject to the approval of Owner/ Consultant from time to time for purposes of determination of the question whether the work is executed by the Contractor in accordance with the contract.

## 15.0 NO WORK SHALL BE UNDERTAKEN WITHOUT APPROVED WORKING DRAWINGS

No work shall be undertaken at Site by the Contractor until detailed approved working drawings are marked "Good for execution/ construction" by Owner/ Consultant. Any work done without the aforesaid approved working drawing shall be at the Contractor's own risk and costs.

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## 16.0 CONTRACTOR SHALL KEEP FOUNDATION PITS/TRENCHES DRY

The Contractor, during the pendency of contract, shall keep in dry condition of pits, trenches, which are not yet back filled due to technical reasons, if not shall be Bail-out/Pump-out all accumulation at his own cost for the safety of the structure / element. During pumping, the Contractor shall have to ensure that 'Loss of Ground' does not occur. Other approved methods shall be undertaken by the Contractor to avoid 'Loss of Ground' if occurred, at his own cost.

## 17.0 NOTHING EXTRA FOR INTRICATE CONCRETE SHUTTERING OR REINFORCEMENT WORK

Nothing extra shall be paid for any intricate concrete, shuttering or reinforcement work for foundations of equipment and machinery and for other foundation/superstructure works or for any delay inherent in concreting in small and thin sections in concrete or RCC works etc.

## 18.0 NOTHING EXTRA FOR REBATING ETC.

Nothing extra shall be paid in concrete/RCC works for all rebating, chamfering, grooving, sinking, trotting weathering, moulding, etc. to accord with the details shown on the working drawings.

## 19.0 CONSTRUCTION JOINTS



19.1 In case of execution of massive concrete elements both in foundation and in superstructure and in some other locations as would be permitted except where specified in the working drawings, the work shall be carried out in one single operation without any break in concreting within time limit that would be specified by the Owner / Consultant without any additional cost to Owner/ Consultant.

19.2 All specified construction joints, either horizontal or vertical, in any element of concrete member shall be provided with shear keys of such dimensions as would be determined by the Owner/Consultant. Before adopting the next operation for the other half of the element these shear keys along with the entire surface of the joint shall be roughened and deepened to above 20 mm by chipping, washing and cleaning thoroughly. The Contractor shall provide cement slurry in sufficient quantity over the cleaned surface for proper bond as per the direction of Owner/Consultant. The Contractor shall not be entitled to any extra/payment; on this account.

## 20.0 SUBMISSION OF BILL

Contractor is to submit the bills and record of measurements in three (3) copies for works executed by him.

### 20.1 FOR R/A BILLS:

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Contractor is to submit the bills and record of measurements to EIC complete in all respect for certification by Owner/Consultant in three copies for works executed by him progressively.

## 20.2 MEASUREMENT OF WORKS

In addition to the provisions of relevant Clause of GCC, following shall also apply:

Measurement of work shall be made in the units mentioned in the schedule of rates. The abbreviations used in the schedule of rates are mentioned in Schedule of Rates.

The Engineer-in-Charge shall, except as otherwise stated ascertain and determine by measurement the value of Work done, in accordance with the Contract and as per actual Work done. The Engineer-in-Charge shall, when he requires any part or parts of the Works to be measured, give notices to the Contractor's authorized agent or representative who shall forthwith attend or send a qualified agent to assist the Engineer-in-Charge in making such measurement and shall furnish all particulars required by either of them. Should the Contractor not attend or neglect or omit to send such representative then the measurement made by the Engineer-in-Charge shall be taken to be the correct measurement of the Work. For all measurements, figured dimensions given in the drawings shall be followed. Measurement of all hidden items shall be carried out by the Engineer-in-Charge. The Contractor or his representative who attends may at the time of measurement take such notes and measurements as he may desire.

The measurements for excavations shall be restricted and limited to minimum excavation line as per drawing for payment purposes.



## 20.3 DISPUTE IN MODE OF MEASUREMENT

Where Works have to be measured for any purpose whatsoever, it shall be in accordance with item specifications as per relevant Indian Standards unless otherwise specifically indicated in the Contract Specifications. All measurements will be recorded in metric units only. In case of absence of mode of measurement of any item not covered by both the methods mentioned above, the Engineer-in-Charge's decision shall be final and binding. The required number of bills, registers, bill forms, level/field books, materials/ account registers, testing registers, site order books and any other stationary item pertaining to this contract shall be printed and provided for by the contractor, at his own cost in the format prescribed and approved by the Engineer-in-Charge in writing. The Measurement Sheet will have three copies in different colour pages and will be printed so that proper referring and record of complete measurement is maintained. Original sheet will be retained in the book and will be returned to Owner on completion of Work.

## 20.4 SUBMISSION OF FINAL BILL

The final bill complete in all respect shall be submitted after certified completion of work.

20.4.1 On the basis of the rates provided in the CONTRACT and subsequent Change Order(s)/Amendment(s), if any, the CONTRACTOR shall prepare the Final Bill as per GST norms. Additions claimed on account of CHANGE ORDER(s) shall be separately indicated in the Final Bill with reference to the relative CHANGE ORDERS(s).

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20.4.2 The Final Bill shall, in addition to the payment entitlements arrived at according to the provisions of Clause 20.4.1 hereof shall separately state and include therein all claims of the CONTRACTOR, if any, with full particulars of the nature of such claim and grounds on which it is based and the amount claimed.

20.4.3 The Final Bill drawn in accordance with Clause 20.4.1 shall be submitted (together with the COMPLETION CERTIFICATE along with other documents as stipulated at Clause No. 39.8 of SCC, to the ENGINEER-IN-CHARGE for certification, who shall certify the Final Bill, if drawn in accordance with Clause 20.4.1. After certification of the ENGINEER-IN-CHARGE, the Final Bill shall be submitted in quadruplicate (or in such other number of copies as the OWNER may prescribe) to the OWNER for payment.

20.4.4 All monies payable under the CONTRACT for WORKS to be performed and MATERIALS to be supplied up to and including successful completion shall become due and payable to the CONTRACTOR only after submission to the OWNER of the Final Bill prepared in accordance with the provisions of Clause 20.4.1 hereof and associated provisions there under accompanied by the COMPLETION CERTIFICATE in respect of the WORKS.

20.4.5 Payments of the amount(s) due on the Final Bill to the extent certified by the ENGINEER-IN-CHARGE, shall be made within 30 (Thirty) days from the due date as specified in Clause 20.4.4 hereof, subject to the deductions provided in Clause 20.4.5.1.

20.4.5.1 All payments due to the CONTRACTOR on the Final Bill shall be subject to tax deductions and any other deductions provided in the CONTRACT or required to be made under any law, rule or regulation having the force of law for the time being applicable, or elsewhere provided for in the CONTRACT documents.



## **21.0 CLAIMS BY THE CONTRACTOR**

21.1 No claim(s) shall on any account be made by the CONTRACTOR after submission of the Final Bill, with the intent that the Final Bill prepared by the CONTRACTOR shall reflect any and all claims whatsoever of the CONTRACTOR against the OWNER arising out of or in connection with the CONTRACT or any supply made or work performed by the CONTRACTOR there under or in relation thereto, and notwithstanding any enabling provision in any law or CONTRACT and notwithstanding any claim that the CONTRACTOR could have with respect thereto, the CONTRACTOR hereby waives and relinquishes any and all such claims not included in the Final Bill and absolves and discharges the OWNER from and against the same, even if in not including the same as aforesaid, the CONTRACTOR shall have acted under a mistake of law or of fact, or shall claim to have acted under economic compulsion or necessity.

21.2 If required by the OWNER, the ENGINEER-IN-CHARGE shall be authorised to require the CONTRACTOR to furnish, and the CONTRACTOR shall, upon the request of the ENGINEER-IN-CHARGE /OWNER, furnish all invoices, vouchers and accounting records as may be deemed necessary by the ENGINEER-IN-CHARGE /OWNER for the purpose of verifying any CONTRACTOR's claim.

## **22.0 PROVISION FOR MULTIFARIOUS CHECKING OF WORK**

Before commencement of the actual concreting operation the position and layout of foundations, pedestals, inserts, pockets, recess, reinforcement and form work shall be checked repeatedly by Owner/Consultant. No claim whatsoever shall be entertained on this account. The level of foundations shall be accurately maintained as shown in the

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drawings or as directed by the Owner/Consultant. No padding, plastering or chipping shall be allowed for achieving the results.

### **23.0 DEFECT LIABILITY PERIOD**

Defect Liability Period shall be 12 months from the date of completion of works in all respects as declared by EIC/PROJECT MANAGER.

### **24.0 CLEARING, FILLING AND LEVELING OF SITE**

The site shown on the layout plan shall be cleared by the Contractor of all obstructions, loose stones, materials, rubbish of all kinds of bushes, trees, grass as well as brush wood. All holes/hollow, whether originally existing or produced by removal of loose stones or brush wood, shall be carefully filled up with earth, well rammed and levelled off as directed by the Owner/ Consultant. The Contractor will not be entitled to any payment in his regard.

### **25.0 CONTRACTOR TO COMPLY ALL LAWS**

25.1 The contract shall be governed by the law in force in the Republic of India.

25.2 The Contractor shall comply with all laws etc. The Contractor shall be responsible to secure compliance with the Central and States Laws as well as the Rules, Regulations, by-laws and orders of the legal authorities and statutory bodies which are in force or as may be in force from time to time. He shall give to the Municipal Corporation Committees, police and other relevant authorities all such notices, etc. as may be required by law and obtain all requisite license for temporary constructions, enclosures, etc. and pay all fees, taxes and such other dues or charges which may be leviable on account of any of his operations in executing the works under this contract. Owner/Consultant shall not pay anything extra to the Contractor on this account. The Contractor shall also make good at his own cost, any damage done by him to any adjoining property, during execution of work.

### **26.0 CONTRACTOR TO USE THE MATERIALS ONLY AFTER THE APPROVAL OF OWNER**

The Contractor shall use the materials only after the approval of Owner/ Consultant, before incorporation of the same in the works.



### **27.0 COMPLIANCE OF ENTIRE PROVISIONS IS OBLIGATORY TO CONTRACTOR**

It shall always prevail, unless otherwise specifically stated, that the entire provisions of the Tender Document have been accepted for compliance by the Contractor without any reservation.

### **28.0 DELIVERY AND DOCUMENTS**

Delivery of the Goods shall be made by the Contractor in accordance with the terms specified by the Owner/Consultant in the schedule of requirements in Technical Specifications and the special conditions of Contract.

### **29.0 WEATHER CONDITIONS**

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Owner/Consultant may order Contractor to suspend any work which in the opinion of Owner/Consultant may be subject to damage by prevailing weather conditions. No claim whatsoever on this account shall be entertained.

It is presumed that the Contractor has familiarized himself with the weather conditions prevailing in the area therefore in such weather parameters if it appears to the Engineer –in –charge (EIC) that certain weather condition may damage the work or specified quality of the work can be achieved without stoppage of the work, the EIC in such conditions may require the Contractor to stop the work till such time as he thinks fit and appropriate. It is understood by the contractor that no compensation will be admissible on this count.

### **30.0 INSTRUCTIONS, DIRECTIONS AND CORRESPONDENCE**

30.1 The work described in Contract is to be executed according to the standards, data sheets, tables, Specifications and Drawings and according to all conditions both general and specific enclosed with the Tender document, unless any or all of them shall have been modified or cancelled in writing as a whole or in part.

- i) All instructions and orders to Contractor shall, except what is herein provided, given by Owner/Consultant.
- ii) All the work shall be carried out under the direction of and to the satisfaction of Owner/Consultant.
- iii) All communications including technical/commercial clarifications and/or comments shall bear reference to the DLOA/ Contract.
- iv) Invoice for payment against DLOA/ Contract shall be addressed to Owner/ Consultant.
- v) The DLOA number shall be shown on all invoices, communications, packing lists, containers and bills of lading etc.

30.2 Correspondence on technical and commercial matters shall be dealt with in separate letters and each copy of the letter shall be complete with all Annexures. Wherever possible, correspondence should be through e-mails.

30.3 Correspondence for expediting and Third Party Inspection (TPI), if applicable, shall be done directly with inspector with a copy to consultant & owner.



### **31.0 QUALITY ASSURANCE / QUALITY CONTROL**

31.1 After the award of the contract detailed quality assurance programme shall be prepared by the Contractor for the execution of contract for various works which will be mutually discussed and agreed to.

31.2 The Contractor shall establish document and maintain an effective quality assurance system outlined in recognized codes.

31.3 Quality Assurance System plans/procedures of the Contractor shall be furnished in the form of a QA manual after award of job. This document should cover details of the personnel responsible for the Quality Assurance, plans or procedures to be followed for



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quality control in respect of Design, Engineering, Procurement, Supply, Installation, Testing and completion in all respect till final acceptance by Owner. The quality assurance system should indicate organizational approach for quality control and quality assurance of the construction activities, at all stages of work at site.



- 31.4 The Owner/ Consultant or their representative shall reserve the right to inspect/ witness, review any or all stages of work at shop/site as deemed necessary for quality assurance.
- 31.5 The Contractor has to ensure the deployment of quality Assurance and Quality Control Engineer(s) depending upon the quantum of work. This QA/QC group shall be fully responsible to carry out the work as per standards and all code requirements. In case Engineer-in-charge feels that Contractor's QA/QC Engineer(s) are incompetent or insufficient, Contractor has to deploy other experienced Engineer(s) as per site requirement and to the full satisfaction of Engineer-In-Charge.
- 31.6 In case Contractor fails to follow the instructions of Engineer-in-charge with respect to above clauses, next payment due to him shall not be released unless until he complies with the instructions to the full satisfaction of Engineer-in-charge.
- 31.7 The Contractor shall adhere to the approved quality assurance system

### **32.0 HEALTH SAFETY AND ENVIRONMENT (HSE) MANAGEMENT**

The Contractor, during entire duration of the Contract, shall adhere to HSE requirement as per Specification enclosed in the Bidding Document as per **Annexure - I (Annexure to Special Conditions of Contract)**

### **33.0 SUSPENSION OF WORKS**

- 33.1 The OWNER reserves the right to suspend and reinstate execution of the whole or any part of the WORK without invalidating the provisions of the CONTRACT. Orders for suspension or reinstatement of the WORKS will be issued by the OWNER to the CONTRACTOR in writing. The time for completion of the WORKS will be extended for a period equal to the duration of the suspension along with mutually agreed remobilization period.
- 33.2 If such suspension of WORK by OWNER delays or is likely to delay the progress of WORK or the carrying out of WORK under CONTRACT resulting in additional expenses or increased liability to CONTRACTOR, the OWNER shall pay to the CONTRACTOR all reasonable expenses, mutually agreed between OWNER and CONTRACTOR, arising from suspension of the work by an order in writing of the OWNER provided that such suspensions of work is more than a cumulative period of Sixty days (60) days and provided that such suspension is not due to some fault on the part of the CONTRACTOR or a SUB-CONTRACTOR.
- 33.3 If the OWNER has;
- (i) failed to pay the CONTRACTOR any sum due under the CONTRACT within the period specified in the Contract; or
  - (ii) failed to approve invoice or supporting document without just cause within the period specified in the Contract; or
  - (iii) committed substantial breach of the Contract:

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Then, CONTRACTOR may give a notice requesting OWNER to remedy aforesaid default within 30 days. If OWNER fails to remedy it within the said period, CONTRACTOR may suspend the performance of its obligations under the CONTRACT.

33.4 If the CONTRACTOR's performance of its obligations is suspended under the CONTRACT pursuant to clause 33.3 as above, then the COMPLETION TIME shall be extended and all reasonable additional costs or expenses incurred by the CONTRACTOR and mutually agreed between OWNER and CONTRACTOR, as a result of such suspension shall be paid by the OWNER to the CONTRACTOR provided that such suspension is not due to fault on the part of CONTRACTOR or its SUB CONTRACTOR.



#### 34.0 INCOMING MATERIAL REPORT/ INSPECTION

All material entering the site shall be properly recorded by contractor's representative with detail of challan, bill and quantity.

- a) All equipment shall be inspected and tested as per an agreed Quality Assurance Plan before the same is packed and dispatched from the Contractor's/ Vendor's Works. The Contractor shall carry out tests as specified/ directed by Engineer.
- b) Contractor shall perform all such tests as may be necessary to meet requirements of Local Authorities, Municipal or other statutory laws/ bye-laws in force. No extra shall be paid for these.
- c) The OWNER/ CONSULTANT may, at his sole discretion, carry out inspection at different stages during manufacturing and final testing after manufacturing.
- d) Approvals or passing of any inspection by the OWNER/ CONSULTANT or his authorized representative shall not however, prejudice the right of the OWNER/ CONSULTANT to reject the plan if it does not comply with the specification when erected or give complete satisfaction in service.
- e) All materials and equipment found defective shall be replaced and the whole work again tested to meet the requirements of the specifications, at the cost of the contractor. Contractor has to obtain a performance certificate/approval for the complete layout of piping/equipment erected.

#### 35.0 THIRD PART INSPECTION

- i. A Third Party Inspection Agency (TPIA), shall be engaged to carryout inspection of equipment/ materials at manufacturer/ supplier works, prior to dispatch, unless the TPI is explicitly waived off (in writing) by the OWNER/ CONSULTANT.
- ii. The TPI shall be carried out by any of the below mentioned approved agencies only:
  - Bureau Veritas (Ind.) Pvt. Ltd. (BVIS)
  - Lloyd's Register (LRIS)
  - Indian Register of Shipping (IRS)/
  - DNV GL

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- TUV India Pvt. Ltd. (TUV)
- iii. Third Party Inspection Release Note clearly indicating that material has been inspected and accepted as per QAP approved by OWNER shall be submitted for OWNER/ CONSULTANT review prior to dispatch.
  - iv. Approvals or passing of any inspection by the TPIA shall not however, prejudice the right of the OWNER/ CONSULTANT to reject the plan if it does not comply with the specification when erected or give complete satisfaction in service.
  - v. The entire Cost for engagement of TPIA and the necessary modification/ rectifications (if any) prior to dispatch, shall be borne by the Contractor and no extra claim whatsoever shall be admissible on this account.
  - vi. The OWNER/ CONSULTANT's Engineer may, at his sole discretion, carry out inspection at different stages during manufacturing and final testing after manufacturing. Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.



### 36.0 SECURITIES OF MATERIALS / EQUIPMENTS

Contractor shall be solely responsible for the security of the material at site and TFL/ Consultant shall not be responsible for any loss/theft of the materials.

- a) Materials required for the works, whether brought by the Contractor shall be stored by the Contractor only at places approved by the Engineer-in-Charge, as storage and safe custody of material shall be responsibility of the Contractor.
- b) TFL,'s officials concerned with the Contract shall be entitled at any time to inspect and examine any materials intended to be used in or on the works, either on the site or at factory or workshop or other place(s) where such materials are assembled, fabricated, manufactured or at any place(s) where these are lying or from which these are being obtained and the Contractor shall give such facilities as may be required for such inspection and examination.
- c) The contractor shall be the OWNER of all bought out items and materials and shall be responsible for the safety, security, insurance and care and custody of all the materials lying at site. TFL will have lien on all the items including those brought by the contractor for the purpose of Erection, testing, and commissioning of the work. For all Equipments/Materials, the title of Ownership shall pass on to the OWNER at the time of acceptance of entire work.

However, in case of termination of contract the transfer of title shall pass automatically to OWNER.

- d) CONSTRUCTION EQUIPMENT used by the CONTRACTOR and its SUB-CONTRACTORS in connection with the execution of works shall remain the property of CONTRACTOR or its SUB-CONTRACTORS. All duties, levies, taxes etc. payable on account of CONSTRUCTION EQUIPMENT shall be borne by the CONTRACTOR. CONTRACTOR shall indemnify the OWNER on this count.

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### 37.0 CONTRACTOR'S PERSONNEL AT SITE:

List of persons employed by Contractor for the subject work mentioning their residential address shall be submitted to TFL. In case of any revision, the same shall be informed to TFL from time-to-time. If required necessary verification from Police / Gram Pradhan shall have to be submitted by the contractor.

The Contractor shall be directly responsible for any/all disputes arising between him and his personnel and keep indemnified against all losses, damage and claims arising thereof.

Within the TFL's premises, the Contractor's personnel shall not do any private work other than their normal duties.

The personnel engaged by the Contractor shall be subject to security check by the TFL's security staff while entering/leaving the premises. The contractor & his personnel shall be required to follow the rules and regulations of TFL in force from time-to-time. The contractor may also be required to provide photo passes to the personnel required by him, for security and safety reasons and furnished the details of the same when asked for.

No other person except Contractor's authorized representative shall be allowed to enter TFL premises Contractor shall also not entertain any outsider or extend any service beyond TFL's premises. Entry of Contractor's persons shall be regulated with proper identity/gate pass.

Contractor shall be fully responsible for theft, burglary, fire or any mischievous deeds by his staff and any loss to TFL shall be recovered from the immediate bill of the Contractor.



Contractor shall provide all necessary tools and tackles, equipments, safety belt, wheel burrow, scaffolding, ladders, drilling m/c & safety equipment etc. required to carry out job at his cost and material used by Contractor shall be of standard make and approval of Engineer-In-Charge shall be taken for the same.

TFL also reserves the right to ask the Contractor to remove particular person(s) from site with immediate effect if in the opinion of TFL, his behaviour/ performance is not up to the mark and/or found indulging in unlawful activities, Contractor shall immediately comply with such instructions.

It will be the responsibility of contractor's engineer to ensure that their personnel behave in a proper manners and behaviour and not to undergo the argument with the employees. It will be the responsibility of the Contractor's Engineer to deal with such complaints or co-ordinate with the TFL Engineer.

### 38.0 SETTING OUT THE WORKS

The CONTRACTOR shall supply dimensioned drawings, levels and other information necessary to set out the works and the Contractor shall set out the works and be responsible for the accuracy of the same. He shall rectify at his own cost and to the satisfaction of the Engineer-in-Charge any error found at any stage which may arise through in accurate setting out. The Contractor shall protect and preserve all bench marks



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used in setting out the works till end of the Defects Liability Period unless the Engineer-in-Charge direct their earlier removal.

### 39.0 COMPLIANCE WITH LABOUR/ INDUSTRIAL LAWS

RESPONSIBILITIES OF THE CONTRACTOR AND COMPLIANCE WITH LABOUR/ INDUSTRIAL LAWS:

- a. The contractor shall have his own PF code no. with the RPFC as required under Employee PF & Miscellaneous Provisions Act, 1952 and ESI code No. required under Employee State Insurance Act 1948 before commencement of work.
- b. The contractors shall periodically submit the challans / receipts / proof for the depositing PF contribution with RPFC and ESIC.
- c. The contractor is require to obtain labour license under the provisions of Contract Labour (R&A) Act, 1970 from the office of ALC (Central), Ministry of Labour, Govt. of India.
- d. The contractor is liable to abide by all necessary licenses / permissions from the concerned authorities as provided under the various labor legislations
- e. The contractor shall discharge obligations as provided under various statutory enactment including the employees Provident Fund and Miscellaneous Provisions Act, 1952, Contract Labour (R&A) Act, 1970, Minimum Wages Act, 1948, Payment of wages act 1936, Workman Compensation Act 1923, Employees' State Insurance Act 1948 and other relevant acts, rules and regulations enforced from time to time.
- f. The contractor shall be solely responsible for the payment of wages and other dues to the personnel, if any, deployed by him latest by 7<sup>th</sup> day of the subsequent month.
- g. The contractor shall be solely responsible and indemnify the TFL against all charges, dues, claim etc. arising out of the disputes relating to the dues and employment of personnel, if any, deployed by him.
- h. The contractor shall indemnify TFL against all losses or damages, if any, caused to it on account of acts of the personnel, if any, deployed by him.
- i. All personnel deployed by the contractor should be on the rolls of the contractor.
- j. The contractor shall ensure regular and effective supervision and control of the personnel, if any, deployed by him and gives suitable direction for undertaking the contractual obligations.
- k. The personnel to be deputed by the contractor shall observe all security, fire and safety rules of TFL while at the site. His Work/Services will be supervised by the supervisors of contractor. Contractor has to be strictly adhere to guidance, instruction when required.
- l. Contractor shall provide proper identification cards for his employees to be deputed by him for Work/Services, duly signed by the contractor or authorized person on behalf of contractor. Also the contractor should obtain entry passes from Security Dept. through OPERATION-IN-CHARGE for his employees.

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- m. Contractor has to deploy the personnel with no past criminal records. Reformed people, names of such persons should be clearly indicated in case of. Also the contractor has to provide police verification for all the persons deployed by him.
- n. While confirming to any of these conditions, the contractor should ensure that no law of state regarding labour, their welfare, conduct etc, is violated. The contractor shall indemnify TFL for any action brought against him for violation, non-compliance of any act, rules & regulation of centre / state / local statutory authorities.
- o. All existing and amended safety / fire rules of TFL are to be followed at the work site.
- p. Contractor shall ensure payment of wages to the personnel employed and meet all statutory obligations of payment as per Minimum Wages act 1948 and payment of wages Act 1936.
- q. Special safety equipment e.g. safety belts, helmets, hand gloves, goggles, safety shoes etc shall be provided to the personnel engaged by the contractor.
- r. Suitable site office space may be provided by TFL if required and available.
- s. In case of accident, injury and death caused to the employee of the contractor while executing the Work under the contract, the contractor shall be solely responsible for payment of adequate compensation, insurance money etc. to the next kith & kin of injured / diseased. Contractor shall indemnify TFL from such liabilities.
- t. The contractor shall also undertake to obtain necessary group insurance coverage covering all risks connected with the job to be undertaken by him under the contract from insurance company and pay the premium accordingly.
- u. The contractor shall not employ or permit to be employed any person suffering from any contagious, loathsome or infectious disease. The contractor shall get examined his employees / persons deployed from a civil govt. doctor.
- v. No employees or person of contractor (including contractor) be allowed to consume alcoholic drinks or any narcotics within the plant premises. If found under the influence of above, the owner / TFL will terminate the contract immediately and may refer the case to police.
- w. The contractor hereby agrees to indemnify owner/ TFL and harmless from all claims, demands, actions, cost and charges etc brought by any court, competent authority/ statutory authorities against owner/ TFL.

#### **40.0 TERMS OF PAYMENT**

Payment shall be released after submitting valid Tax Invoice. GST no. of Contractor as well as Owner should be mentioned by the Contractor on Invoice.

Following terms of payment shall be applicable:

##### **40.1 Mobilization Advance: Not Applicable**

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#### 40.2 Running on Account Payment

Contractor shall raise the invoice for the 100% completed job against the RA bill and payment shall be release as per following manner:

##### (a) For Civil Works:

95% against the value of actual work done shall be paid against running bills certified by OWNER/CONSULTANT after recovery of following payments:

- a) Value of chargeable materials issued by OWNER/CONSULTANT, if any
- b) Mobilization advances if any.
- c) Statutory deductions like income tax, etc. as applicable.
- d) Any other recovery if becomes due.
- e) Value of Chargeable Service provided by owner/Consultant, if any

Payment shall not be released against 1st R/A bill until submission of following documents by contractor to the indenting department.

1. Financial Guarantee for Performance
2. Labour License (as per statutory requirements)
3. EPF Code Registration number
4. Insurance Contractor All Risk (CAR) Policy
5. Workmen compensation policy



##### (b) For Structure Steel Work:

- I. 5% on Finalization of quantities and submission of Approved Fabrication drawings.
- II. 50% on Supply & Acceptance of material at site.
- III. 15% on completion of fabrication.
- IV. 25% on Erection, Alignment, Welding, Grouting, Painting (as applicable) etc.
- V. 5% shall be treated as retention money and shall be released at the time of Settlement of final bill.

##### (c) MECHANICAL/ELECTRICAL / INSTRUMENTATION WORK

###### i. For Only Supply Items

- 80% upon receipt of material at site and acceptance of equipment/materials
- 10% after completion of the erection
- 5 % after Inspection and Testing
- Balance 5% (Retention Money) shall be released along with final bill

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**ii. For Only Erection Items**

- 80% on completion of erection / Installation
- 15% after inspection/testing
- Balance 5% (Retention Money) shall be released along with final bill

**iii. For Items involving both Supply & Erection**

- 65% on receipt and acceptance of material at site.
- 20% on completion of erection / Installation.
- 10% on Inspection & testing.
- Balance 5% (Retention Money) shall be released along with final bill

**(d) For Lumpsum/Lot Item:**

- 70% shall be paid on receipt and acceptance of material at site
- 20% on completion of erection / Installation
- 5% on Inspection & testing.
- Balance 5% (Retention Money) shall be released along with final bill.



**Balance 5% (Retention Money) shall be released along with final bill.**

40.3 Payment shall be released for supply of materials (wherever applicable) on submission of the following documents:

1. Signed Invoice(s)
2. Delivery Challan
3. Manufacturer's certificate of inspection for shipment in one original and one photocopy / Manufacturer's test certificate (wherever applicable)
4. Third Party Inspection Release Note clearly indicating that material has been inspected and accepted as per QAP approved by OWNER, or waiver certificate issued by OWNER (wherever applicable).
5. Railway Receipt/LR (wherever applicable)
6. Insurance Certificate/Intimation
7. Guarantee/ Warranty certificate (wherever applicable)
8. Operation & Maintenance manual (wherever applicable)

**Note :**



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The amount of CGST & SGST or IGST and GST cess, if any will be released when the same will appear in the GSTR-2A of OWNER, in the common portal of GST and supplier has filed the valid return in accordance with the provisions of the GST Act and the rules made there under. If, input tax credit is not available to OWNER for any reason attributable to the bidder, then OWNER shall not be obligatory or liable to pay or reimburse GST claimed in invoice and shall be entitled to deduct /setoff/ recover such GST together with all the penalty and interest if any, against any paid or payable to bidder. Further in this case, OWNER reserves the right to upload the name of such defaulter on the Company website and may also consider for giving Holiday or debarred from participation in future tender.

#### 40.4 **PAYING AUTHORITY**

Director (Finance),  
Talcher Fertilizers Ltd.,  
C/o GAIL Training Institute, PARC Building,  
Plot No. 24, Sector – 16A, Film City, NOIDA (U. P.)

40.5 Payment in R.A. bills shall based on quantity of work executed at site (as per the item of work) & verified by Owner/ Consultant as per the Contract. Owner/ Consultant is authorized to allow part rate/ reduced rate for any item as mentioned in Contract. The engineer in charge shall specify the reason for the part rate payment in the R.A. bill. Payment has been made in R.A. bill for any item but later on, if some defect is noticed by the Owner/ Consultant, then Owner/ Consultant shall disallow the payment in successive R.A. bill till rectification of the work has been done.

#### 40.6 **RELEASE OF 1st R/A BILL**

Payment will be released against 1st R/A bill only on submission of following documents by contractor to the EIC/ OWNER:



- i. Contract Performance Security
- ii. Labour License (as per statutory requirements)
- iii. EPF Code Registration number with RPFC/ARPF
- iv. Insurance Contractor All Risk (CAR) Policy
- v. Workmen compensation policy

40.7 Balance 5% (Retention Money) shall be released along with final bill subject to the following:

If the amount recoverable exceeds the amount payable in final bill, the balance amount shall be recovered by the Owner, from the retention money and or performance bank guarantee/any other moneys or bank guarantees available with the owner for any other job being done by the contractor. The contractor shall restore the performance guarantee to the requisite value to the extent of 3% of contract price in such case where recovery is required to be affected by the encashment of full amount or a part of the performance bank guarantee as soon as the contractor receives such intimation from the owner/ consultant.

40.8 The contractor shall raise invoices on fortnightly basis. Bidder shall enclose all documents as per check list issued by CONSULTANT/TFL. However, EIC/Project Manager may authorize payments for bills more frequently i.e. periodicity of less than fortnight, depending on site requirements.

After receipt of complete R.A. Bill as per terms and conditions of the contract and duly certified by Engineer-in-Charge (EIC), on-account payment equivalent to seventy percent (70%) of the net payable certified amount of the R.A. Bill will be released to the Contractor within a period of seven (07) working days from submission of certified bill by EIC to

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OWNER. The balance amount will be released within a period of 15 days from submission of certified bill by EIC to OWNER.

However, in addition of Running Account Bill, the contractor has to submit the Monthly Progress Report. This report will acts as a mandatory document for submission of the bill. Failing in submission of the report, the invoice will not be processed further for payment

40.9 The final bill complete in all respect shall be submitted by the contractor within three (3) months of certified completion of work. The bill should be accompanied along with the following documents.

1. Job completion certificate.
2. No claim certificate on Owner's prescribed proforma.
3. Site clearance certificate.
4. Contract Performance Security duly amended to cover Defect Liability Period.
5. Material reconciliation statement (statement of material issued by Owner or consultant to be got certified from stores dept.).
6. Indemnity certificate towards labour payment and all statutory payments.

No claim shall be entertained after receipt of final bill. Settlement of final bill shall be made subject to settlement of all disputes and furnishing of all required documents/clarifications and grant of extension of time, if any, by Owner's competent authority.

**In case any claim with regard to the wages of any labour employed by Contractor for the subject job is pending/ reported, TFL shall be fully entitled to withhold payment of final bill pending finalisation of such claims.**



#### **41.0 DISPATCH, TRANSPORTATION/SHIPPING**

CONTRACTOR shall be responsible for dispatch of EQUIPMENT by sea/ rail/ road/ air after proper packing and protection. The consignment shall be dispatched after inspection by Third Party Inspection Agency as specified in the Tender document, unless otherwise agreed to in writing however such inspection shall not constitute waiver of the CONTRACTOR's obligations, responsibilities for the EQUIPMENT including care, safety and preservation in any way and manner and the CONTRACTOR's responsibility and obligation in this behalf shall continue till ACCEPTANCE OF ENTIRE WORK.



**The Consignee for all bought-out material shall be CONTRACTOR.**

#### **42.0 WORK CONTRACT SERVICES**



42.1 The award of work shall be on 'Work Contract Service' basis. The contractor shall be responsible for payment of any tax levied on the transfer of property and goods involved with relevant GST act and rules made there under including amendments, if any. The contractor shall be liable to ensure to have registered with the respective tax authorities and to submit self-attested copy of such registration certificate(s) and any taxes/ duties/ levies being charged by the Contractor would be claimed by issuing proper tax invoice/ challan indicating details/ elements of all taxes charged and necessary requirements as prescribed under the respective tax laws and also to mention correct and valid registration number(s) on all tax invoices raised to TFL.

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- 42.2 Irrespective of single or separate insurances, the CONTRACTOR shall take the same in the joint name of OWNER and CONTRACTOR, with OWNER as Primary Beneficiary and CONTRACTOR as Joint Beneficiary, to cover all risk including marine cum erection insurance (MCE), workmen compensation / Employees State Insurance (ESI) under ESI Act 1948 for Contractor's personnel, fire risk policy etc. till handing over of PLANT to OWNER duly commissioned and tested. However, for CONTRACTOR's EQUIPMENT, CONTRACTOR can be the sole beneficiary. Further, OWNER shall have the first right over the claim amount for all insurance claims, where owner has made part or full payment to the contractor.
- 42.3 CONTRACTOR shall be fully responsible for pursuing and settling all claims under the underwriters. In the event of accident, injury, damage or loss likely to form a claim under the above insurance policies, CONTRACTOR shall, as quickly as possible submit the insurance claims by underwriters under intimation to OWNER. CONTRACTOR shall also keep OWNER fully informed about progress of each such case. CONTRACTOR shall undertake immediate repair and replacement of the equipment lost in transit, storage, assembly, erection and COMMISSIONING of PLANT pending settlement of claim thereafter by the underwriters.
- 42.4 The CONTRACTOR at his cost shall arrange, secure and maintain all insurance as may be pertinent to the works and obligatory in terms of law to protect his interest and interest of OWNER in the project, against all perils detailed herein. The Form and the limit of such insurance as defined herein together with the under-writer in each case shall be acceptable to the OWNER and OWNER's acceptance shall not be unreasonably withheld. However, irrespective of such acceptance, the responsibility to maintain adequate insurance coverage at all times including third party liability during the period of contract shall be as of CONTRACTOR alone. The contractor's failure in this regard shall not relieve him of any of his contractual responsibilities and obligations. The insurance covers to be taken by the CONTRACTOR shall be in the joint names of OWNER and the CONTRACTOR. The CONTRACTOR shall, however, be authorized to deal directly with insurance company or companies and shall be responsible in regard to maintenance of all insurance covers.
- 42.5 Any loss or damage to the equipment during handling, transportation, storage, erection, putting the equipment into satisfactory operation and all activities to be performed till the successful completion of trial operation of the plant shall be to the account of the CONTRACTOR. The CONTRACTOR shall be responsible for reference of all claims and make good the damages or loss by way of repairs and/or replacement of the equipment, damaged or lost. The transfer of title shall not in any way relieve the CONTRACTOR of the above responsibility during the period of CONTRACT. The CONTRACTOR shall provide the OWNER with copies of all insurance policies and documents taken out by him in pursuance of the CONTRACT. Such copies of documents shall be submitted to the OWNER immediately after such insurance coverage. However, if Marine cargo insurance or Third party liability Insurance is a part of their global policies; insurer certificate (including the main terms of policy) shall be submitted by CONTRACTOR. The CONTRACTOR shall also inform the OWNER in the writing at least thirty (30) days in advance regarding the expiry/ cancellation and/or change in any of such documents and ensure revalidation, renewal etc. as may be necessary well in time. However adequacy, credibility and maintenance of Insurance policies is the sole responsibility of CONTRACTOR and CONTRACTOR shall keep the OWNER indemnified against any such failure.

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- 42.6 If the material/ equipment or any portion thereof is damaged or lost during transit and handling, storage, erection, commissioning at site, the replacements of such material / equipment shall be effected by the CONTRACTOR within a reasonable time to avoid unnecessary delay in the COMMISSIONING of the EQUIPMENT and without waiting for realization of cost of damages from the insurance company, appointed by him for this purpose. This will not alter the schedule of commissioning & guarantee tests in any way.
- 42.7 All works and operations necessary to lift and to remove the material from port, warehouse, railway or other siding, factory or other places of delivery, loading, handling, transporting and unloading and safely stacking, placing or storing the same at approved godowns, yards or other place(s) of storage including lashing or other-wise securing or protecting the same in transit and during and in storage.
- 42.8 The CONTRACTOR shall maintain a day-to-day account of all materials indicating the daily receipt(s), consumption(s) and balance of each material and category thereof. Such account shall be in the format, if any, prescribed by the Engineer-in-Charge and shall be supported by all documents necessary to verify the correctness of the entries in the account. Such account shall be maintained at the CONTRACTOR MANAGER's office and site(s) and shall be open for inspection and verification (by verification of documents in support of the entry as also by feasible verification of the stock) at all times by the Engineer-in-Charge with authority at all times without obstruction to enter into or upon any godown or other place(s) or premise(s) where the materials or any part of them are lying or stored and to inspect the same himself and or through his representative(s).
- 42.9 The CONTRACTOR shall at all times be exclusively responsible for any and all losses, damages, deterioration, misuse, wastage, theft, or other application or misapplication or disposal of the materials or any of them contrary to the provisions hereof and shall keep the OWNER indemnified from and against the same and shall forthwith at its own cost and expenses replace any such material, lost, damaged, deteriorated, misused, wasted, stolen, applied, mis-applied and/or disposed as aforesaid with other material of equivalent quality and quantity delivered to site at the CONTRACTOR's risks and costs in all respects.
- 42.10 Notwithstanding anything herein provided, the CONTRACTOR shall be and remain solely and exclusively liable to repair, restore or replace, as the case may be, the materials damaged or destroyed as a result of any act or omission, notwithstanding the existence or otherwise of any policy(ies) of insurance aforesaid, with the intent that any policy(ies) of insurance aforesaid taken out by the CONTRACTOR or by the OWNER, on default by the CONTRACTOR, shall not anyway absolve the CONTRACTOR from his full liability up to and until issue of the Completion Certificate as provided for herein in respect of the works, the work(s) and all materials incorporated therein shall be and remain at the risks of the CONTRACTOR in all respects, including (but not limited to) accident, lightning, earth-quake, fire, storm, flood, tempest, riot, civil commotion and/or war or otherwise with respect to the materials, but shall constitute merely an additional security and not a substitution of liability.

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- 42.11 If the CONTRACTOR shall default in replacing at the job site, free of any cost to the OWNER, any material lost, damaged, deteriorated, misused, wasted, short, stolen, misapplied or disposed of within the provisions hereof above, or shall fail to return to the OWNER any surplus material or empties within the provision hereof above, the CONTRACTOR shall be liable to pay to the OWNER the cost of such materials or empties delivered at OWNER"s stockpile/ godown.

#### 43.0 CONSTRUCTION EQUIPMENT, TOOLS AND TACKLES DEPLOYMENT



- i. The details of key construction equipment in good condition, required to be mobilized by the contractor, to complete the work within the schedule is listed below (not limited to only the following) :

Sl. No.	Equipment Description
1	Hydraulic Telescopic Boom Pick & Carry Crane of suitable capacity
2	Hydraulic Excavator
3	Dumper
4	Tractor Trailer
5	Water Tanker
6	Total Station
7	Dumpy level
8	Welding Machine
9	Dewatering Pump
10	Concrete Mixer
11	Electrical tool Kit
12	Breaker
13	Manual/ Electrical Lifting Equipment/ Hoists/ Pullers of suitable capacity
14	Any, other equipments to complete the job

- ii. Contractor to confirm that the above equipments are available with him in good working condition and shall be timely mobilized on this project site. Contractor has the option to hire some these equipment from equipment hiring agencies also, however contractor shall be responsible for all the machinery deployed at site.
- iii. In addition to above, Contractor shall be required to deploy all the machinery/ tools & tackles at site as required for the successful completion of the job/ as directed by the Engineer-in-charge.
- iv. Owner/ consultant reserve the right to physically check & verify the availability of these equipments prior to award of work
- v. Contractor shall replace any defective/ damaged equipment promptly to complete the work without any time & cost implication to the owner/ consultant
- vi. The actual deployment of equipments shall be finalized or approved by Engineer-in-charge.

#### 44.0 BOCW (BUILDING AND OTHER CONSTRUCTION WORKS)

Applicable BOCW shall be included in the quoted TOTAL CONTRACT PRICE. The contractor shall pay the cess under BOCW Act for subject works and submit proof of submission of cess to owner before submitting the next R.A. bill. In case, contractor does not



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submit the said proof, applicable BOCW shall be deducted at source by the OWNER from the contractor's invoice and deposit the deducted amount to the concerned authority. OWNER does not undertake any further responsibility in this regard.

#### 45.0 DELETED

#### 46.0 SUB-CONTRACTOR/VENDOR AND MANUFACTURER WARRANTIES

- (a) CONTRACTOR shall ensure that all equipment and other items used in connection with the performance of the WORK or incorporated in the PLANT (other than minor items) will be purchased in compliance with CONTRACT Technical Specifications and requirements in order to allow the PLANT to achieve the Guarantee and Warrantee as provided for in the CONTRACT, unless otherwise agreed with OWNER. Any residual warranty from sub-contractor/vendor shall be passed to the OWNER after expiry of DEFECT LIABILITY PERIOD.
- (b) Neither CONTRACTOR nor its SUB-CONTRACTORS/SUB-VENDORS nor any person under the control of either thereof, shall take any action which could release, void, impair or waive any Guarantee or Warranty on EQUIPMENT or services relating to the PROJECT or the WORK. Any residual warranty from sub-contractor/sub-vendor shall be passed to the OWNER after expiry of DEFECT LIABILITY PERIOD.
- (c) Nothing in this clause shall derogate from the obligations of CONTRACTOR to provide the Guarantees and Warranties described in and to comply with the provisions hereinabove.
- (d) CONTRACTOR shall, based on its past professional judgement, enforce all guarantees and warranties provided hereunder to the fullest extent thereof till such time they are transferred to the OWNER pursuant to sub-clause (g) below.
- (e) Upon the expiration or termination of any of the guarantees or warranties provided by CONTRACTOR pursuant to the CONTRACT, the CONTRACTOR shall assign, and hereby assigns, effective as of such date, or otherwise make available, to OWNER all of CONTRACTOR's rights under all such SUBCONTRACTOR's residual Guarantees and warrantee as per 45.0 (a) & (b) (except to the extent CONTRACTOR has thereof provided warranty services to OWNER and is enforcing CONTRACTOR's rights with respect to such services under the applicable guarantee or warranty) and shall deliver to OWNER copies of all contracts providing for such guarantees and warranties.
- (f) CONTRACTOR, in accordance with the CONTRACT, shall require all SUB-CONTRACTORS/ SUB-VENDORS to be covered by the insurance covers specified in the CONTRACT, during the time in which they are engaged in performing WORK.
- (g) CONTRACTOR shall require all SUB-CONTRACTORS/ SUB-VENDORS to release and waive any and all rights of recovery against OWNER including its affiliates, subsidiaries, employees, successors, permitted assigns, insurers and underwriters) and against CONTRACTOR and all other SUB-CONTRACTORS/ VENDORS which the releasing SUB-CONTRACTOR/ VENDOR may otherwise have or acquire, in or from or in any way connected with any loss covered by policies of insurance maintained or required to be maintained pursuant to this the CONTRACT (other than third party liability insurance policies) or because of deductible clauses in or inadequacy of limits of any such policies of insurance. CONTRACTOR shall further require all SUB-CONTRACTORS/VENDORS to include in all policies of insurance maintained by the SUB-CONTRACTORS/

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VENDORS clauses providing that each underwriter shall release and waive all of its rights of recovery, under subrogation or otherwise, against OWNER, its promoters, affiliates, subsidiaries, employees, successors, permitted assigns, insurers and underwriters, and against CONTRACTOR and all other SUB-CONTRACTORS/VENDORS.

- (h) OWNER shall not be deemed by virtue of the CONTRACT to have any contractual obligation to or relationship with any SUB-CONTRACTOR/ VENDOR.

#### 47.0 CONTRACTOR's LIABILITY FOR APPROVED SUB CONTRACTOR :



The review by and approval and consent of OWNER as to the approved SUB-CONTRACTORS list or as to CONTRACTOR entering into any SUB-CONTRACT with any approved SUB-CONTRACTOR or as to any WORK done or supply made or services provided by any such approved SUB-CONTRACTOR/ SUB-VENDOR shall not relieve CONTRACTOR of any of his duties, liabilities or obligations under this CONTRACT, and CONTRACTOR shall be liable hereunder to the same extent as if any such SUB-CONTRACT had not been entered into. Any inspection review or approval by OWNER permitted under this CONTRACT of any portion of the work or of any work in progress by CONTRACTOR or SUB-CONTRACTORS/ SUB-V ENDORS shall not relieve CONTRACTOR of any duties, liabilities or obligations under this CONTRACT.

#### 48.0 STATUTORY VARIATION IN TAXES AND DUTIES

- 48.1 No variation on account of taxes and duties, statutory or otherwise, (other than due to change in turnover) shall be payable by OWNER to CONTRACTOR, except for GST. Any statutory variation in GST, shall be payable up to COMPLETION PERIOD against documentary evidence. Any reduction in the amount of GST resulting from a reduction in the rate of GST or remission or exemption from GST with respect to Goods and Services provided to the OWNER shall be refundable to the OWNER at actuals within the COMPLETION PERIOD and also during the delayed contractual Project completion, if any. The CONTRACTOR shall submit a copy of the 'Government Notification' to evidence the rate as applicable on the Bid due date and on the date of revision.
- 48.2 Any new taxes, duties, cess, levies notified or imposed after the submission of Price Bid but before COMPLETION PERIOD shall be to OWNER's Account.
- 48.3 In case of delayed completion beyond the COMPLETION PERIOD, even though extension of completion time is allowed by OWNER, for reasons solely attributable to Contractor, all extra costs on account of changes of statutory regulations/ acts shall not apply to the Contract price and shall be borne by the CONTRACTOR.

However, any decrease in taxes and duties during the delayed period shall be passed on to the OWNER.

In case the COMPLETION PERIOD is extended for reasons solely attributable to OWNER, then any increase on account of statutory changes in GST until the extended period shall be borne by OWNER. Further, any new taxes, duties, cess, levies notified or

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imposed after the submission of Price Bid during such extended COMPLETION PERIOD shall be to OWNER's Account-

- 48.4 Claim for payment of GST (CGST & SGST/UTGST or IGST)/ Statutory variation, should be raised within two [02] months from the date of issue of 'Government Notification' for payment of differential (in %) GST (CGST & SGST/UTGST or IGST), otherwise claim in respect of above shall not be entertained for payment of arrears.  
The base date for the purpose of applying statutory variation shall be the Bid Due Date.



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**ANNEXURE - I**  
**TO**  
**SPECIAL CONDITIONS OF CONTRACT**  
  
**SPECIFICATION**  
**FOR**  
**HEALTH, SAFETY AND**  
**ENVIRONMENT (HSE) MANAGEMENT**



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### ANNEXURES: -

1. ANNEXURE-1 A : RELEVANT I.S. CODES
2. ANNEXURE-1 B : REPORTING FORMATS

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## 1.0 SCOPE

This Specification establishes the Health, Safety and Environment (HSE) management requirement to be complied with by the Contractors during construction. Requirements stipulated in this specification shall supplement the requirements of HSE Management given in relevant Act (s)/ legislations. General Conditions of Contract (GCC), Special Conditions of Contract (SCC), and Job Specifications. Where different documents stipulate for different requirements, the most stringent shall be adopted.

## 2.0 REFERENCES

This document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Condition of Contract (SCC)
- Job Specifications
- Relevant IS Codes (Refer Annexure-IA)
- Reporting Formats (Refer Annexure-IB)

## 3.0 REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPILED BY BIDDERS

### 3.1 MANAGEMENT RESPONSIBILITY

The contractor should have a documented HSE policy to cover commitment of their organization to ensure health, safety and environment aspects in their line of operation.

3.1.2 The HSE management system of the Contractor shall cover the HSE requirements including but not limited to what is specified under Para 1.0 and Para 2.0 above.



3.1.3 Contractor shall be fully responsible for planning and implementing HSE requirements. Contractor as a minimum requirement shall designate/deploy the following to coordinate the above.

No. of workers deployed  
Upto 250

- Deploy one qualified and experienced safety Engineer/Officer

Above 250 & Upto 500

- One additional safety engineer/officer, as above



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Above 500  
(For every 500 or less)

- One additional safety engineer/officer,  
for each 200 workers.

Contractor shall indemnify & hold harmless Owner/Consultant & their representatives free from any and all liabilities arising out of non-fulfillment of HSE requirements.

- 3.1.4 The Contractor shall ensure that the Health, Safety and Environment (HSE) requirements are clearly understood & faithfully implemented at all levels at site.
- 3.1.5 The Contractor shall promote and develop consciousness for Health Safety and Environment among all personnel working for the Contractor. Regular awareness programs and fabrication shop/work site meetings shall be arranged on HSE activities to cover hazards involved in various operations during construction.
- 3.1.6 Arrange suitable First-Aid measures such as First Aid Box, trained personnel to First Aid, Standby Ambulance or Vehicle and install fire protection measures such as adequate number of steel buckets with sand and water and adequate extinguishers to the satisfaction of Consultant/Owner.
- 3.1.7 The Contractor shall evolve a comprehensive planned and documented system for implementation and monitoring of the HSE requirements. This shall be submitted to Consultant/Owner for approval. The monitoring for implementation shall be done by regular inspections and compliance to the observations thereof. The Contractor shall get similar HSE requirements implemented at his sub-contractor(s) work site/office. However, compliance of HSE requirements shall be the sole responsibility of Contractor. Any review/approval by Consultant/Owner shall not absolve contractor of his responsibility / liability in relation to all HSE requirements.
- 3.1.8 Non-Conformance on HSE by Contractor (including his Sub-contractors) as brought out during review/audit by Consultant/Owner representative shall be resolved forthwith by Contractor. Compliance report shall be provided to Consultant/Owner.
- 3.1.9 The Contractor shall ensure participation of his Resident Engineer/ Site-in-Charge in the Safety Committee / HSE Committees. Meetings arranged by Consultant/Owner. The compliance of any observations shall be arranged urgently. He shall assist Consultant/Owner to achieve the targets set by them on HSE during the project implementation.
- 3.1.10 The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliance or continuous failure in implementation of any of HSE provisions; Consultant/Owner may impose stoppage of work without any Cost & time implication to Owner and/or impose a suitable penalty for noncompliance with a notice of suitable period upto a cumulative limit of 1.0% (one percent) of Contract Value with a ceiling of Rs 10 lakhs. This penalty shall be in addition to all other penalties specified else where in the contract. The decision of imposing stoppage

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work, its extent & monetary penalty shall rest with Consultant/Owner & binding on the Contractor.

3.1.11 However **fatal accident** may lead to termination of the Contract. The personnel accidents shall be investigated by a team of Contractor's senior personnel for root cause & recommend corrective and preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to Consultant/Owner. Owner/Consultant shall have the liberty to independently investigate such occurrences and Contractor shall extend all necessary help and co-operation in this regard.



### 3.2.0 HOUSE KEEPING

3.2.1 Contractor shall ensure that a high degree of house keeping is maintained and shall ensure inter-racial the followings:

- a. All surplus earth and debris are removed/disposed off from the working areas to identified location(s).
- b. Unused / Surplus Cables different places within location(s). Steel items and steel scrap lying scattered at the working areas are removed to identified
- c. All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to indemnified location(s).
- d. Roads shall be kept clear and materials like pipes steel sand, boulders concrete, chips and bricks etc shall not be allowed on the roads to obstruct free movement of men & machineries.
- e. Fabricated steel structural, pipes & piping materials shall be stacked properly for erection.
- f. Water logging on roads shall not be allowed.
- g. No parking of trucks/trolleys, cranes and trailers etc shall be allowed on roads which may obstruct the traffic movement.
- h. Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.
- i. Trucks carrying sand, earth and pulverized materials etc shall be covered while moving within the plant area.



### 3.3.0 HEALTH, SAFETY AND ENVIRONMENT

3.3.1 The Contractor shall provide safe means of access to any working place including provisions of suitable and sufficient scaffolding at various stages during all operations

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of the work for the safety of his workmen, and, Consultant/Owner. Contractor shall ensure deployment of appropriate equipment and appliances for adequate safety and health of the workmen and protection of surrounding areas.

- 3.3.2 The Contractor shall ensure that all their staff and workers including their subcontractor(s) shall wear Safety Helmet and Safety shoes. Contractor shall also ensure, use of safety belt protective goggles, gloves etc. by the personnel as per job requirements. All these gadgets shall conform to relevant IS specifications or equivalent.
- 3.3.3 Contractor shall ensure that a proper Safety Net System shall be used at appropriate locations. The safety net shall be located not more than 30 feet (9.0 meters) below the working surface at site to arrest or to reduce the consequences of a possible fall of persons working at different heights.
- 3.3.4 Contractor shall ensure that flash back arrester shall be used while using Gas Cylinders at site. Cylinders shall be mounted on trolleys.
- 3.3.5 The Contractor shall assign to his workmen tasks commensurate with their qualification experience and state of health for driving of vehicles, handling and erection of materials and equipments. All lifting equipments shall test certified for its capacity before use. Adequate and suitable lighting at every work place and approach there to, shall be provided by the contractor before starting the actual operations at night.
- 3.3.6 Hazardous and/or toxic materials such as solvent coating or thinners shall be stored in appropriate containers.
- 3.3.7 All hazardous materials shall be labeled with the name of materials the hazards associated with its use and necessary precautions to be taken.
- 3.3.8 Contractor shall ensure that during performance of the work, all hazards to the health of personnel have been indemnified, assessed and eliminated.
- 3.3.9 Chemical spills shall be contained & cleaned up immediately to prevent further, contamination.
- 3.3.10 All personnel exposed to physical agents such as ionizing or non-ionizing radiations ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.
- 3.3.11 Where contact or exposure of hazardous materials could exceed limits or could otherwise have harmful affects, appropriate personal protective equipments such as gloves, goggles, aprons chemical resistant clothing and respirator shall be used.
- 3.3.12 Suitable facilities for toilet, drinking water, proper lighting shall be provided at site and labor camps, commensurate with applicable Laws/Legislation.

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3.3.13 Contractor shall ensure storage and utilization methodology of materials that are not detrimental to environment. Where required, Contractor shall ensure that only the environment friendly materials are selected.

3.3.15 All persons deployed at site shall be knowledgeable of and comply with the environment laws, rules & regulations relating to the hazardous materials substances and wastes. Contractor shall not dump release or otherwise discharge or dispose off any such materials without the express authorization of Consultant / Owner.

#### **4.0 DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR**

##### **4.1 On Award of Contract**



The Contractor shall prior to start of work submit his Health, Safety and Environment Manual or procedure and HSE Plans for approval by Consultant/Owner. The contractor shall participate in the pre-start meeting with Consultant/Owner to finalize HSE Plans including the following.

- Job procedure to be followed by Contractor for activities covering handling of equipments, Scaffolding, Electric Installation, describing the risks involved, actions to be taken and methodology for monitoring each activity.
- Consultant/Owner review /audit requirements.
- Organization structure along with responsibility and authority records/ reports etc on HSE activities.

##### **4.2 During job execution**

4.2.1 Implement approved Health, Safety and Environment management procedure including but not limited to as brought out under Para 3.0. Contractor shall also ensure to:

- Arrange workmen compensation insurance registration under ESI Act third party liability insurance etc, as applicable:
- Arrange all HSE permits before start of activities (as applicable) like hot work, confined space, work at heights, storage of chemicals/explosive materials and its use and implement all precautions mentioned their in.
- Submit timely the completed checklist on HSE activities, Monthly HSE reports, accident reports, and investigation reports etc as per Consultant/Owner requirements. Compliance of instructions on HSE shall be done by contractor and informed urgently to Consultant /Owner.
- Ensure that resident Engineer/Site-In-Charge of the Contractor shall attend all the Safety Committee/HSE meetings arranged by Consultant/Owner. Only in

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case of his absence from site that a second senior most person shall be nominated by him in advance and communicated to Consultant/Owner.

- Display at site office and work locations caution boards list of hospitals emergency services available.
- Provide posters, banners for safe working to promote safety consciousness.
- Carry out audits/inspection at sub-contractor works as per approved HSE document & submit the reports for Consultant/Owner review.
- Assist in HSE audits by Consultant /Owner and submit compliance reports
- Generate & submit HSE records/report as per HSE Plan.
- Appraise Consultant /Owner on HSE activities at site.

**ANNEXURE -1A**

**RELEVANT IS - CODES FOR PERSONAL PROTECTION**



	<p style="text-align: center;"><b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b></p> <p style="text-align: center;"><b>HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</b></p>	PC-183/ E/ 206/ S-V	0	
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IS: 2925 - 1984	Industrial Safety Helmets
IS: 4770 - 1968	Rubber gloves for electrical purposes
IS: 6994 - 1973 (Part-I)	Industrial Safety Gloves (Leather & Conon Gloves)
IS: 1989 - 1986 (Part -I & III)	Leather safety boots and shoes
IS: 3738 - 1975	Rubber knee boots
IS: 5557 - 1969	Industrial and Safety rubber knee boots
IS: 6519 - 1971	Code of practice for selections, care and repair of Safety footwear
IS: 11226 - 1985	Leather Safety footwear having direct moulding sole
IS: 5983 - 1978	Eye protectors
IS: 9167 -1979	Ear protectors
IS: 3521 -1983	Industrial Safety belts and harness

**NOTE:**

For necessary Codes for safety/Environmental requirement, concerned statutory authorities may be consulted.

**ANNEXURE –1B**

**1.0 HEALTH SAFETY & ENVIRONMENT (HSE) PLAN**



**SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES  
AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA**

**HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT**

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**HEALTH SAFETY & ENVIRONMENT (HSE) PLAN**

Project: ..... Contractor: .....  
Date: ..... Owner: .....

(To be prepared by each construction Agency )

Activity description	Procedure /with guide lines	Code of Conformance	Performing function			Audit function
			Performer	Checker	Approver	
						Customer review/audit

**2.0 MONTHLY HSE CHECKLIST CUM COMPLIANCE REPORT (1/6)**

	<p align="center"><b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b>  <b>AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b></p> <p align="center"><b>HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</b></p>	PC-183/ E/ 206/ S-V	0	
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**PROJECT:**

**CONTRACTOR:**



**DATE:**

**OWNER:**

**INSPECTION BY:**



**NOTE:** Write N.A. where the item is not applicable.

ITEM	Yes	No	Remarks	Action
<b>HOUSEKEEPING</b>				
Waste containers provided and used				
Sanitary facilities adequate and clean				
Passageways and walkways clear				
General neatness of working areas				
Other				
<b>PERSONAL PROTECTIVE EQUIPMENTS</b>				
Goggles, Shields				
Face protection				
Hearing protection				
Safety shoes provided				
Hand protection				
Respiratory mask etc.				
Safety belts				
Other				
<b>EXCAVATION / OPENINGS</b>				
Opening properly covered or barricaded				
Excavation shored				
Excavation barricaded				
Overnight lightening provided				
Other				

	<p align="center"><b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b>  <b>AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b></p> <p align="center"><b>HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</b></p>	PC-183/ E/ 206/ S-V	0	
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**MONTHLY HSE CHECKLIST CUM COMPLIANCE REPORT (2/6)**

ITEM	Yes	No	Remarks	Action
<b>WELDING ,CUTTING</b>				
Gas cylinders chained upright				
Cables and hoses not obstructing				
Screens or shields used				
Flammable materials protected				
Fire extinguisher (s) accessible				
other				
<b>SCAFFOLDING</b>				
Fully decked platforms				
Guard and intermediate rails in place				
Toe boards in place				
Adequate shoring				
Adequate access				
Other				
<b>LADDERS</b>				
Extension side rails 1 m above				
Top of landing				
Properly secured				
Angle $\pm 70^\circ$ from horizontal				
Other				

	<p align="center">SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</p> <p align="center">HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</p>	PC-183/ E/ 206/ S-V	0	
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### MONTHLY HSE CHECKLIST CUM COMPLIANCE REPORT (Contd. 3/6)

ITEM	Yes	No	Remarks	Action
<b>HOISTS, CRANES AND DERRICKS</b>				
Condition of cables and sheaves OK				
Condition of slings, chains hooks and eyes O.K.				
Inspection and maintenance logs maintained				
Outriggers used				
Sign/l barricades provided				
signals observed and understood				
Qualified operators				
Other				
<b>MACHINERY, TOOLS AND EQUIPMENT</b>				
Proper instruction				
Safety devices				
Proper cords				
Inspection and maintenance				
Other				
<b>VEHICLE AND TRAFFIC</b>				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Others				



	<p align="center"><b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b>  <b>AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b></p> <p align="center"><b>HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</b></p>	PC-183/ E/ 206/ S-V	0	
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**MONTHLY HSE CHECKLIST CUM COMPLIANCE REPORT (Contd. 4/6)**

ITEM	Yes	No	Remarks	Action
<b>TEMPORARY FACILITIES</b>				
Emergency instructions posted				
Fire extinguisher provided				
Fire-aid equipment available				
Secured against storm damage				
General neatness				
In accordance with electrical requirements				
Other				
<b>FIRE PREVENTION</b>				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas.				
Hydrants Clear				
Other				
<b>ELECTRICAL</b>				
Proper wiring				
ELCB's provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Other				

**MONTHLY HSE CHECKLIST CUM COMPLIANCE REPORT (Contd. 5/6)**



ITEM	Yes	No	Remarks	Action
<b>HANDLING AND STORAGE OF MATERIALS</b>				
Properly Stored or stacked				

	<b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b>	PC-183/ E/ 206/ S-V	0	
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<b>HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</b>				

Passageways clear				
Other				
<b>FLAMMABLE GASES AND LIQUIDS</b>				
Container clearly identified				
Proper storage				
Fire extinguishers nearby				
Other				
<b>WORKING AT HEIGHT</b>				
Erection plan				
Safety nets				
Safety belts and lanyards: chute lines				
Other				
<b>ENVIRONMENT</b>				
Chemical and other Effluents properly disposed				
Cleaning liquid of pipes disposed off properly				
Sea water used for hydro-testing disposed off as per agreed procedure				
Lubricant waste/Engine oils properly disposed				
Waste from Canteen, offices, sanitation etc disposed properly				
Disposal of surplus earth stripping materials Oily rags and combustible materials done properly				
Green belt protection				

### MONTHLY HSE CHECK LIST CUM COMPLIANCE REPORT (Contd. 6/6)

ITEM	Yes	No	Remarks	Action
<b>HEALTH CHECKS</b>				
Hygienic conditions at labour camps O.K.				



	<p align="center">SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</p> <p align="center">HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</p>	PC-183/ E/ 206/ S-V	0	
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Availability of first Aid facilities				
Proper sanitation at site ,office and labour camps				
Arrangement of medical facilities				
Measures for dealing with illness				
Availability of potable drinking water for working and staff				
Provision of crèches for children				

(Signature of Resident Engineer with Seal)

3.0 **ACCIDENT CUM FIRE REPORT**



	<p align="center"> <b>SUPPLY AND CONSTRUCTION OF ASH POND AND  ALLIED SERVICES  AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b> </p> <p align="center"> <b>HEALTH, SAFETY AND  ENVIRONMENT (HSE) MANAGEMENT</b> </p>	PC-183/ E/ 206/ S-V	0	
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STANDARD TFL FORMAT SHALL BE SUPPLIED AT SITE

4.0

**SUPPLEMENTRY ACCIDENT & INVESTIGATION REPORT**



STANDARD TFL FORMAT SHALL BE SUPPLIED AT SITE

**5.0 MONTHLY HEALTH, SAFETY & ENVIRONMENT (HSE) REPORT**

(To be submitted by each Contractor)

Actual work start Date:  
Project:  
Name of the Contractor:  
Name of work:

For the Month of:  
Report No:  
Status as on:  
Name of safety officer:

	<b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b>  <b>HEALTH, SAFETY AND ENVIRONMENT (HSE) MANAGEMENT</b>	PC-183/ E/ 206/ S-V	0	
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ITEM	THIS MONTH	CUMMULATIVE
Total Strength (Staff + Workmen)		
Number of HSE meetings organized at site		
Number of HSE awareness programs conducted at site		
Whether workmen compensation policy taken		
Whether workmen compensation policy is valid		
Whether workmen registered under ESI Act		
No. of fatal accidents		
Number of Loss time accidents(other than fatal)		
Other accidents (Non Loss Time)		
Total No. of Accidents		
Total man-hours worked		
Man-hour loss due to fire and accidents		
Compensation cases raised with Insurance		
Compensation cases resolved and paid to workmen		
Remarks		

Date:

**Safety Officer / Resident Engineer**

(Signature and name)

To:

OWNER..... 1 Copy

RCM/SITE-IN-Charge (CONSULTANT) 1 Copy



**TALCHER FERTILIZER LIMITED**

**(TFL)**

**NOTICE INVITING TENDER**

**FOR**

**SUPPLY & CONSTRUCTION OF ASH POND AND ALLIED SERVICES**

**AT**

**TALCHER FERTILIZER LIMITED**

**(NIT NO.: PNP/PC-183/E/206/NCB)**

**PROJECT: INTEGRATED COAL BASED FERTILISER  
COMPLEX AT TALCHER, ANGUL DISTRICT,  
ODISHA (INDIA)**

**PREPARED & ISSUED BY**



**PROJECTS & DEVELOPMENT INDIA LTD.**

**(A Govt. of India Undertaking)**

**PDIL BHAWAN, A-14, SECTOR-1,**

**NOIDA, U.P., (INDIA)**

**June, 2022**

## INDEX

**NIT NO : PNP/PC-183/E- 206/NCB**



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2	DESIGN PHILOSOPHY & TECHNICAL SPECIFICATION – MATERIAL HANDLING	PC183/E/206/S-VI/2.0
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4	DESIGN PHILOSOPHY & TECHNICAL SPECIFICATION – ELECTRICAL	PC183/E/206/S -VI/4.0
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<b>SECTION VII</b>		
<b>1.0</b>	<b>SCHEDULE OF RATE</b>	

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## PROJECT DESCRIPTION & SCOPE OF WORK

**PLANT: SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES**

**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

	<b>CONSTRUCTION OF ASH POND AND ALLIED FACILITIES AT TFL, TALCHER</b>	PC183/E/206/S-VI/1.0	0	
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## 1. PROJECT DESCRIPTION

Talcher Fertilizers Ltd. (TFL), a joint venture company of four major Public Sector Units – M/s GAIL (India) Limited (GAIL), M/s Rastriya Chemicals & Fertilizers Ltd. (RCF), M/s Coal India Ltd. (CIL) and M/s Fertilizers Corporation of India Ltd. (FCIL) is in the process of establishing a world class Coal based fertilizer complex at Talcher, Angul District, Odisha (India).

The plant will be consisting Coal Gasification Plant, Ammonia Plant and Urea Plant, along with Offsite and Utility facilities, various offices for functional & administrative requirements etc. Besides above plants & facilities, TFL shall also have its own township complex.

During the process of establishing the above plants, combustion of coal shall be carried out and that will generate huge quantities of ash/Slag.

This tender document is intended to cover the activities and services in respect of all the work relates to Construction of Ash Pond & Facilities i.e. Ash water recirculation system, Ash Evacuation facility from the dyke to be installed for Talcher Fertilizer Limited Orissa, India.

### **Ash /Slag generated from Gasification Plant:**

Slag generated in the Gasifiers, shall be transported suitably from Gasification area to the dedicated adjacent ash/slag pond within Battery Limit of the Complex by CGP LSTK Contractor Fly Ash generated in the Gasifiers shall be pneumatically transported to the dedicated Fly Ash RCC Storage Silo (near Ash Pond) by CGP LSTK Contractor, from where dry fly ash shall be unloaded into trucks for further disposal to mines.

### **Ash generated from Steam Generation Plant:**



Ash generated in all the Boilers (both Bottom ash and Fly ash) shall be transported suitably from Boiler area to the dedicated Bottom Ash / Fly Ash RCC Storage Silo (near Ash Pond) by SGP LSTK bidder, from where dry bed/ fly ash shall be unloaded into trucks for further disposal to mines.

### **Requirement of Ash Pond:**

In case of any unforeseen condition, when ash/slag cannot be transferred to the mines via trucks, then the Bottom ash /Fly ash shall be disposed to Ash pond in slurry form at single point within plant battery limit having 30 days storage capacity.

### **Broad description/ details of Ash pond:**

1. Proposed area for ash pond and utilities is around 300m x 225m. Ash Pond shall be designed for fulfilling 30 days storage capacity for all the generated Ash and slag in the plant.
2. The fly ash/ Bed ash from Bed ash silo/Fly ash silo shall be transferred to Ash/slag

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pond in slurry form) at a single point by other Contractor. However, Garland piping around the ash pond is to be designed and provided under this contract.

3. Slag will be coming to the ash/slag pond via belt conveyer from Coal Gasification Plant. Separate compartments for Bed ash/Fly ash and Slag are proposed.
4. System for ash/ slag removal and further deposal to mines from ash/ slag pond is to be designed.
5. Water recovery system to recover the water from Ash slurry is to be considered.
6. Necessary system to treat the recovered water is to be designed. Recovered water shall be stored in a storage tank. Recovered water storage tank for retention time of 8 hours is to be designed. Recovered water shall be transferred to Ash slurry preparation system (in other LSTK's scope Steam Generation Plant) through Pumps (1W+1S).

Data for Fly ash and Slag to be generated in the Plant:-

Sr no.	Description	Generated quantity per hour	Generated quantity per day
1	Fly ash from Coal gasification	10 MT/hr	240 MT/day
2*	Fly ash from steam generation plant (estimated)	78 MT/hr	1872 MT/day
3	Slag from coal gasification	120 MT/hr	2880 MT/day
4*	Bed Ash from steam generation plant (estimated)	16 MT/hr	384 MT/day

MT= Metric Tonne



Detailed description regarding scheme of Ash Pond and water recovery system is to be referred from referred from Process Design Philosophy and Material Handling Technical Specification.

## 2. GENERAL SPECIFICATIONS

The Contractor shall inspect and examine the site and its surrounding and shall satisfy himself before submitting his bid as to the nature of the ground and subsoil, the form and nature of the site, the quantum and the nature of work and material necessary for successful completion of the works and the means of access to site and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his Tender. Under no circumstances, extra payment consequent on any misunderstanding or otherwise on the part of the Contractor shall be allowed.

The Contractor shall have to take all safety precaution to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case, any damage occurs due to the activities of the Contractor on account of negligence, ignorance, accidental or any other reasons whatsoever, the damage shall be made good by the Contractor at his own cost to the satisfaction of the Owner / Consultant. The Contractor shall have to take also all necessary



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safety measure, at his own cost, to avoid any harm/ injury to his workers and staff and facilities of the existing plant.

The work to be performed under the Scope of Work consists of providing all labour, materials except if indicated in Schedule of Rates, supervision, scaffolding, construction equipment, tools, tackles and plants, supplies, transportation, all incidental items though not indicated or specified, but reasonably implied or necessary for successful completion of the work including Contractor's supervision.

Sampling & testing of material & equipment shall be done as per relevant clauses of BIS & shall not be paid extra. The contractor shall preferably establish a laboratory at site for all relevant site tests as per BIS requirements.

### 3.0 BROAD SCOPE OF WORK

“Detailed Engineering, Procurement, Supply, Manufacture, Fabrication, Transportation of all equipment & material to site including Loading, Unloading, Storage, Maintenance, Construction and Erection of all Civil & structural work (earthen Ash Pond and other facilities), Mechanical (Piping and Machinery), Electrical and allied Instrumentation works, Installation, obtaining all necessary statutory approvals from concerned Government authorities as applicable, Testing, Mechanical completion, Pre-commissioning, Commissioning, Sustain load test run, Performance guarantee test runs etc.”



Bidder to quote price inclusive of above scope of work in their price bid.

Detailed scope of work includes, but not limited to, the following:

- (a) Detailed design and engineering (Complete Process, Civil, Mechanical, Electrical and C&I) of all the underground structures, foundations, super structures, equipment and equipment system(s), including associated civil, structural and architectural works;
- (b) Providing complete design, engineering data drawings, commissioning procedures and O&M manuals, etc. for the Owner's review, approval and records.
- (c) Supply, unloading, handling, storage, insurance, preservation and conservation of equipment at the site.
- (d) Execution of all associated electrical, mechanical and structural works.
- (e) Construction of all civil buildings and structures envisaged in the package.
- (f) Performance and guarantee tests after successful completion of trial operation.

### 4.00 SCOPE OF WORK (CIVIL)

The nature of work generally involves site clearance, excavation in all types of soils/ ash/ rock, foundation preparation, dewatering, shoring, backfilling, formation of dyke

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embankment with the material of specified quality from the specified or approved borrow areas, laying of impervious liner(LDPE) forming aggregate filter, bottom ash chimney & blanket, Bottom ash filter, upstream and downstream slope protection, instrumentation, forming drains, RCC spillways, supplying & laying of RCC Hume pipes & road works etc. and other ancillary works associated with the completion of dyke embankment as per specifications, drawings, Schedule of Items and directions of the Engineer.

Complete design, preparation of general arrangement drawings, detailed drawings, architectural drawings, getting the design and drawings approved by the Owner for the civil works (after incorporation of comments if any) associated with Ash/Slag Handling Plant System Package is in the bidder's scope. The structures under civil works shall include Ash Pond and dyke embankments, the pump houses viz, Ash slurry pump house & sump, Recovery cum Recycle water pump house and sump, Chemical Room & Electrical Building, Clarifier with its associated structure such as stilling chamber, Parshall Flume, Flash mixer Tank, Water Channel from clarifier to Recycle Water Sump, Disposal Pipe Pedestals and Thrust Blocks including garlanding pedestals for ash dyke; structures at discharge points; Equipment Foundations, Trestles, Roads, Roads/nallah/pipe/boundary wall crossings; trenches, etc. Other structures not mentioned above but as mentioned elsewhere in the specification or required for the successful completion of the entire System Package shall also be designed by the bidder. Construction & Execution of the structures mentioned above is in the scope of Bidder.

Detailed Scope of work of Material Handling, Process, Electrical, Instrumentation and piping etc, has been mentioned in respective sections of NIT.

### **5.00 TENDER DRAWINGS**

The drawings listed in the NIT forming part of the specification shall supplement the requirements specified herein. These drawings are preliminary drawings for bidding purpose only and subject to changes that may be necessary during the detailed engineering. In case of any conflict's contradiction among various volumes/sections/annexures/chapters / appendices / tender drawings of bid documents, the same shall be referred to the Owner/PMC for clarifications whose decision shall be final and binding. No extra claims shall be allowed on this account.

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**TECHNICAL SPECIFICATION & DESIGN PHILOSOPHY  
MATERIAL HANDLING**

**FOR**

**SUPPLY & CONSTRUCTION OF ASH POND  
AND ALLIED SERVICES**



**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX, AT  
TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

0	08.06.2022	08.06.2022	ISSUED FOR TENDER	NS	NS	AMAR
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>TECHNICAL SPECIFICATION- MATERIAL HANDLING</b>	PC183/E/206/S-VI/2.0	0	
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**LIST OF ATTACHMENTS**

SL. NO.	DRG. NO.	DESCRIPTION
1.0	PC0183-PNCV-AP-0201	Layout - Ash/Slag Dyke
2.0	PC0183-PNCV-AP-0204	Material Flow Diagram for Conveyor System
3.0	PC0183-PNCV-AP-0209	GA Drawing of Silo
4.0	PC0183-PNCV-AP-02010	GA Drawing of Movable Conveyor MBC-1 and MBC-1A
5.0	PC0183-PNCV-AP-02011	GA Drawing of Belt Conveyor BC-1 and BC-1A

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## 1.0 INTENT

This specification together with all enclosures cover the requirements for detailed design, engineering, manufacturing, inspection, testing, painting, supply, packing & forwarding, transportation to site, unloading & storage at site, erection/installation, assembly, trial run on no load, commissioning, smooth & trouble free operation and guarantee test run and acceptance of complete system including guarantee of complete Ash and slag handling at Ash and Slag dyke along with supply of spares for commissioning and 2 years' operation for M/S TFL at Talcher (Odisha).

## 2.0 SCOPE OF WORK

The scope of work of Ash/Slag handling system shall consist of, but not limited to the following:-



- a) Complete loading system by Front end pay loader into belt conveyor.
- b) Belt conveyor system for Ash/Slag handling from Ash/Slag Dyke to overhead bunker for Truck/dumper loading.
- c) Ash/Slag Storage Silo and associated accessories.

Contractor/Bidder to follow below mentioned drawings:-

### **PC0183-PNCV-AP-0204 - Material Flow Diagram for Conveyor System.**

Layout of Conveyor gantry, Transfer towers etc, levels of conveyors/ height of transfer towers, size, capacity and number of equipment mentioned in tender documents/shown in the conceptual drawings / layout are minimum requirements and tentative. The same shall be adjusted accordingly by the Contractor/bidder during detail engineering to suit their design as required to meet the bid requirement. All such changes pertaining to change in elevation, height, levels and any increase in capacity/ size/ number of equipment etc. shall implemented by the contractor without any cost and time implication to Owner/Consultant.

The data sheets and drawings indicate service requirements of proposed system and these shall be in no way relieve the bidder of his responsibility for providing equipment capable of meeting the required performance.

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### 3.0 BRIEF DESCRIPTION

#### 3.1 PROPOSED SCHEME OF ASH DISPOSAL SYSTEM

In case of any unforeseen condition, when ash/slag cannot be transferred to the mines via trucks, then the Bottom ash /Fly& Bed ash shall be disposed to Ash Pond in slurry form. Ash Pond Proposed area for ash pond and utilities will be provided with following facility.



- a) 30 days storage capacity of Slag & Fly Ash + Bed Ash.
- b) Separate Compartment for the Ash & Slag.
- c) Approach Road for the Trucks, Payloader, Portable Conveyor & Dozer, etc.
- d) Discharge point for the Ash Slurry.
- e) Decantation well & drain for the overflow Water to Recovery Water Sump.

Brief description of proposed Conveyor system for Ash Evacuation from Dyke:-

**3.1.1** This shall be read in conjunction with Conveyor Layout, Scheme & Flow Diagram and the elsewhere in the specification.



**3.1.2** Initially, Wet Ash slurry form (ratio of water: ash - 70:30) will be filled through Garlanding piping at two disposal points inside Ash Pond. Ash Pond size shall be adequate to receive the Ash generated in 30 days. the After a certain period when the Ash Particle starts settling down in the Ash Pond, the floating water will be allowed to flow through the decantation well to collect in the recovery water sump. The Ash Slurry flow in the pond shall be allowed till the deposition level RL (+) 100.5M of Ash is achieved. This recovered water will be clarified up to the permissible parameters & allowed to flow in Feed Water sump. The settled ash will be evacuated from the Ash Pond by Conveying system so that Ash Pond will be available to receive the fresh Ash Slurry flow.

**3.1.3** When the Floating Water drained off through the decantation well to the water recovery system & the left over Ash settled down which form an Elevation of RL (+) 100.5M, at this level, The Tyre mounted mobile belt conveyor # MBC-1 travel from the parking & get the position such that it can receive the ash in the hopper situated at its tail end by Pay Loader & deliver the Ash to the main Belt conveyor at an elevation of +101.5M.



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- 3.1.4** The wet ash shall be evacuated from pond through Front End Loader Machine and transfer the material into fixed hopper # FH-1 of mobile belt conveyor # MBC-1 which discharge the material on to the Belt Conveyor # BC-1 (Belt top level 101.5M.)
- 3.1.5** In Junction Tower # JT-1, Belt Conveyor # BC-1 discharge the material into Ash silo in Truck loading station.
- 3.1.6** During continuous removal of ash from the pond, the Ash level will get reduced and reach RL (+) 98.0M. In that position, the pay loader cannot feed the Belt conveyor which is at an elevation of +101.5M. To facilitate the upward motion from Elevation 100.8M to 98M following arrangement will be provided in BC-1
- 3.1.7** A Hinge type connection will be provided at approximate 12M distance from the Tail End of BC-1.
- 3.1.8** A hydraulic cylinder will be mounted at the tail end of BC-1. Similarly, mobile belt conveyor # MBC-1 shall also move upward / downward direction using hydraulic cylinder which is mounted below the conveyor structure to maintain the proper feeding level for Belt Conv.
- 3.1.9** Initially Slag shall be filled inside Slag Pond. After a certain period, complete slag shall be settled inside the pond & reached to it maximum Level of storage i.e., RL (+) 100.8M.
- 3.1.10** The Tyre mounted mobile belt conveyor # MBC-1A travel from the parking & get the position such that it can receive the Slag at its tail end by Pay Loader & deliver the Slag to the main Belt conveyor at an elevation of +101.5M.
- 3.1.11** The wet slag shall be evacuated from pond through Front End Loader Machine and transfer the material into fixed hopper # FH-1A of mobile belt conveyor # MBC-1A which discharge the material on to the Belt Conveyor # BC-1A.
- 3.1.12** In Junction Tower # JT-1A, Belt Conveyor # BC-1A discharges the material in to Slag Silo in Truck Loading Station.



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- 3.1.13** During continuous removal of Slag from the pond, the Slag level will get reduced and reach RL (+) 98.1M. In that position, the pay loader cannot feed the Belt conveyor which is at an elevation of +101.5M. To facilitate the downward motion from Elevation 102.3M to 100M following arrangement will be provided in BC-1A.
- 3.1.14** A Hinge type connection will be provided at a 10M distance from Tail End of BC-1.
- 3.1.15** A hydraulic cylinder will be mounted at the tail end of BC-1. Similarly, mobile belt conveyor # MBC-1 can also move upward / downward direction using hydraulic cylinder which is mounted below the Movable/Portable conveyor structure to maintain the proper feeding level to Belt Conv.
- 3.1.16** Each equipment of above system shall be design to operate round the clock duty of 24hour per day & give guaranteed capacity of 200 tph. Accordingly, all mechanical, structural, electrical, C&I system etc. shall be designed & installed.
- 3.1.17** Mobile Conveyor MBC-1/1A, Conveyors BC-1/1A & complete conveyor gallery (open gallery with conveyor hood) along with its supporting structures, short supports, stringers, deck-plate, seal-plate, conveyor foundations, drive motors, pulleys, idlers, gravity take ups, take up structure, internal and external belt cleaners, pull chord switches, belt sway and zero speed switches, electro-hydraulic thruster brakes, all electrical etc. including all civil, structural and architectural works for conveyor gallery, gallery supporting trestle and their associated foundation etc.
- 3.1.18** Complete chute work along with chute block switches in all Transfer points and between various conveyors.
- 3.1.19** Monorails and electrically operated hoist blocks as well as hand operated chain pulley blocks for servicing / installation / easy replacement of drive machinery, different types of pulleys for all conveyors, GTU and other equipment from ground level to their locations and vice-versa.
- 3.1.20** All equipment / fittings, supporting structure, along with insert plates, bolts, accessories, MS sleeves, base plates, grouting as may be required and proper alignment etc.

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- 3.1.21** Complete unused set of all special tools and tackles, which are necessary or convenient for erection, commissioning and overhauling of any equipment, covered under the scope.
- 3.1.22** First fill of all consumables e.g.; oils and lubricants for one year toppings requirements.
- 3.1.23** Preservative shop coating, final painting of all structures and equipment under the scope.
- 3.1.24** All inserts, anchor bolts, foundation bolts for Bidder's equipment, platforms etc. in the entire Ash/Slag evacuation System including the transfer points, & conveyors galleries.
- 3.1.25** All necessary grouting & finishing of the floor after welding at all such pockets & elsewhere is in Bidder's scope.

**4.0 Layout Requirement**

**4.1** Hoist maintenance platforms along with approach ladder shall be provided, preferably at the end of the building. Any maintenance platforms / supporting structure required for ash handling facilities shall also be provided by the contractor. Fresh air supply and exhaust air fans shall be located at a minimum height of 3200mm.

**4.2 Conveyor / Junction Towers:**



**4.2.1** Monorail beam with Electric Hoist shall be provided at Junction Tower. So that equipment likes Motor, Gear Box, High Speed & Low Speed Coupling, Pulley etc. can be repair & maintain easily. The monorail shall be extending to outside the buildings by minimum 2m.

**4.2.2** Monorail beam with Manual Hoist shall be fixed above floating Take-up Pulley center line of all vertical gravity take-up arrangements for belt conveyor to lift the take-up pulley / counter weight at the time of belt joining to get the required loop.

**4.2.3** All safety guards wherever needed shall be provided for safety of operators. All pulley guards shall have adequate opening so that pulley bearings can be lubricate without removing the entire guard.

**4.2.4** The safety guard for the Take-up Carriage / Cwt. box of the Gravity Take-up unit shall be provided with a removable panel for entry of operating personnel for greasing / maintenance of pulleys etc.

**4.2.5** Adequate maintenance space (minimum 1500mm clear) around equipment and the

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drives, suitable operating & maintenance platforms as necessary with access stair or ladder (as applicable or as specified) for equipment shall be provided.

**4.2.6** Monorails, inserts, handrails of 32 NB (M) pipe with toe guards, stairs/ ladders (as applicable) and angle protection for cut-outs in RCC floors shall be provided wherever required.

## **5.0 SYSTEM CAPACITY**

### **5.1 Design Data**

The bidder shall base the design of the system on the ash densities and production rates given below, the predicted ash distribution, the requirements of this specification, and the normal safety margins which the Bidder includes in his design of ash handling system.

### **5.2 Ash Densities:**

Type of Ash	Bulk Density (Tons per m <sup>3</sup> )		Particle density (Tons per m <sup>3</sup> )
	For Load Calculations	For Storage volume Calculations	
Fly Ash	2.0	1.0	2.0
Slag	2.5	2	2.5

### **5.3 Ash Removal Rates**



Bidder's proposals shall be based on the following ash removal rates:

**5.3.1** The fly ash / Bed ash from Bed ash silo / Fly ash silo shall be transferred to Ash/slag pond in slurry form (ratio of water: ash - 75:25) at single point by other LSTK contractor. However, Garland piping with suitable equipment around the ash pond is provided.

**5.3.2** Slag will be coming to the ash/slag-pond via-belt conveyer from Coal Gasification Plant will be discharged at a single Point. Further the suitable system of Belt Conveyer (Belt + Portable) for the evacuation of Slag for Loading in Trucks is to provide.

**5.3.3** Separate compartments for Bed ash/Fly ash and Slag are suggested for the storage of fly ash/bed ash and slag.

**5.3.4** Water recovery system to recover the water from Ash slurry is considered. Necessary system to treat the recovered water is considered. Recovered water will

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be stored in a storage tank Recovered water storage tank for retention time of 8 hours is designed. Recovered water will be transferred to Ash slurry preparation system. (other LSTK's scope (SGP)) through Pumps (1W+1S). Pumps of appropriate capacity is proposed accordingly.

### 5.3.5 Evacuation of Ash from Dyke by Belt Conveyor System:

- 5.3.5.1 Initially Wet Ash shall be filled inside Ash Pond. After a certain period, complete ash shall be settled inside the pond to maintain a level RL (+) 100.5M.
- 5.3.5.2 At this level, Tyre mounted mobile belt conveyor # MBC-1 travel from parking position to fix above receipt point of belt conveyor # BC-1. The top of belt of conveyor no. is+101.5M.
- 5.3.5.3 The wet ash shall be evacuated from pond through Front End Loader Machine and transfer the material into fixed hopper # FH-1 of mobile belt conveyor # MBC-1 which discharge the material on to the Belt Conveyor # BC-1 (Belt top level 103.5M.)
- 5.3.5.4 In Ash silo, Belt Conveyor # BC-1 discharge the material into Ash Silo in Truck Loading Station.
- 5.3.5.5 During continuous removal of ash from the pond, the level of ash was also, get reduce and reach at RL (+) 100.0M.
- 5.3.5.6 The Tail end portion of Belt conveyor # BC-1 shall be provided with hinge type structure so that the complete portion can be move upward / downward direction using hydraulic cylinder to maintain RL (+) 102.3M / RL (+) 100.0M.
- 5.3.5.7 Similarly, mobile belt conveyor # MBC-1 shall also move upward / downward direction using hydraulic cylinder which is mounted below the conveyor structure to maintain the proper feeding level for Belt Conv. BC-1 respectively.

### 5.3.6 Conveying System for Evacuation of Slag

- 5.3.6.1 Initially Slag shall be filled inside Slag pond. After a certain period, complete slag shall be settled inside the pond to maintain a level RL (+) 102.3M.
- 5.3.6.2 At this level, Tyre mounted mobile belt conveyor # MBC-1A travel from parking position to fix above receipt point of belt conveyor # BC-1A.
- 5.3.6.3 The wet slag shall be evacuated from pond through Front End Loader Machine and transfer the material into fixed hopper # FH-1A of mobile belt conveyor # MBC-1A which discharge the material on to the Belt Conveyor # BC-1A
- 5.3.6.4 Each Belt Conveyor shall be complete with all types of idler sets with mounting brackets, all types of pulley assemblies with Plummer blocks supported on ruggedly designed steel frames, complete drive unit with base frame, belting, take-up device, deck plate, skirt board, primary / secondary belt scrapers, V-plow cleaners, discharge chute, stringer

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frames, short supports with base plate, seal plate, safety switches and the necessary anchor bolts / fixing bolts including other hardware etc.

## **6.0 ASH / SLAG STORAGE SILO AND ASSOCIATED ACCESSORIES**

6.1 This specification covers the design, manufacturer, constructional features, erection, testing and commissioning of Storage Silos and Associated Accessories.

## **6.2 CODES AND STANDARDS**

6.2.1 The design, manufacture, inspection and testing of Storage Silos and Associated Accessories shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment are to be installed. The equipment shall also conform to the latest applicable Indian / British / American Standards. Other internationally acceptable standards, which ensure equal or higher performance than those specified, shall be accepted. Nothing in this specification shall be constructed to relieve the Contractor of the required statutory responsibility.

## **6.3 DESIGN AND CONSTRUCTIONAL FEATURES**



In addition to the details specified in the enclosed data sheet the Bidder / Contractor shall comply with the following requirements.

6.3.1 Storage silos shall be of conical type at the bottom. Storage silos shall be provided to store wet ash / Slag from Dyke. The capacity shall be as indicated in data sheets. This silo shall be used to collect Wet ash / slag for the purpose of further disposal to mines through truck.

6.3.2 Each storage silo shall be provided with following arrangement for unloading the Ash / Slag.

6.3.2.1 A chute along with Vibrating feeder for unloading the Slag / ash into bulkers at a rate indicated in data-sheets.

6.3.2.2 Two blanked connections along with isolation valves shall also be provided in the silo for future installation of equipment to slurry the ash / Slag for further dispose.

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6.3.3 For Instrumentation requirement refer to DESIGN SPECIFICATION – INSTRUMENTATION. The bidder shall include any other instrument required to make the system complete, safe, efficient and reliable.

6.3.4 DATA SHEET FOR DRY FLYASH STORAGE SILOS AND ASSOCIATED ACCESSORIES

i	Number	:	As per scope
ii	Volume of each silo	:	75 cum
iii	Location	:	As indicated in drawings.
iv	Material of construction	:	M.S. Plates as per IS:2062, 10 mm thick(min). with minimum 3 mm thick SS liners as per SS-409 M at the bottom conical portion of Silo.
v	Dry Ash un loader		
	Unloading rate	:	100 Tons per hr.
vi	Vibrating Feeder		
	Unloading rate	:	100 Tons per hr.

## 7.0 ELECTRIC HOISTS AND MONORAILS

### 7.1 GENERAL

Suitable handling arrangements shall be provided for Chemical pump houses, Electrical Room, Conveyors and Slag and Ash Silo top. For this purpose, Contractor shall provide monorails and hoist blocks as required with cross travel facility.

### 7.2 CODES AND STANDARDS


The design, manufacture, inspection and testing of Monorails and Hoists shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The Monorails & Hoists shall conform to the latest edition of the following standards & codes. Other internationally acceptable standards / codes, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the contractor of the required statutory responsibility. In case of any conflict in the standard and this specification, the decision of the Employer shall be final and binding.

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IS : 3938 : Specification for Electric Wire Rope Hoist IS:3832: Chain pulley blocks  
 IS : 2429 : Round steel short link chain IS:6216: Short link chain grade 80  
 IS : 8610 : Points hooks with shank for general engineering purposes  
 IS : 210 : Cast Iron Castings

### 7.3 DESIGN REQUIREMENTS

- 7.3.1 Electrically operated mono girder type hoists shall consist of following major components.
- 7.3.1.1 Electrically operated trolley completes with drive motor (Trolley travel speed maximum 15m/min.).
- 7.3.1.2 Hoist cable, hoisting block and hooks complete with drive motor (Hoisting speed maximum 6m/min.).
- 7.3.1.3 Limit switch top re vent over hoisting, over lowering and over travel.
- 7.3.1.4 Festoon arrangement of feeding power to trolley assembly.
- 7.3.1.5 Erection hardware.
- 7.3.1.6 Pendant control station suspended from hoist.
- 7.3.1.7 Control panel mounted on wall.
- 7.3.2 The electric hoist shall be designed and constructed in accordance with the latest revision of IS:3938 and shall be suitable for duty class2.
- 7.3.3 For electric hoists, trolley movement and hoisting shall be affected by using two separate motors. Motors shall be as per technical requirements discussed elsewhere. However, the motors shall be suitable for 150 starts per hour at 40%CDF.
- 7.3.4 Trolley for motorized / manual cross travel shall be designed to accommodate a wide range of I beams and shall be capable of traveling on straight as well as curved monorails with the design being such to maintain uniform distribution of pressure on the flanges.
- 7.3.5 Motor operated geared trolley shall have two (2) pairs of wheels, one pair of which shall be driven through motor.
- 7.3.6 Wire rope shall be of pre-formed type, hemp cored, regular lay 6/36 construction with a breaking strength of 160 -175 kgf/ sq. mm. Reverse bend of ropes is not acceptable. Minimum number off alls of rope shall be four (4).
- 7.3.7 All gears and pinions shall be of hardened and tempered steel with machine cut teeth in metric modules. Surface hardening of steel is not acceptable.
- 7.3.8 All running shafts and wheels shall be fitted with ball /roller bearings with a rate d life not less than 20 years based on equivalent running time as per IS:3938.
- 7.3.9 An electro mechanical brake shall be provided for hoisting as well as cross travel .Brake lining shall be of asbestos.

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7.3.10 Cast iron parts, wherever used, shall be of minimum grade 30, IS:210

#### 7.4 CONSTRUCTION REQUIREMENT

The hoist mechanism shall consist of a grooved rope drum driven by electric motor through gears. Each end of the rope shall be anchored to the drum in such a way as the anchorage is readily available for maintenance. Each rope shall have not more than two (2) full turns of the drum when the hook is at its lowest position and one (1) spare groove when the hook is at its highest position. The leading rope taken by the drum should not slope sideways when slack and it should not be caught between the gear wheel.

7.4.1 Rope drum, gearbox, block etc. should be fabricated out of weld able quality steel.

7.4.2 Trolley wheels shall be of single flange type in the taper treads. The wheels shall be mounted on antifriction bearings and shall be easily removable for repair/replacement.

7.4.3 The load hook shall be swiveling type forged circular shank section and shall confirm to IS : 8610.

7.4.4 All gears and bearings shall be lubricated by grease. All lubricating points shall be grouped together in easily accessible position.

7.4.5 The bottom block shall be of enclosed type and shall have guard against rope jamming in normal use. It shall have standard forged swivel shank hook fitted on antifriction thrust bearing. Lock to prevent hook from rotation and locking arrangement to prevent accidental unlocking shall be provided. Pulley of the bottom block shall be provided with antifriction bearings.

7.4.6 All parts requiring replacement / inspection /lubrication shall be accessible without need for dismantling of other parts / structures.

7.4.7 All components of hoists of identical capacity and duty shall be interchangeable.

7.4.8 Hoists shall have permanent inscription in English on each side readily recognizable from floor level stating safe working load.



7.4.9 Pendant shall be provided with fluorescent up/down/forward/reverse travel push buttons and indicating lamps. Its power supply shall be limited to 24VAC.

7.4.10 The control panel shall be wall mounted type & easily approachable from the floor by a standing man.

#### 7.5 DATASHEET: HOISTS AND MONORAILS

i.	GENERAL	
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ii.	Functional Requirement :	To handle Chemical pump house 1. Electrical Room 2. Conveyors 3. Slag and Ash Silo top.
iii.	Lifting capacity	125% of the weight of the heaviest piece to be lifted.
iv.	<b>DESIGN &amp; CONSTRUCTION REQUIREMENT</b>	
v.	Hoists	
vi.	Maximum trolley travel speed for electric hoists	15m/min
vii.	Maximum Hoisting speed for electric hoists	6m/min
viii.	Drive Motors	SQIM, Separate for travel & lift
ix.	No. of starts for drive motor	150 starts/hr at 40%CDF
x.	Wire Rope	
xi.	Type / Construction	Pre-formed type, hemp cored, regular lay 6/36 construction
xii.	Breaking Strength	160-175 kgf/sq.mm
xiii.	Bearing	
	Type	Ball / Roller bearing
	Life	20 years
xiv	Brake	Electro Mechanical type with asbestos lining.
xv	Load Hook	Swiveling type forged circular shank section.
xvi	Duty	Class-2
xvii	Mono rail location / layout	
xviii	Cross section	I beam
xix	Distance between C/L of monorail & C.G. of equipment to be lifted	Maximum 500mm
xx	Power Cables Support	Festoon type arrangement

## 8.0 BELT CONVEYING SYSTEM

### 8.1 GENERAL

All Belt Conveyors shall be furnished and erected along with necessary supporting structures, platforms, on ground or over head galleries, trestle structure with foundation footings, carrying and return idlers, automatic take-ups, pulleys, drive motors with suitable

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reduction units and couplings, belting, feeder hoppers, transfer chutes, flap gates, hydraulic couplings and other necessary accessories as per scope specified elsewhere.

## 8.2 CODES AND STANDARDS

The design, manufacture, inspection and testing of the Belt Conveyor System shall comply with all the currently applicable statues, regulations and safety codes in the locality where the equipment is to be installed. The belt conveyor system shall confirm to the latest edition of the following standards & codes. Other internationally acceptable standards/codes, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the contractor of the required statutory responsibility. In case of any conflict in the standard and this specification, the decision of the Employer shall be final and binding.

“Belt Conveyors for Bulk Materials” published by Conveyor Equipment Manufacturers’ Association.

IS:7155 : Codes of Practice for Conveyor safety.

IS:1891 (Part-I) : General Purpose Belting

IS:8598 : Idlers and Idler Sets for Belt conveyors

IS:4009 (Part-II) : Conical Head Grease Nipples

IS:8531 : Pulleys for Belt Conveyors.

IS:226 : Structural Steel ( Standard Quality)

IS:4682 : Codes of Practice for Lining of Vessels and Equipment for Chemical Processes.

IS:11592 : Code of practice for selection and design of Belt Conveyors.

IS 9295 : Specification for Steel tubes for idlers for Belt Conveyors

IS 4573/BS2573 Part-I, BS245 : Specification for Power Driven Mobile Cranes

ISO 5049/1 : Mobile Equipment for Continuous handling of Bulk Materials

IS: 4776 (Part-I) : Specification for troughed belt conveyor for surface installation.

IS: 4776 (Part-II) : Specification for troughed belt conveyors for underground installation

## 8.3 DESIGN REQUIREMENT

8.3.1 Design of belt conveyor system shall be suitable for coal parameters specified elsewhere.

8.3.2 Slopes of conveyors, wherever applicable, shall not exceed 14 deg. depending on the lump size, and other governing factors.



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- 8.3.3 The guaranteed capacity of all conveyors shall be the rated capacity.
- 8.3.4 All conveyors shall be designed for 110% of rated capacity. Design capacity of the conveyor system shall be considered for the selection of belt width , belt speed and the continuous motor rating at 50 deg C Ambient.
- 8.3.5 The drive chain equipment's for various belt conveyor systems shall consist of drive motors, fluid couplings, gear reduction units, low speed flexible couplings and pulleys. For the ratings of various equipment's as mentioned above in the drive chain of conveyor systems relevant sections of this specification shall be referred to.
- 8.3.6 Conveyors and belt feeders shall be provided with electro hydraulic thrust or brakes or fly wheels to adjust the coasting time of conveyors such that there will not be any build up of material in the chutes. Further conveyor shall come to halt as early as possible. All conveyors with HT drives shall be provided with brakes.
- 8.3.7 Belt conveyor system shall be designed as per the latest edition of 'Belt Conveyors for Bulk Materials' published by Conveyor Equipment Manufacturer's Association' or equivalent International Standard. **Ai** value for idler shall be considered 2.8lb (min.) for the purpose of conveyor design calculation only.
- 8.3.8 Belt sag on the carrying side shall not exceed 1.5% of idler spacing.
- 8.3.9 Wrap angle shall be generally 200° for single snub drive pulley respectively. All drive pulley shall be lagged. However, wrap angle shall be such so as to ensure proper mounting arrangement of the external belt scraper assembly.
- 8.3.10 Under all operating conditions including running, starting, fully or partially loaded or empty belt, the belt shall not lift off the idlers. The radius of curvature shall be adequate so that there is no lift off of the belt in case of Concave curve and no overstress at edges of belt or lack of tension at belt centre in case of Convex curve. An extra allowance of minimum 15% shall be kept on the calculated radius of curvature.

## 8.4 CONVEYOR COMPONENTS

### 8.4.1 Belting

8.4.2 Belting shall be Nylon/Nylon type with M24 [as per Conveyor Data Sheet] suitable for

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heavy duty application with adequate flexibility to give troughing angle of 35 degree. The Belting shall be of moulded edge construction. For all the conveyors the number of plies, cover thickness, factor of safety etc. shall be as per the recommendation of belt manufacturer, but not inferior to the figures as tabulated in data sheet.

8.4.3 Belt joint shall be properly vulcanized and finished.

8.4.4 All Conveyor belting shall be suitable for Cold Vulcanized Jointing.

8.4.5 Normal working tension at design capacity shall be less than 80% of max allowable working tension.

## 8.5 Idlers

8.5.1 Carrying idlers shall be provided with three equal rolls with toughing angle of 35deg.


8.5.2 All idlers shall be made out of ERW tube and shall conform to IS: 8598. Mechanical properties of ERW tube shall be equal to or better than YSt 210 grade [IS: 9295]. Friction factor of idler shall not be more than 0.017 while testing at works. For standardization of idlers, all rollers shall be identical and interchangeable type for the same category. Idlers shall be easily removable type. Idler shaft shall be of bright bar (UTS 45 kgf/mm<sup>2</sup>, IS: 9550) or equal.

8.5.3 Idler bearings shall be 'sealed and lubricated for life' provided with double labyrinth seal and rain cap to prevent entry of dust & moisture. Deep grooved ball bearing with C-3 clearance of SKF/FAG/TIMKEN make only shall be used. The bearings shall be chosen for life L-10 of minimum 40,000 hours.

8.5.4 Normal Spacing of idler shall be 1.0m for carrying side and 3m on return side. [Note: For conveyor below track hopper, Carrying side idlers [normal troughing idler] shall be provided at 500mm spacing throughout loading length]. However at convex curve; spacing shall not exceed 50% of the above idler spacing of 1m.

8.5.5 All carrying idlers shall be 3-equal roll fixed type x 35<sup>0</sup> troughing suitable for 650mm belt width. All carrying idlers shall have interchangeable rolls.

8.5.6 Impact type idlers shall be provided with number of tough rubber discs with minimum

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shore hardness of  $65 \pm 5$  deg on shore 'A' scale. Impact idler frame shall be inverted channel. Rubber ring thickness shall be minimum: OD ERW tube + 50mm. Minimum of eight (8) set of impact idlers shall be provided at each loading point of the conveyor with maximum spacing of 400 mm. Material used shall be of resilient type rubber.

- 8.5.7 Sufficient number of adjustable type transition idlers with 10-degree steps, shall be provided adjacent to terminal pulleys. Minimum two (2) transition idlers shall be used at the head end of each conveyor. Transition length shall be provided as recommended by the belt manufacturer.
- 8.5.8 All return idlers shall be two roll flat idlers shall be provided at return belt.
- 8.5.9 Self-Aligning Idlers shall be direct acting type complete with actuating rollers fitted with ball bearings and idler frame shall be suitably cradled about a vertical pivot supported in bearing over a fixed plate. Adequate sealing arrangement shall be provided to prevent contamination of the lubricant by dirt & moisture.
- 8.5.10 Self-Aligning Carrying Idler (SACI) shall be provided one each within approximately 5m to 10m distance from Conveyor ends and the spacing of intermediate self-aligning carrying idlers shall not exceed 10 times the normal troughing idler spacing.
- 8.5.11 Idler rollers shall be waterproof, dust proof and weather proof against a high velocity water jet. All idlers shall be provided with minimum double labyrinth dust seal.
- 8.5.12 Suitable deflector pulley of at least 189mm OD x 6mm (minimum) thk shell on minimum 50mm dia. bearing housed in Plummer block and lagged with 6mm thk neoprene rubber lagging shall be provided for each conveyor. One (1) no. deflector pulley as above shall be provided near head end of conveyor.
- 8.5.13 All roller brackets shall be fabricated from steel channel section for end rolls and & plate sections of adequate thickness & strength with stiffeners for central roll. Brackets shall be mounted on inverted steel angle or channel frame. Adequate arrangement for proper alignment of the brackets over supporting steel frame structure of conveyor shall be provided. Fixing arrangement of roller with brackets shall be drop in slot type.
- 8.5.14 Each conveyor shall be provided with one (1) no self-cleaning type rubber disc return idler located near head end.
- 8.5.15 Following idler test shall be carried out at works.

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- Idler friction factor test
- Dust and Water proof test.
- Diametric run-out check
- Bearing Noise Check
- Eccentricity and ovality check
- Any other tests as per relevant codes & standards.

8.5.16 All the conveyors shall be provided with one self cleaning type rubber disc return idler located near the head pulley for cleaning the return belt.

8.5.17 Proper arrangement shall be provided in the brackets of all types of idlers for preventing the rollers from coming out of the brackets during normal / abnormal conditions.

## 8.6 SKIRT

8.6.1 Skirt board of 6mm thk SS-304 shall be provided at each loading point. Minimum skirt board shall be as shown on drawings. Minimum height of skirt plate shall be 400 mm. Inside Clear width between skirt boards shall be 2/3rd of belt width. Skirt-boards shall terminate above an idler preferably.

8.6.2 Skirt board shall be covered from top and provided with necessary flanges for connecting to feed chute. 5mm thk. MS cover plate along with 3mm thk neoprene rubber gasket, bolted to skirt flanges shall be provided for dust tightness. 10mm thk Neoprene Rubber curtain shall be fixed at skirt board end for reducing dust nuisance. Back plate of skirt board shall be kept about 1200mm away from the feed Chute rear edge.



8.6.3 The gap between the skirt and the belt shall be closed or controlled by exterior modular rubber block segments of 50–60-degree durometer hardness on shore 'A' scale. Rubber blocks shall be of adjustable type for effective sealing. Rubber blocks shall be of TEGA/HOSCH/THEJO/Kaveri or equal approved make.

## 8.7 Deck Plate

8.7.1 Continuous deck plate of 3.15mm thick MS sheet for full length of all conveyors shall be provided. Suitable ribs for adequate stiffness of deck plate shall be provided.

## 8.8 Belt Take-ups

8.8.1 Each belt conveyor shall be provided with take-up device as per Data Sheet. For

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horizontal gravity T.U., necessary additional sheaves shall be provided to reduce the vertical travel/ movement of counter weight box and also the height of counter wt. tower. Screw take-up (if applicable) shall be hydraulic operated type.

- 8.8.2 Counter weights shall be made out of cast iron with standardized denominations. In all cases, space shall be provided for addition of 25% of the counter weight. Provision shall be made for dismantling the counter weight or relieving the tension in the belt. Height of the take-up guide steel sections frame shall be sufficient to allow the take-up main pulley at the time of belt jointing to get the required loop. Above each bend pulley of VGTU.
- 8.8.3 For belt replacement & jointing facility, provide 5m x 5m paved area near each take-up unit. Hooks (minimum 3T capacity) shall be provided in Junction Towers, Gallery and above bend pulleys.
- 8.8.4 Suitable expanded metal guards marked up scale attached to the frame to monitor belt stretch and access / maintenance platform with handrail all around & stair (800mm wide) with handrails shall be provided for VGTU
- 8.8.5 Adequate access from conveyor gallery / Junction Tower / Transfer house / ground etc., as the case may be shall be provided to inspect, repair and maintain the gravity take-up arrangement. Guides of take up pulley/counter weights shall be sufficiently strong, of pipe / box cross section, so that they do not bend during belt snapping.
- 8.8.6 Sand pit, 600mm (deep), shall be provided at ground under the take-up weights. The area below the counter weight shall be guarded. Two (2) meter safety fencing along with suitable gate and locking arrangement shall be provided around gravity take-up at the base level / ground level. Wherever it is not feasible to provide sand pit, suitable Impact beam/ Sand bags shall be provided below the counter wt. box in addition to safety guard.
- 8.8.7 The design of the counter weight assembly shall have a self-cleaning top. For HG TU – twin sheave/ loop arrangement shall be provided to reduce Counter wt travel to about 50%.
- 8.8.8 Height of take-up guide structure shall be sufficient to allow the take-up weight movement up and down for all operating conditions of conveyor and to allow minimum

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two (2) vulcanizing lengths margin in the belt plus 600 mm. Suitable guides shall be provided both for take up pulley and take up weight.

8.8.9 A lifting beam with Manual Hoist of minimum capacity 150% the total weight of counter wt unit shall be provided, located on the centre line of the take-up unit and above the Take-up Pulley in case of VGTU and above the Cwt. Box in case of HGTU.

8.8.10 The pulley slide frame shall be self-cleaning type or better. The pulley slide carriage shall be equipped with V - type wheels [attached to shaft] running on guide rails. End Travel limit switch shall be provided at both ends of take-up travel. In case of HGTU, suitable buffers at both ends of Travel of Pulley carriage shall be provided.

## 8.9 Seal Plate

8.9.1 3.15mm thk. MS (IS: 2062) seal plate shall be provided throughout conveyor gallery for all conveyors which are installed in overhead conveyor gallery.


## 8.10 Drive Unit:

8.10.1 The drive shall be complete with motor, gear reducer, L.S & H.S. coupling with guards, internal hold back device, brake etc mounted on steel fabricated base frame. All components of drive unit shall be designed based on 50°C (maximum) ambient temperature and continuous duty of 24hrs operation per day. Water cooled Gear Box or Coupling will not be accepted.

8.10.2 Rating of all drive motor of conveyor shall not be less than 110% of the power required at drive motor output shaft at specified guaranteed capacity. The motor rating shall beat 50 deg C ambient.

8.10.3 Drive unit shall have common base frame of welded steel construction, designed with sufficient depth and stiffness to ensure rigidity of drive assembly. Base frame shall be fabricated to achieve accurate alignment of the various components of drive unit. All machinery mounting surfaces shall be machined. Base plates shall be suitable for erection on both concrete and structural steel base. Base plates shall be provided with lockable adjustment screws to facilitate alignment of heavy gear reducers and motors in the horizontal plane. All equipment shall be totally enclosed and completely sealed against dust & moisture. Necessary hoist with monorails for lifting of drive unit



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components/ drive pulley shall be provided. Drive unit with its base frame shall be mounted on heavy concrete block. Only high tensile bolts shall be used for fixing drive component to base frame and base frame to the concrete block or steel surface.

#### 8.11 Gear Box:

8.11.1 Only bevel-helical gearbox, natural/ fan cooled and of approved make shall be provided for conveyor drive. Water-cooled gearbox will not be accepted.


8.11.2 Gearbox mechanical power rating shall not be less than 1.80 times of the belt kW. Thermal rating shall be adequate and if required, only fan cooling shall be provided.

8.11.3 Gear Box Casing shall be of closed grained cast iron of grade FG-260 of IS-210 or equivalent and stress relieved. Casing area shall be sufficient to ensure effective cooling. Suitable ribs shall be placed under the bearing seats for strength to withstand the most severe stress encountered during operation. Gear box shall have oil filling cap, adequate air breathing arrangement, visible oil indicator & oil drain plug, inspection openings, lifting lugs. All bearings shall be splash lubricated and gear box casing shall have adequate oil reservoir. The base of the housings shall be machined and shall be suitable for bolting to base plate.

8.11.4 Gear & pinions shall be manufactured out of high tensile carbon/ alloy steel, duly hardened and ground to withstand operating conditions. Forged/ Alloy Steel shafting to suit shall be provided. Shaft ends shall be properly sealed for protection from any ingress of dust. Antifriction ball/ roller bearing of ample size shall be incorporated.

8.11.5 Following Tests shall be performed:-

- Noise Level
- Guaranteed Efficiency
- Guaranteed Reduction Ratio
- Max. Temperature Rise.
- Bearing Performance.
- Tests to check physical and chemical properties of material
- Ultrasonic and hardness test for shaft and gear forgings
- Case depth, hardness and MPI after hard facing
- Vibration level tests
- Backlash and trunion eccentricity.

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## 8.12 Coupling (High Speed/ Low Speed)

8.12.1 All couplings shall provide for lateral, angular and longitudinal misalignment of shafts. Type of couplings to be used shall be as given below:

S.No	Motor kW rating	Type of LS coupling	Type of H.S. Coupling
1.	Less than 30 kW (Single Drive Unit)	Geared type	Resilient type flexible coupling / Pin bush coupling
2.	30 kW & above but less than 160 kW	Geared type	Delay Filled Chamber (DFC) type fluid coupling

## 8.13 Gear Coupling:



Coupling shall be able to absorb parallel and angular misalignment. Coupling shall have crowned external teeth, which engage, with the straight internal teeth of the sleeve. The pressure angle, the amount of crowning & backlash value shall be selected to achieve the best results in load carrying capacity. Lubrication arrangement shall be adequate to ensure silent operation and minimum wear of gear teeth. Coupling shall be dust proof and suitable sealing device shall be provided. Permissible parallel & angular misalignment shall be within 3-5mm & ( $\pm$ ) 1.5 degree respectively. Service factor shall not be less than 1.5 (to be used on belt kW) for coupling selection.

## 8.14 Fluid Coupling:

8.14.1 Fluid couplings shall be suitable for providing controlled starting for conveyor driven by direct online squirrel cage induction motor. Starting torque applied to conveyor shall at no time exceed 140% of the torque corresponding to the full load belt kW.

8.14.2 The fluid coupling shall have resilient mounting arrangement to take care of misalignment between the motor and reducer input shaft. The fluid coupling shall be designed for ease of maintenance so that it can be taken out without shifting the motor or gearbox.

8.14.3 Fluid coupling rating shall be selected with minimum service factor of one (1) on kW rating of motor.

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8.14.4 Running slip vs torque characteristic curve of fluid coupling shall be such that slip across the coupling is not more than 3%. Rating (kW) of fluid coupling shall not be less than the connected motor kW rating.

8.14.5 Impeller of the coupling shall have member with radial vanes extending to the Periphery. Runner shall be similar proportioned bowl and shall be set facing the impeller keeping adequate clearance yet providing acceptable efficiency. Housing of coupling shall be of robust design.

8.14.6 Housing shall be so designed that effective cooling can be ensured. Provision shall be kept so that oil quantity inside housing can be adjusted at site. Water-cooling is not acceptable. Suitable fusible plug shall be provided for fluid coupling in order to protect against thermal over load and allow oil to be disposed such that hydraulic connection between impeller and runner ceases.

8.14.7 The equipment shall be suitable for full load, part load and no-load starting of the drive equipment without hampering safety of the motor and rate of acceleration.



8.14.8 Technical Particulars

- |                              |  |
|------------------------------|--|
| (i) Housing material         | : Aluminum Alloy Steel                             |
| (ii) Type of Cooling         | : Air-cooled                                       |
| (iii) Semi-flexible coupling | : Yes, at output side with brake drum, if          |
| (iv) Maximum starting Torque | : Adjustable in the range of 120% to 275%          |
| (v) Direction of rotation    | : Should be capable of rotating in both directions |
| (vi) Balancing               | : Dynamically Balanced                             |

(vii) Tests:-

- Test to establish torque-speed and slip characteristic
- Pressure tightness and leak-proof test
- Temperature rise test
- Over speed (125%) withstand tests
- Functional test on fusible plug for each type of coupling

## 8.15 Brakes

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- 8.15.1 Hydraulically operated Thruster (EHT) brake only [mounted on brake drum coupling] shall be provided.
- 8.15.2 Brakes shall generally be mounted outside either on motor shaft or on high speed shaft of reducer.
- 8.15.3 Rating of brakes for conveyor drives shall be adequate to stop a fully loaded conveyor belt before the successive conveyor stops. While computing conveyor coasting time, least practicable resistance shall be considered.
- 8.15.4 The thermal capacity shall be adequate to limit the contact surface temperature within the permissible limit recommended by brake liner manufacturer for similar application.
- 8.15.5 Suitable devices/ limit switches shall be incorporated to ensure that motor does not start before the brake is released.
- 8.16 Belt Cleaners**
- 8.16.1 External Belt Cleaner**
- 8.16.1.1 To ensure proper cleaning of belt, belt cleaners shall be provided as stated below. Each belt cleaner shall be of tested and proven design suitable for belt conveyors handling uncrushed / crushed coal. Belt cleaners & scrappers shall be of reputed and approved make.
- 8.16.1.2 Multi bladed Type Secondary Belt Cleaner [External]: A multi bladed (full belt width is made up of small individual cleaners), having tungsten carbide blades mounted on a carrier assembly of steel tube shall be provided. The steel tube shall be supported on both sides with elastomount or equivalent arrangement having tensioning arrangement such that blade adjustment towards wear is automatic. The cleaner shall be located in such a way that effective cleaning of belt is ensured and all scraped material is lead into the main chute. Discharge Chute shall enclose the snub pulley so that there is no accumulation of scraped material on floor.
- 8.16.1.3 Qty: one (1) per Discharge pulley (located between discharge and snub pulley).
- 8.16.1.4 Primary Belt Cleaner [External]: Construction of this type of cleaner shall be similar to Multi-bladed Type cleaner but the blade shall be made out of polyurethane material for such application.

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8.16.1.5 Qty: One (1) no. per discharge pulley.

8.16.2 Internal Belt Cleaner

V-plough type belt cleaner made of mild steel flats and hard rubber strips with automatic wear adjustment and necessary accessories shall be furnished for cleaning internal surface of the conveyor belt.

8.16.3 Belt Take-up Arrangement

8.16.4 Automatic take-up of gravity type shall be generally provided with necessary take-up arrangements complete with bend pulleys, take-up pulley, with its supporting / sliding assembly, wire ropes with turnbuckle arrangement (to adjust the level) for suspending the separate take - up weight sliding assembly close to the ground, counter weights and other accessories. Suitable guards marked up scale attached to the frame to monitor belt stretch and access/maintenance platforms with hand rails all around etc. shall be provided. Adequate access from conveyor gallery/transfer house/ground etc., as the case may be shall be provided to inspect, repair and maintain the gravity take-up arrangement. Guides of take up pulley/counter weights shall be sufficiently strong, of pipe/box cross section, so that they do not bend during belt snapping.

8.16.5 The prime consideration should be to locate the automatic take-ups at a place where these will work best, in relation to the drive, to keep belt tension at a minimum. Other considerations such as available space, maintenance considerations and the economics of the location should also be taken into account while designing. Take up shall not be located over buildings unless indicated in tender drawings. Height of take-up guide structure shall be sufficient to allow the take-up weight movement up and down for all operating conditions of conveyor and to allow minimum two (2) vulcanizing lengths margin in the belt or percentage of conveyor length (2.5% for synthetic belting) whichever is larger. Suitable guides shall be provided both for take up pulley and take up weight.

8.16.6 Two (2) meter safety fencing along with suitable gate and locking arrangement shall be provided around gravity take-up at the base level /ground level.

8.16.7 Irrespective of take-up location, the travel zone of take-up weight shall start from a

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suitable height above ground level.

8.16.8 Suitable buffer arrangement shall be provided to arrest the fall of take-up pulley in order to avoid damage of the pulley assembly in case of belt snapping. Similar buffer arrangement shall be provided for take-up weight also, in case of, take-up weight travel zone terminating above a building floor. Sand pits of 600 mm deep shall be provided at ground below the take-up weights. In case of double stream conveyors, a partition of 3 mm steel plate shall be provided between the two take-up pulleys along entire travel zone of take-up pulleys. Intermediate platforms shall be provided in the take-up zone for maintenance of take –up pulleys /counter weight.

8.16.9 Take-up weight shall consist of multi-blocks of RCC/Cast Iron and not of single block to facilitate adjustment in weight if required during operation. Single heaviest piece shall be suitable for easy handling. Take-up weight block shall be provided with edge protection angle to take care of any damage. Take up weights shall be kept inside atake up weight box frame structure and shall be properly anchored / bolted with the main frame, so that none of the weight shall be loose / free inside the box. The box shall be painted with counter weight and conveyor number and shall have good aesthetic look. Intermediate platforms shall be provided in the take-up zone for maintenance of take-up pulleys /counterweight.

8.16.10 Take-up weight shall consist of multi-blocks of RCC/Cast Iron and not of single block to facilitate adjustment in weight if required during operation. Single heaviest piece shall be suitable for easy handling. Take-up weight block shall be provided with edge protection angle to take care of any damage. Take up weights shall be kept inside a take up weight box frame structure and shall be properly anchored / bolted with the main frame, so that the none of the weight shall be loose/free inside the box. The box shall be painted with counter weight and conveyor number and shall have good aesthetic look.

**8.17 Hold Back Devices**



Suitable hold back devices for preventing running back of the conveyor belt in case of conveyor being stopped in loaded conditions due to power failure or during normal operational delays shall be provided to give positive protection. The hold back shall instantaneously engage without shock and be capable of protecting equipment and personnel. It shall be released instantly when ‘power’ resumes or the ‘delay’ is removed.

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The hold back devices shall be integral with gearbox.


## 8.18 Pulleys

- 8.18.1 All pulleys shall conform to the requirement of IS: 1891/ IS: 8531. Pulleys shall be of welded steel construction (Mild Steel conforming to IS: 2062, tested quality) having continuous rim and two end discs fitted with hubs and the required internal stiffeners. The end disc of drive pulley, discharge pulley, take-up pulley and any other pulley shall be turbo web design for uniform stress distribution. The material of end disc shall be cast steel.
- 8.18.2 The snub pulleys on each conveyor shall be located to provide a belt wrap on the drive pulleys of not less than 210 deg. wrap is envisaged for single snub drive only.
- 8.18.3 All drive pulley surfaces shall be hot lagged with vulcanized natural rubber lagging grooved in diamond pattern.
- 8.18.4 All non-drive pulleys shall be vulcanized natural rubber lagged (hot) with plain lagging.
- 8.18.5 The rubber to be used for lagging of pulleys shall confirm to specifications listed in data sheet of this section.
- 8.18.6 The rubber lagging of pulleys and method of lagging and testing the same shall conform to IS:4682.
- 8.18.7 The pulleys shall be made from mild steel conforming to IS:2062 (Tested Quality). However, for conveyors with in line magnetic separators, the head end pulleys shall have shell and end disc made of non-magnetic stainless steel material.
- 8.18.8 All the pulleys shall be mounted on the forged steel shafts of EN-8 or equivalent material of adequate proportion by taper lock arrangement, running in heavy duty roller bearings with proper greasing arrangement. The plummer blocks for pulleys shall be of horizontally split type construction with minimum (4) nos. bolts holding the two split halves and with min (4) nos. foundation bolts. The Plummer blocks shall be dust tight with double labyrinth seals. Conical head shape nipples conforming to IS: 4009, suitable drain plug and eye bolt shall be provided. Side covers of plummer blocks shall be heavy duty metallic sheets. No plastic components shall be used.

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- 8.18.9 Pulleys shall be mounted on machined & ground surfaces. Suitable guards shall be provided for all tail pulleys and bend pulleys for safety of operating personnel.
- 8.18.10 Suitable stiffening arrangements shall be provided in all pulleys as required. For selection of pulley shaft dia of all the pulleys, a margin of at least 20% shall be considered on the maximum tension at designed Conveyor capacity. Selection of pulley diameter, shell thickness, stiffening and shaft diameter shall be subject to approval of Employer during detailed engineering.
- 8.18.11 Pulleys shall be duly stress relieved before machining. Hubs shall be of forged steel. Hubs and end discs shall be accurately machined for concentricity. All pulley shafts shall be EN-8 or equivalent. Cold Rolled steel shall be used for pulley shafts of diameter up to 160mm. Forged steel shall be used for shaft of 160mm dia. and above. Shafting shall be fitted by using ring feeder / taper lock assembly only, of reputed & approved make for all pulleys.
- 8.19 Pulley shafts shall be designed in accordance with CEMA (5th Edition) considering minimum service factor of 1.5 for bending and 1.0 for torsion. Shaft deflection shall not exceed six (6) minutes for any pulley. Shaft diameter shall be calculated based on rubber lagging only. i.e. T1/ T2 etc. shall be based on rubber lagging only.
- 8.20 All pulleys shall be straight faced having good concentricity and lagged as stated below:
- 8.20.1 All drive pulley shall have minimum 10 mm (4mm ceramic + 6mm rubber) thick Ceramic rubber lagging [Al<sub>2</sub>O<sub>3</sub> (92%) ceramic tiles embedded into the natural rubber by vulcanizing process, Hardness=9 on Mohr's scale]. Coefficient of friction shall not be less than 0.7 (Dry Conditions)/ 0.5 (Wet condition) for the above lagging. Lagging shall be of reputed, proven & approved make only.
- 8.20.2 All other pulleys shall have minimum 10 mm thick (plain) natural rubber lagging having 55 to 65 degree durometer hardness on shore "A" scale.
- 8.21 Pulley assemblies shall be statically balanced and run concentric when mounted on shaft. Balancing weight shall not exceed 0.5 percent of pulley weight. Out of roundness of any pulley shall be within  $\pm 0.5\%$  of diameter without lagging.



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8.22 Pulley shafting shall be supported by heavy duty antifricition - double row self-aligning spherical roller bearings with double labyrinth with synthetic seals and grease nipples. Bearings shall be housed in horizontally split type Plummer block equipped with four fixing bolts and complete with side covers. Plummer blocks shall be of cast steel construction. Adjustable screw and lock nut shall be provided on one side of Plummer block for alignment purpose. Vendor shall ascertain pulley diameter, shell thickness and shaft diameter and suitable calculations shall be submitted for approval during detailed engineering. L10 Life of bearing shall be 40000 hrs. Minimum.

8.23 Bend/ Tail/ T.U. pulley shall be kept identical in all respects including bearing centers for a given conveyor.

8.24 Pulley shall be mounted on machined & ground surfaces. Suitable guard of expanded metal shall be provided for tail & bend pulleys. Pulley guard shall have adequate opening to allow greasing of pulley bearings.

8.25 **Belt Protection Equipment**

8.25.1 Pull chord Switch

Pull chord type (manually reset type) emergency stop switches shall be located on both sides of belt conveyors along the walkways for the entire length of conveyors for emergency stopping of conveyor provided at 30 m intervals for Conveyors longer than 20m. Minimum one pair of switch shall be provided for conveyor length of 20m or shorter than 20m length. The enclosure shall be of cast aluminum with degree of protection IP-65. It shall have a separate terminal box with a separate hinged cover which shall be totally sealed from main box containing actuating mechanism / limit switch etc. Local pull chord actuation shall be provided by means of mechanical flap. Each switch shall have two NO and two NC contacts, which shall be wired out to the terminal block. The terminal block shall have facilities of cable looping. The Contact rating of the switches shall be rated for at least 5 Amps, breaking at 240 VAC at 0.3 p.f. lagging. Adequate length of rope and all accessories shall be furnished. Pull chord in stone picking area shall be routed inside G.I. pipe of 1”size.

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### 8.25.2 Belt Sway Switches

Belt sway switches of self-resetting type shall be furnished at periodic intervals to limit belt sway to permissible extent. The enclosure shall be of cast aluminum having degree of protection of IP-65. It shall have a separate terminal box with a separate hinged cover totally sealed from the main box containing actuating mechanism/ limit switch etc. Each switch shall have two NO and two NC contacts one for alarm and one for trip, which shall be wired up to terminal block. The terminal block shall have facilities for cable looping. The contacts of the switches shall be rated for at least 5 Amps breaking at 240 VAC at 0.3 p.f. lagging. The roller length of the switch shall be at least 150 mm. Belt sway switches shall also be provided at HGTU & VGTU to detect excessive belt away. Belt sway switches (in pairs) shall be provided at 50 meters intervals for all conveyors having length greater than 20m. Minimum One (1) pair of belt sway switches shall be provided for conveyor of 20m or shorter than 20m length. Ball bearing shall be provided for roller & cam shaft.

### 8.25.3 Zero Speed Switch

Zero speed switch shall be non-contact (proximity) type electronic switch. Mounting arrangement / location shall be such that operation, effective sensing distance , sensitivity etc. shall not be effected by accumulation of dust on rotating part or surface of probe. Adequate mechanical protection by means of non-metallic shields shall be provided on top of the switch to prevent any damage due to falling coal/ metallic pieces etc. In built initial startup delay and nuisance, tripping delay through timers shall be provided. Each switch shall have two NO and two NC contacts wired out to the terminal blocks. The contact of the switches shall be rated for at least 5Amps breaking at 240 VAC at 0.3 p.f. lagging. The monitoring unit shall have cast aluminum body having IP-65 degree of protection. A separate terminal box with a separate cover, which shall be totally sealed from main box, shall be provided. Terminal blocks shall be suitable for terminating 1.5 mm<sup>2</sup>. Standard copper cable.

### 8.26 Chute Blockage Switches

One no. chute blockage switch of proven type (subject to approval of the employer) shall be provided at a suitable height on each leg of the conveyors discharge chute, vibrating

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screening feeders bypass chutes, crusher feeding chutes, tripper discharge and feeding chutes nearest to the skirt boards. Chute blockage switch shall trip the feeding conveyor in case of Chute blockage and protect the feeding conveyor equipment. Chute blockage switch shall also be provided at each leg of mobile tripper and shall trip the tripper conveyor.

The switch and its operating arrangement shall be suitable for working in dusty areas. The minimum degree of protection of switch shall be IP-65. Local indication of chute blockage switch actuation shall also be provided. Location of chute block switch shall be such that washing does not affect it.

Sensing arrangement shall be provided in the DDCMIS based control system for detecting the presence of material on the belt which shall in turn be used for operating solenoid valves of dust suppression / extraction system elaborated elsewhere. The arrangement shall detect three events simultaneously as follows:

- (a.) Belt loaded
- (b.) Belt running at more than preset speed.
- (c.) Preset initial start delay.

The terminal boxes of all the belt protection equipment / switches shall be such that all the components / terminals inside are easily accessible for inspection and maintenance without removing the cables / connections / components.

Each pull cord and Belt sway switch shall have necessary chip for using in circuit for the identification of the operated switch in main control room. The scheme for switch identification shall be fail safe and shall have all diagnostic features. The scheme shall have facility to bypass one or more switches, if required.

I.	<p>Drive Motors</p> <p>Rating of all drive motors of conveyors shall not be less than 110% of the power required at drive motor output shaft at specified design capacity. The motor rating shall be at 50deg Cent. Ambient. Single LT drive motors shall be used for conveyor drive ratings up to 180 KW. For conveyor drive rating beyond 160 KW, single HT drive shall be used for conveyors.</p>
II.	Conveyor Bridges



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	<p>All over ground and overhead conveyors shall be located in suitably enclosed bridge structure. Structural steel bridges of adequate width and depth (2700 mm clear head room) shall be provided complete with conveyor bottom deck plates, seal plates, walkways of chequered plates with anti-skid arrangement(s), hand rails (on both sides of each conveyor belt).</p>
1.	<p>The conveyor bridge shall have permanently color coated steel sheeting covers on roof and both sides, properly screwed or locked to steel structure as required. Adequate provision of windows shall be kept. A continuous slot opening of 500 mm shall be provided on both sides just below the roof sheeting.</p>
2.	<p>The floors of out door conveyor galleries shall be designed and constructed as follows: All conveyors shall be provided with 12 G steel seal plates throughout the length of the conveyor gallery in such a way that complete gallery bottom surface area forms a single water proof floor and no water / coal falls down from conveyor gallery in case of cleaning / washing. It is envisaged to clean the conveyor gallery with water periodically. All the water / coal slurry shall be suitably guided to down comers provided at every trestle. Each down comer shall lead the coal slurry into a 2 cub meter brick wall tank at ground level having 2 Nos. decanting taps at suitable elevations. Decanted water shall be led to the nearest drain in the Contractor's scope. Necessary arrangement shall be provided to avoid choking of down comers by bigger coal lumps and for cleaning of choked down comers.</p>
	<p>The conveyors shall be provided with continuous decking plate of minimum 3 mm thickness plain steel sheet.</p>
	<p>Independent supports for walkways, conveyor structures shall be provided. The width of conveyor galleries shall be decided by the Contractors depending on the equipment's size and the walkway width as specified. However, in no case the width of gallery shall be less than the width specified intender drawings</p>
	<p>Provision shall be kept with platforms and ladders for crossing over the conveyors at approximately every 100m intervals of route length and minimum one per conveyor.</p>
3.	<p>Telescopic Hydraulic Cylinder Hydraulic cylinder shall provide smooth lifting action. The cylinder shall be equipped with a drain back line to oil reservoir to return any oil seal seepage. A</p>



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	<p>lowering control valve shall be provided in order to prevent dropping of load in the event of loss of hydraulic pressure. A relief valve shall be provided to protect hydraulic system against excessive pressures due to over loading. The oil filter shall be provided to foreign particles entering in hydraulic system. The oil reservoir shall have adequate capacity to avoid undue heating of oil</p> <p>All shafts and pistons of all the hydraulic cylinders shall be protected against corrosive fumes by shielding them as far as possible. Material of construction of all the shafts and pistons shall be SS 316/ 316L.</p>
I.	<p><b>Extent of Shop Assembly</b></p> <p>The structural elements shall be dispatched loose to be bolted in field. Head, tail and take-up frames shall be fully shop assembled, in order to check the correct manufacture and shall be shipped in partially assembled elements in order to reduce the shipping volume.</p>
I.	<p><b>Safety Guards</b></p> <p>Safety guards shall be provided for operating equipment. Guards shall completely enclose moving parts so that physical contact with the moving parts cannot be made with the guard in place. Guards shall be constructed of steel wire net casing. Design and construction of guards shall permit easy removal and shall be of the hinged type.</p>
	<p><b>Walkways</b></p> <p>a) Construction: Chequered plate with antiskid arrangement. Chequered plate steps shall be provided where conveyor slope exceeds 10degrees. (Totally sealed so that no waterfalls down while washing.)</p> <p>b) Central walk way width : 1100mm</p> <p>way width: 750mm (for single conveyors, the width of side walkways shall be 750 mm on one side and 1100mm on other side.</p>
	<p><b>Side Walkways</b></p> <p>a) Spacing (Center to center) : 25.0m on each side (in staggered fashion)</p> <p><b>b) Size : 1.2m x1.5m</b></p>
	<p><b>Trestle</b></p> <p>a) Spacing of monkey ladderson trestles</p> <p>b) Where height of conveyor gallery (walkway level) is 10 m or more Monkey</p>



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	<p>c) ladder shall be provided on every trestle.</p> <p>d) Where height of conveyor gallery (Walkway level) is less than 10m monkey ladder shall be provided on alternate trestle.</p>
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Data Sheet: Belt Conveyors

S.	Conv. No.	MBC-1	BC-1	MBC-1A	BC-1A
1)	Qty, no.	1	1	1	1
2)	Material Handled	Slag	Slag	Ash	Ash
3)	Maximum moisture	20%	20%	20%	20%
4)	Max. Lump size, mm (Nominal)	(-) 5mm	(-) 5mm	(-) 5mm	(-) 5mm
5)	Bulk Density, t/cum	1.0	1.0	1.5	1.5
6)	Design / Guaranteed capacity, tph	220/200	220/200	220/200	220/200
7)	Belt Width, mm	650	650	650	650
8)	Troughing angle, degree	◀----- 3-equal roll x 35° tr -----▶			
9)	Troughing angle, return side	◀----- Single roll Flat x 0° tr -----▶			
10)	Belt Speed (max.),m/s	1.75	1.75	1.75	1.75
11)	Length,m	20	156	20	156
12)	Lift,m	2.8	10	2.8	10
13)	Take-Up	Screw	VGTU	Screw	VGTU
14)	Type of Drive	◀----- Single Snub Drive -----▶			
15)	Motor, Kw	18	37	18	37
16)	Motor speed, RPM (Syn.)	1480	1480	1480	1480
17)	Belting	Nylon / Nylon Type			
	Minimum Belt rating required	◀----- HD N/N-400/3 (FR Grade) -----▶			
	Length,m	◀----- 715 -----▶			
	Factor of Safety (FOS)	Not less than 10 for N/N Belt			
	Top Cover thk, mm (Minimum)	5	5	5	5



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Data Sheet: Belt Conveyors

S.	Conv. No.	MBC-1	BC-1	MBC-1A	BC-1A
	Bottom Cover thk, mm (Minimum)	2	2	2	2
18)	Gear Box	Bevel Helical Type			
	Qty, no.	1	1	1	1
i.	Ratio	18.9	18.9	18.9	18.9
19)	Low Speed Coupling	Flexible Geared Coupling Type			
i.	Qty, no.	1	1	1	1
20)	High Speed Coupling	< 30 kW Resilient type / Pin bush coupling ≥ 30 kW Delay Filled Chamber type			
i.	Qty, no.	1	1	1	1
21)	Brakes	Hydraulically operated Thrustor Type			
i.	Qty, no.	N.A	1	N.A	1
22)	Drive Pulley	Welded steel construction (MS, IS:2062)			
i.	Diameter ,mm	400	400	400	400
i.	Pulley Face width ,mm	750	750	750	750
i.	Qty, no.	1	1	1	1
γ.	Shaft Dia. At bearing ,mm	65	80	65	80
γ.	Shell thk. ,mm	12	12	12	12
i.	Bearing Centre ,mm	1200	1200	1200	1200
i.	Bearing Qty.	2	2	2	2
i.	Plummer Block	2	2	2	2
23)	Snub/Tail/Take-up/Bend Pulley	Welded steel construction (MS, IS:2062)			
κ.	Diameter ,mm	315	315	315	315
κ.	Pulley Face width ,mm	750	750	750	750
i.	Qty, no.	2	5	2	5



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Data Sheet: Belt Conveyors

S.	Conv. No.	MBC-1	BC-1	MBC-1A	BC-1A
i.	Shaft Dia. At bearing ,mm	50	70	50	70
i.	Shell thk. ,mm	10	10	10	10
γ.	Bearing Centre ,mm	1200	1200	1200	1200
γ.	Bearing Qty.	2	10	2	10
i.	Plummer Block	2	10	2	10
24)	Carrying Idlers				
i.	No. of Roll	◀----- 3-equal roll x 35° tr -----▶			
i.	Roll dia[OD]	114.3	114.3	114.3	114.3
i.	Shell thk, [nominal]	4.05	4.05	4.05	4.05
γ.	Type & size of bearings	20	20	20	20
γ.	Normal Idler Qty. @1.2m	7	124	7	124
i.	Self Align Idler Qty. @10m	1	15	1	15
i.	10° Tr. Transition idler Qty.	2	2	2	2
i.	20° Tr. Transition idler Qty.	2	2	2	2
25)	Impact Idlers				
i.	Roll Dia. without Rubber Discs	88.9	88.9	88.9	88.9
i.	Shell thk, [nominal]	4.5	4.5	4.5	4.5
i.	Idler Qty. @0.4m	8	8	8	8
26)	Return Idlers				
i.	No. of Roll	◀----- Single roll Flat x 0° tr -----▶			
i.	Roll dia[OD]	114.3	114.3	114.3	114.3
i.	Shell thk, [nominal]	4.05	4.05	4.05	4.05
γ.	Type & size of bearings	20	20	20	20
γ.	Normal Idler Qty. @3.0m	7	45	7	45





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Data Sheet: Belt Conveyors					
S.	Conv. No.	MBC-1	BC-1	MBC-1A	BC-1A
i.	Self Align Idler Qty. @30m	1	5	1	5
27)	Belt Cleaner Qty, no.				
i.	Primary Belt Cleaner	1	1	1	1
i.	Multi bladed Type Secondary Belt	1	1	1	1
i.	V-Plow type cleaner	1	1	1	1
28)	Safety Switches				
i.	Pull Cord Switches Qty. @30.0m	1	5	1	5
i.	Belt Sway Switches Qty. @50.0m	1	3	1	3
i.	Zero Speed switch Qty.	1	1	1	1
29)	Telescopic Hydraulic Cylinder				
i.	Type	Double acting Hydraulic cylinder			
i.	Qty, no.	2	2	2	2
i.	Capacity, tons	2.5	1.5	2.5	1.5
i.	Stroke, mm	2800	2800	2800	2800
i.	Operating Pressure, bar	180	180	180	180
i.	Hydraulic accumulator unit including valve control	←-----Shall be provided-----→			
i.	Secure Locking Unit				
i.	Position sensor system				

**9.0 CHUTES & HOPPERS**

**9.1 GENERAL**

Chutes & Hoppers, flap gates and rack & pinion gates shall be furnished integral with coal handling system being supplied. All necessary accessories, electrical etc. shall be provided to ensure proper flow/storage/bifurcation of coal as per system requirements.

**9.2 CODES AND STANDARDS**

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The design, manufacture, inspection and testing of Chutes & Hoppers shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the equipment is to be installed. The chutes, hoppers shall conform to the latest edition of the following standards and codes. Other internationally acceptable standards/codes, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the contractor of the required statutory responsibility. In case of any conflict in the standard and this specification, the decision of the Employer shall be final and binding.

IS:4682: Code of practice for lining of vessels and equipment for chemical processes.

IS:2062: Structural Steel (Standard Quality)

IS:11592 :Code of practice for selection and design of Belt Conveyors.

### 9.3 DESIGN AND CONSTRUCTION

#### 9.3.1 Chutes, Hoppers

9.3.2 The minimum valley angle of chutes shall be 60 degrees from horizontal.


9.3.3 Transfer chutes shall be adequately sized and sloped to ensure smooth flow of coal without any accumulation any where.

9.3.4 Direct impact of material on conveyor belt shall be avoided by providing an inclined surface at 60 degrees valley angle at the feeding point to guide the material in the direction of belt travel. Further, chute construction below flap gate shaft shall be such that there will not be any accumulation of coal dust between chute and flap gate in that zone.

9.3.5 Hoppers and Chutes shall be made of minimum 6mm thick SS-304 material. Long chutes guiding flow from considerable height shall be provided with impact plates wherever change indirection off low takes place. Hinged inspection doors of leak proof construction shall be provided for access/ maintenance purpose, at approachable heights for chutes and flap gates. All chutes should have one inspection door at every floor and for the ones in between the floors (more than 1.5 meter above the operating floor level) suitable access for trouble free maintenance shall be provided. For sealing of inspection doors labyrinth type arrangement to be provided. In addition to positive locking arrangement, mounting bolts, to tighten the door further against rubber shall also be provided.

9.3.6 Bottom side of the chutes on which the coal slides shall be welded to the side plates to form a trough. Bottom sides along with its adjacent sides shall be flanged and made from 6 mm thickness SS-304. The non-striking surface i.e. the covers of the trough shall be of 6mm thick SS-304 and bolted to the flange provided on the trough. Inside welding shall be provided in the corners for permanent sealing. Further, the chute boxes not more than 1.5 m in length shall be joined through bolted flange connection to form the chute legs. Adequate care shall be taken to locate the flange joint away from floor level for easy maintenance.

Bolted flange joints shall be of dust tight construction and necessary sealing material shall

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be provided in all the flange connections for adequate sealing.

Complete chute work in the region of flap gates shall be fabricated from 10 thk SS-304. In case of vertical chute (valley angle more than 80 degree) complete chute, work shall be of SS-304 material. While finalizing the chute work inside the building, arrangement for shifting and replacing chute legs, proper handling arrangement/wall openings, trolleys, hoists shall also be provided.

9.3.7 Hoods over the conveyor head pulleys shall be made of suitably stiffened minimum 6mm M.S. Plates and shall be provided with hinged and gasket inspection doors with suitable access to them. Further, serrated rubber seal shall also be provided at the every inlet of head chute to minimize dust nuisance.

9.3.8 Separate maintenance sealed door shall be provided for access to belt cleaners in head pulley hood, flap gates for maintenance and inspection doors shall be of hinged with positive locking facility.

#### 9.4 Skirt Boards

Skirt board shall ensure centralized loading of conveyor belt to avoid coal spillage. Suitable 'Skirt Plates' shall be provided for entire feeding chute and shall be extended minimum 3m ahead of front edge of chute and 500 mm beyond rear edge of chute. The width of the Skirt Boards shall be two-third the conveyor belt width. In the belts where coal of appreciable lump size (250 mm) is being conveyed, the gap between the bottom of the skirt board and the belt shall be made to increase uniformly in the direction of belt travel. The height of the skirt boards shall be sufficient to contain the material volume as it is loaded on the belt and shall not be less than 750 mm. The skirt plates shall be fitted with modular segmented and replaceable rubber skirting pads having facility of adjusting the pressure on the belt conveyor and shall have provision of online removal for the purpose of easy maintenance. Such segmented rubber pads with its holding down adjustment arrangements shall be of proven design. The edges of segmented pads shall be installed at an angle for providing a better seal. All care shall be taken while designing, to combine good sealing with minimum belt wear.

#### 9.5 DATASHEET: CHUTES AND HOPPERS

Ash / Slag Parameters As specified elsewhere

##### DESIGN & CONSTRUCTION

##### Chutes & Hoppers

Minimum Valley Angle 60 degrees

Material:

(a) Chute work

Sliding zones & adjacent sides 6 mm thk. SS-304 No striking/ Non

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>TECHNICAL SPECIFICATION- MATERIAL HANDLING</b>	PC183/E/206/S-VI/2.0	0	
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sliding zones	6mm thk SS-304
Chute with valley angle 80 degree and above	All four sides of 6mm thk. ss-304 material
In the zone of flap gates	10 thk SS-304 material Discharge
Hoods over head pulleys	6mm thk M.S. with rubber curtain
Inspection Doors	Hinged & leak proof construction (min. size 350x350mm)

### Chute Construction

(a) Corners connection	One face of removable bolted flange
(b) Joints Bolted construction	Flange joints of dust tight
(c) Bolt size	Min.M-16
(d) Bolts spacing	Not more than 125mm C/C
(e) Fixing Arrangement	Bolts with plain spring washers

### Skirt Boards

Length	Entire feeding chute shall be extended Minimum 3 mm ahead of front edge of Chute & 500 mm beyond rear edge of chute Height Not less than 750 mm
Width	2/3 of belt width
Side plate	Min.6 thk SS-304
Top cover	6 mm thk M.S

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## 10.0 FRONT END LOADER

Front End Loader (As per ISO:1585)	
1.00.01	Wet Ash shall be evacuated from dyke through Front End loader Machine and transfer the material into fixed hopper # FH-1/1A of mobile belt conveyor # MBC-1/1A. Also the machine shall work in conjunction with Bulldozer for clean-up of Ash Dyke & Slag Dyke.
1.00.02	Two (2) self-propelled Front End Loader (Tyre Mounted) of BEML-200L or equal shall be provided with a minimum net power 99kw (133 hp) @2300 rpm / (Min.) 2.7cum bucket capacity, SAE Rated). Each Front End Loader shall be equipped with all the necessary components and controls to provide a complete and independent unit as specified herein and as delivered to the project. Each Front End Loader shall be fully assembled and ready for production when delivered, bucket mounted; fuel tank full of fuel; coolant system filled with heater/engine coolant; and crankcase, transmission, differential and final drives (each), hydraulic system, and windshield washer reservoirs filled.
1.00.03	Each Front End Loader shall have a rollover protective structure (ROPS) which meets SAE / ISO standards.  Each cab shall meet requirements for operator sound exposure limits when tested according to ANSI / SAE J732. Each cab shall be sound suppressed and have an air conditioner. Each cab shall include an adjustable suspension seat, seat cover, and seat belt; tilt steering wheel; air filter; rear view mirrors; and front and rear windshield washer and wiper.
1.00.04	Each Front End Loader shall have the following or equivalent equipment:
1.00.05	Lighted instrument panel: Monitoring systems for alternator charging and voltmeter; fuel level and pressure; transmission oil temperature and filter service; coolant flow and temperature; pilot system filter service; hydraulic oil level, temperature, and filter system service; engine oil level, temperature, and pressure, air cleaner service; brake oil pressure and parking brake application; and clock hour meter. Monitoring systems can include lighted gauges and/or electronic monitoring system with warning horn.
1.00.06	Vandalism protection group, cap locks, and key start.



**SUPPLY & CONSTRUCTION OF ASH POND  
AND ALLIED SERVICES  
TALCHER FERTILIZER PLANT, ODISHA  
TECHNICAL SPECIFICATION- MATERIAL HANDLING**

PC183/E/206/S-VI/2.0

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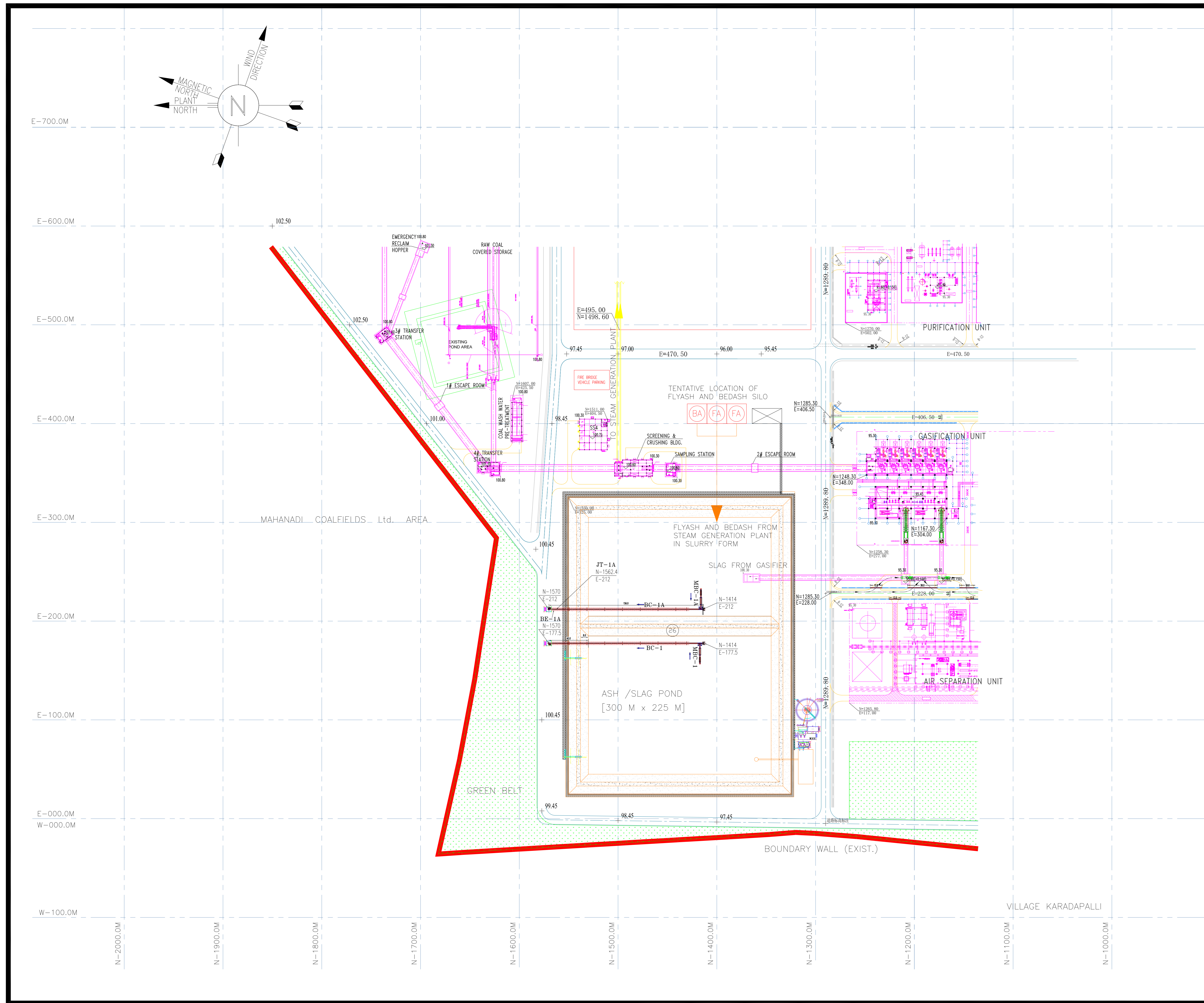
DOCUMENT NO

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	<p>Muffler</p> <p>Safety glass in windshield</p> <p>Backup alarm</p> <p>Warning horn</p> <p>50 amp alternator and heavy-duty batteries</p> <p>Lighting system, six forward lights, two rear mounted lights, and rear mounted stop lights.</p> <p>Electrical diagnostic connector and diagnostic tool.</p> <p>Fast oil change system</p> <p>Fast fuel system</p> <p>Fire suppression</p> <p>Draw bar</p> <p>Front counterweight</p> <p>Power shift transmission</p> <p>Supplemental steering</p> <p>Guards on power train</p> <p>Heavy-duty crankcase guard.</p> <p>Tool kit</p> <p>Multiple row module radiator</p> <p>All other standard equipment</p>
1.00.07	<p>Parts and Supplies</p> <p>Spare parts shall be delivered (in addition to those installed on the machine) with each machine for 5,000 hrs operation of each Machine.</p>



S.NO.	REFERENCE DRG.	DRAWING NO.

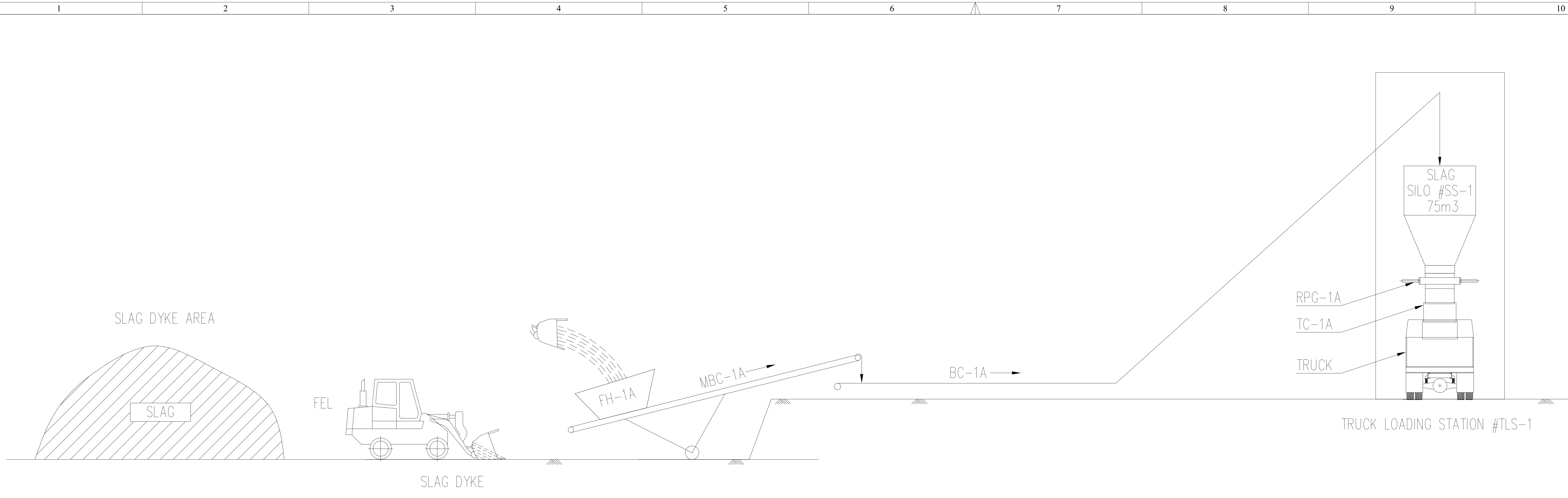
**GENERAL NOTES:-**

1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN M UNLESS NOTED OTHERWISE.
3. THIS DRAWING IS ONLY FOR BID PURPOSE.
4. EL (+) 0.000M LVL. BELONGS TO RL 98.500M

**LEGEND**

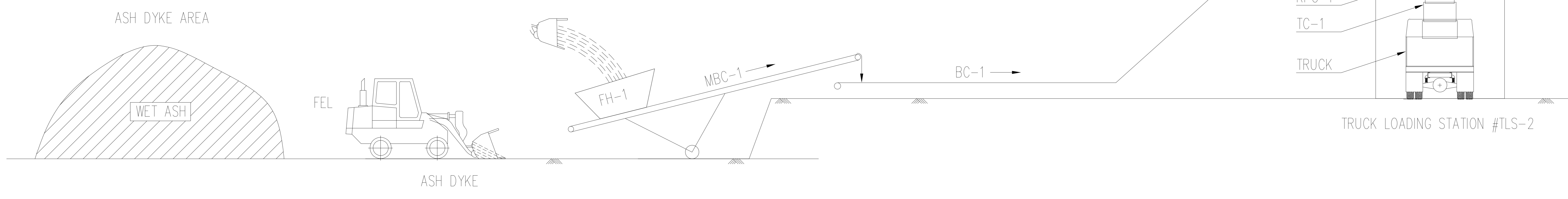
FGL - FINISHED GROUND LEVEL  
 FFL - FINISHED FLOOR LEVEL  
 HPL - HIGHEST PAVED LEVEL  
 TOG - TOP OF GROUT

P	19.01.22	ISSUED FOR TENDER	ANIL	NS	AMAR
REV	DATE	DESCRIPTION	BY	CHKD	APPD.
M/S TALCHER FERTILIZER LIMITED			REV.	P	
<b>LOCATION</b> TALCHER, ANGUL DISTRICT, ODISHA(INDIA)			SCALE:- NTS		
<b>TITLE</b> LAYOUT - ASH & SLAG DYKE			DRG. NO.- PC183-PNCV-AP-0201 FILE.- PC183-PNCV-AP-0201_P		
PROJECTS & DEVELOPMENT INDIA LIMITED NOIDA					



LEGEND: -

MBC	MOVABLE BELT CONVEYOR
BC	BELT CONVEYOR
FH	FEED HOPPER
TLS	TRUCK LOADING STATION
TC	TELESCOPIC CHUTE
RPG	RACK & PINION GATE
AS	ASH SILO
FEL	FRONT END LOADER



LEGEND: -

MBC	MOVABLE BELT CONVEYOR
BC	BELT CONVEYOR
FH	FEED HOPPER
TLS	TRUCK LOADING STATION
TC	TELESCOPIC CHUTE
RPG	RACK & PINION GATE
AS	ASH SILO
FEL	FRONT END LOADER

S.NO.	REFERENCE DRG.	DRAWING NO.

GENERAL NOTES:-  
1. THIS IS FOR BID PURPOSE ONLY.

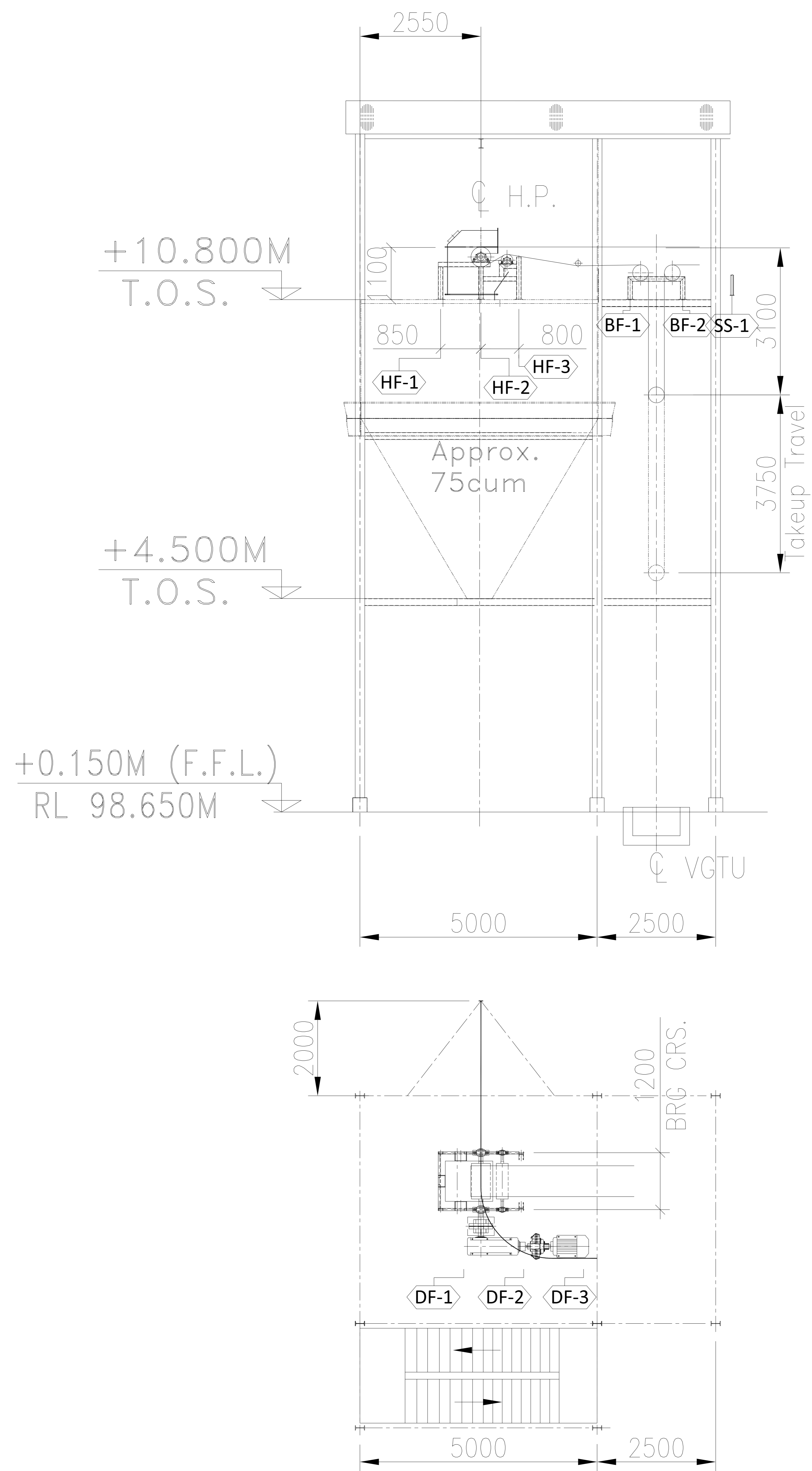
FOR TENDER PURPOSE ONLY

P	22.12.21	ISSUED FOR TENDER	ANIL	NS	AMAR
REV	DATE	DESCRIPTION	BY	CHKD	APPD.
M/S TALCHER FERTILIZER LIMITED			REV.		
			SHEET 1 OF 1		
LOCATION	TALCHER, ANGUL DISTRICT, ODISHA(INDIA)		SCALE:- NTS		
TITLE	FLOW DIAGRAM FOR CONVEYOR SYSTEM		DRG. NO.- PC183-PNCV-AP-0204 FILE.- PC183-PNCV-AP-0204_P		



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Silo Bldg.

FOR TENDER PURPOSE ONLY

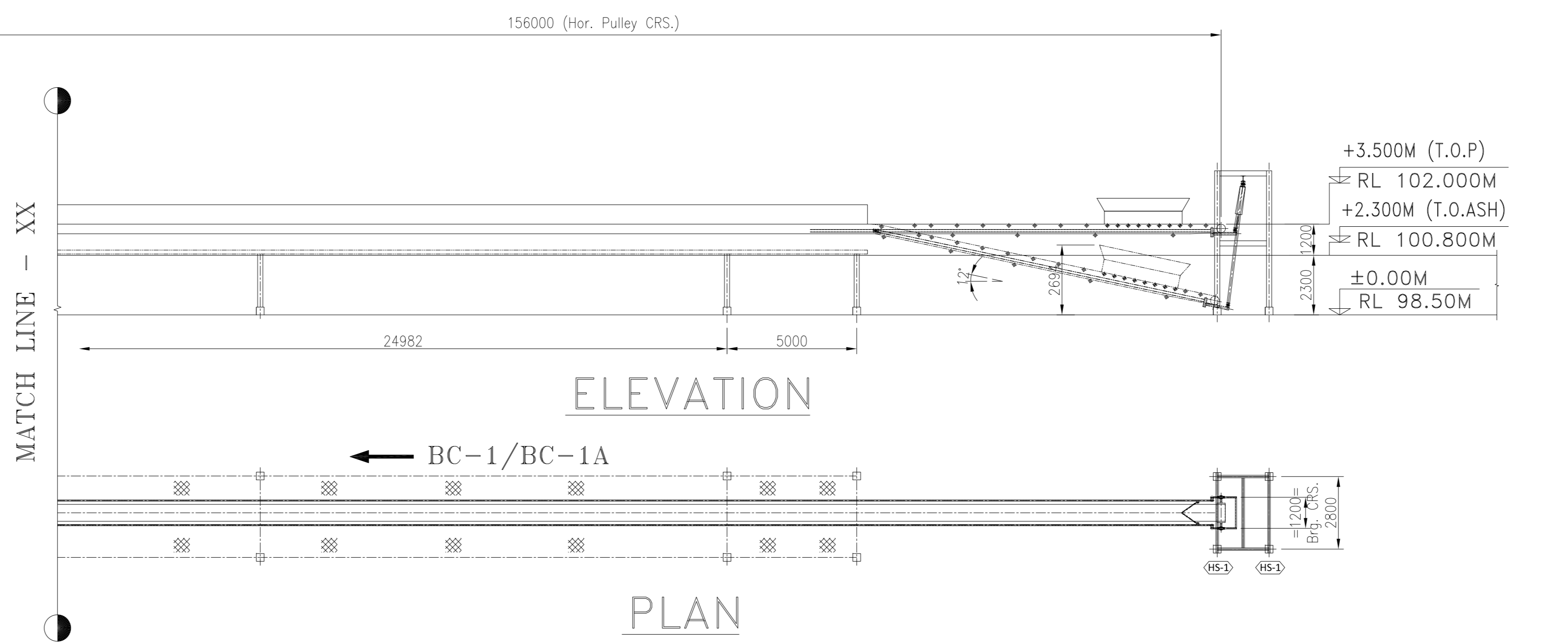
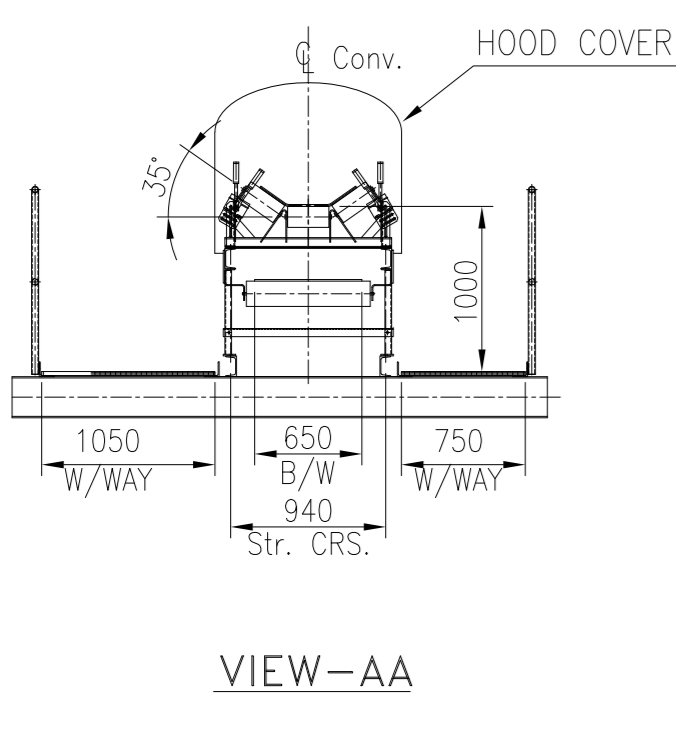
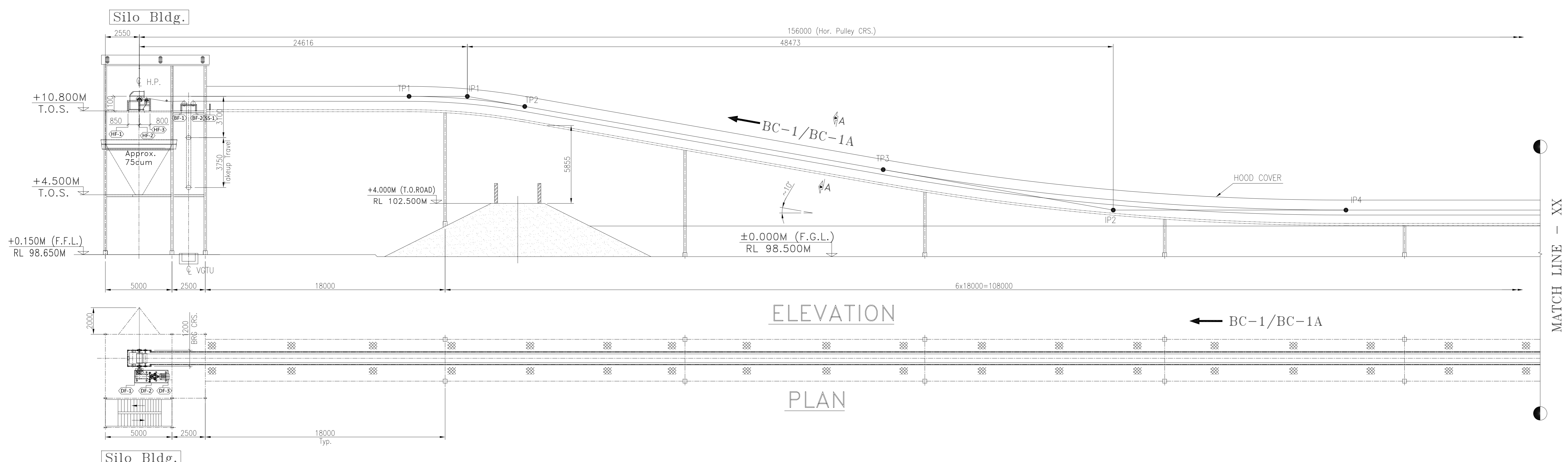
S.NO.	REFERENCE DRG.	DRAWING NO.

- GENERAL NOTES:-
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
  2. ALL LEVELS ARE IN M UNLESS NOTED OTHERWISE.
  3. THIS DRAWING IS ONLY FOR BID PURPOSE.

- LEGEND
- FGL - FINISHED GROUND LEVEL
  - FFL - FINISHED FLOOR LEVEL
  - HPL - HIGHEST PAVED LEVEL
  - TOG - TOP OF GROUT

P	22.12.21	ISSUED FOR TENDER	ANIL	NS	AMAR
REV	DATE	DESCRIPTION	BY	CHKD	APPD.
		M/S TALCHER FERTILIZER LIMITED	REV.		
LOCATION			TALCHER, ANGUL DISTRICT, ODISHA(INDIA)		
TITLE			GA DRAWING OF SILO		
			SCALE:- NTS		
			DRG. NO.- PC183-PNCV-AP-0209 FILE.- PC183-PNCV-AP-0209_P		
			PROJECTS & DEVELOPMENT INDIA LIMITED NOIDA		





Item No.	QTY.	UNIT	WEIGHT (KGS.)	REMARKS	
DF-3	2	-	500	For Drive Frame of Conv. #BC-1	
DF-2	2	-	500	For Drive Frame of Conv. #BC-1	
DF-1	2	-	500	For Drive Frame of Conv. #BC-1	
HS-2	2	-	1800	1500	For Hanging Post of Conv. #BC-1
HS-1	2	-	1800	1500	For Hanging Post of Conv. #BC-1
SS-1	2	-	100	25	For Short Post of Conv. #BC-1
BF-2	2	-	500	300	For Bend Pulley of Conv. #BC-1
BF-1	2	-	500	300	For Bend Pulley of Conv. #BC-1
HF-3	2	-	1355	750	For Head Frame of Conv. #BC-1
HF-2	2	-	1795	1450	For Head Frame of Conv. #BC-1
HF-1	2	1545	-	1450	For Head Frame of Conv. #BC-1
MKD. NO.	QTY.	KGS.	KGS.	REMARKS	
LOAD / BASE PLATE					
LOAD DATA					

**LEGENDS:**  
 TP : TAIL PULLEY  
 HP : HEAD PULLEY  
 TOS : TOP OF STEEL  
 BOM : BOTTOM OF MONORAIL  
 FFL : FINISH FLOOR LEVEL  
 U/S BP : UNDER SIDE OF BASE PLATE  
 Str. : STRINGER  
 EL : ELEVATED LEVEL  
 RL : REFERENCE LEVEL  
 W/WAY : WALKWAY

S.NO.	REFERENCE DRG.	DRAWING NO.

**GENERAL NOTES:-**  
 1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.  
 2. ALL LEVELS ARE IN M UNLESS NOTED OTHERWISE.  
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**LEGEND**  
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 FFL - FINISHED FLOOR LEVEL  
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REV.	DATE	DESCRIPTION	BY	CHKD	APPD.
P	19.01.22	ISSUED FOR TENDER	ANIL	NS	AMAR

M/S TALCHER FERTILIZER LIMITED  
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**LOCATION** TALCHER, ANGUL DISTRICT, ODISHA(INDIA)      **SCALE:-** NTS

**TITLE** GA DRAWING OF BELT CONVEYOR BC-1/BC-1A  
 DRG. NO.- PC183-PNCV-AP-0211  
 FILE.- PC183-PNCV-AP-0211\_P

 <b>PROJECTS &amp; DEVELOPMENT INDIA LTD.</b>	PC183/E/206/S-VI/3.0	1	
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## SECTION-VI-3.0

### DESIGN PHILOSOPHY – PROCESS

**SUPPLY AND CONSTRUCTION  
 OF  
 ASH POND AND ALLIED SERVICES  
 FOR  
 INTEGRATED COAL BASED FERTILIZER COMPLEX  
 AT  
 TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

#### 3.0 DESIGN PHILOSOPHY

1	13.06.2022	13.06.2022	Comment incorporated	SKK	SKK	AKS
0	28.01.2022	28.01.2022	First Issue	SKK	SKK	MN
<b>REV</b>	<b>REV DATE</b>	<b>EFF DATE</b>	<b>PURPOSE</b>	<b>PREPD</b>	<b>REVWD</b>	<b>APPD</b>

	<b>PROCESS PHILOSOPHY</b> <b>for</b> <b>SUPPLY AND CONSTRUCTION OF ASH POND AND</b> <b>ALLIED SERVICES</b>	PC183/E/206/S-VI/3.0	1	
		DOCUMENT NO	REV	
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Coal Gasification Plant involve the ash generation while processing the coal as a by-product. TFL plant has two sources of Ash Generation. First is Coal Gasification Plant and second is Steam Generation Plant. Gasifier generates fly ash and Slag. Steam Generation Plant generates fly ash and bed ash. Fly ash and Bed ash from both sources shall be stored in the RCC silos (Other LSTK's scope) while slag from Gasifier shall be routed to directly Ash pond through conveyor.

### **3.1 ASH POND**

In view of above, an Ash pond for emergency storage of Fly Ash, Bed Ash and Slag is envisaged within Plant Battery Limit. Ash pond is having partition to store the slag and "fly ash + bed ash" separately. For dimension of Ash, Please refer civil drawings.

### **3.2 ASH SLURRY**

Fly Ash and Bed Ash in slurry (Ash + Water) form shall be made available through single pipeline at the Ash Pond's B.L. at a single point. Further, Ash slurry Pipeline shall be routed to the designated partition of ash pond and garlanding pipeline shall be provided to distribute the ash slurry in the ash pond. Peripheral water pipeline shall be provided at Ash Pond for sprinkling the water to suppress the dust arising from Ash pond. Suitable sprinkler shall be provided to cover all the area of ash pond. Fly Ash slurry will be having 70% water.



### **3.3 SLAG**

Slag shall be conveyed directly to the designated partition of ash pond. Slag will be having 50% water.

### **3.4 WATER RECOVERY SYSTEM**

Water shall be recovered from the Ash pond (Fly + Bed Ash) for recycling purpose. To achieve the water recovery from ash pond and reuse the recovered water in preparation of ash slurry again, a provision has been envisaged consisting of following items:-

- Recovered water storage tank
- Recovered water pump
- Stilling Chamber
- Flash mixer
- Clarifier
- Sludge tank
- Sludge pump
- Recycle water tank
- Recycle water pump
- Poly Electrolyte Dosing system
- Alum Dosing system
- Lime Dosing system

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- Overhead Water tank (FRP)

**Size of following items has already been frozen as mentioned below:-**

- Recovered water storage tank
- Recovered water pump
- Recycle water tank
- Recycle water pump
- Sludge tank
- Sludge pump
- Flash mixer
- Stilling Chamber

Any residual engineering required for design and trouble free operation of above items shall be in the scope of contractor.

### **3.5 PACKAGE ITEMS (Clarifier along with dosing system)**

#### **SCOPE OF WORK**

The Bidder's scope of work shall include Detailed Design, Engineering & scope of supply of all equipments & accessories, procurement of complete materials & bought-out items whatever deemed necessary for process, mechanical, electrical & instrumentation, fabrication at shop/ site as required, inspection, testing, painting, calibration & supply of complete Package along with spares & maintenance tools etc. as per related documents enclosed with the enquiry.



#### **SCOPE OF SUPPLY**

The scope of supply for the Package items i.e. Clarifier along with Dosing System" shall include but not limited to the items as listed below. These includes the clarifier, Dosing Tanks, dosing Pumps with drivers, valves, strainers, First fill of lubricating oil, Companion flanges with nut, bolt and gaskets, surface preparation & painting, Drawings & data, Capital spares, Start-up & commissioning spares, Special tools, motors, cables, field instrumentation etc. as required for completing the system as per specifications. Any other item not specifically mentioned but which is essential for good engineering practice to operate the system safely at all times shall be included in scope of supply by Bidder.

#### **Clarifier along with Dosing System**

- RCC Clarifier along with Agitator & Scrapper – One nos.
- Poly Electrolyte Dosing system (Two RCC Tanks + Two Agitators + Two Pumps)
- Alum Dosing system (Two RCC Tanks + Two Agitators + Two Pumps)
- Lime Dosing system (Two RCC Tanks + Two Agitators + Two Pumps)
- Over head water Tank (FRP) – One nos.

#### **Design Criteria of Package Item:-**

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- Design of clarifier (RCC) shall be based on 1000 PPM TSS load in Recovered water (Inlet) and 10 PPM shall be in treated water (outlet) from clarifier. Inlet flow rate to clarifier shall be 235 M3/hr. Clarifier system shall have scrapper, Agitator, scrapper bridge, Platform, handrail across platform etc.
- Capacity of dosing tank (RCC) shall be 12 hours based on dosing rate. Dosing pump capacity shall have 10% margin over dosing rate.
- Capacity of Over head tank will be based on the required water for preparation dosing chemicals at least two times (i.e. 24 hours).

### Exclusion

- Bidder shall not consider any civil, Electrical, Instrumentation and interconnecting piping for above package as the same has already been included in other line items.

Recovered water shall be terminated at B.L. of this tender's scope through pipeline. Please refer P&ID for scope demarcation.

### 3.6 Quality of Recovered Water

Sr. No.	Parameter	Value
1	Suspended Solid	1000 PPM (Max.)
2	Particle Size	10 Microns (max.)

### 3.7 Quality of Recycled water

Sr. No.	Parameter	Value
1	Suspended Solid	10 PPM (max.)

### 3.8 ATTACHMENTS

1. Instrument datasheet
2. P&ID
3. Pump data sheet \_Centrifugal
4. Pump data sheet \_PD
5. Agitator datasheet

Please refer P&ID for details of clarifier, dosing tank, underground tank.



## **SECTION – 3.1**

### **PERFORMANCE & GUARANTEE TESTS**

#### **DESIGN PHILOSOPHY – PROCESS**

#### **SUPPLY AND CONSTRUCTION**

#### **OF**

#### **ASH POND AND ALLIED SERVICES**

#### **FOR**



#### **INTEGRATED COAL BASED FERTILIZER COMPLEX**

#### **AT**

#### **TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**



0	13.06.2022	13.06.2022	Issued for Tender Purpose	SKK	SKK	AKS
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



 <b>पी डी आई एल</b> <b>PDIL</b>	<b>PERFORMANCE &amp; GUARANTEE TESTS</b> <b>for</b> <b>SUPPLY AND CONSTRUCTION OF ASH POND AND</b> <b>ALLIED SERVICES</b>	PC183/E/206/SEC-VI/3.1	0	
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Section Number	Description	Sheet Number
1.0	Performance Guarantees	3
2.0	Performance Tests	4

	<b>PERFORMANCE &amp; GUARANTEE TESTS</b> for <b>SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b>	PC183/E/206/SEC-VI/3.1	0	
		Document No.	Rev	
		Sheet 3 of 5		

## 1.0 PERFORMANCE GUARANTEES

### 1.1 Performance Guarantees

LSTK Contractor shall guarantee the performance as specified in this clause under the following heads:-

1. Capacity
2. Power
3. Quality
4. Noise
5. Vibration

Failure to meet flow rate and head of pumps, Power consumed by pumps, Storage Tanks Capacity, Quality Parameters of Recycled water, Noise and vibration shall be breach of contract requiring corrective action by LSTK contractor irrespective of the cost involved.



Bidder shall specify Guaranteed Performance Parameters:-

Parameter	Units	Value
Flow rate of Water	M <sup>3</sup> /hr	P-101A/B = 235 M <sup>3</sup> /hr P-102A/B = 230 M <sup>3</sup> /hr P-103A/B = 25 M <sup>3</sup> /hr Guarantee to be performed for Individual pump running
Power consumption	Kw/h	LSTK Contractor to provide
Head of pumps	M	P-101A/B = 15 M P-102A/B = 30 M P-103A/B = 30 M
Storage Tanks Capacity	M <sup>3</sup>	Recovery Water sump (RWS-101) = 2500 M <sup>3</sup> Recycle Water Sump (RWS-102) = 235 M <sup>3</sup> Sludge Sump (SS-101) = As per Detail Engineering
Quality Parameters of Recycled water	PPM	<10PPM
Noise	dBA	<85 (from 1 meter distance)
Vibration	---	As per standard

### 1.2 Conditions for Guarantees:

For proving the performance guarantees, the following shall be provided by Owner to the LSTK Contractor.

Power in sufficient quantity conforming to the range of specifications supplied to LSTK Contractor by Owner.

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### 1.3 **Consumption of Utility:**

Consumption of power shall be measured and calculated as per figures indicated by various calibrated instruments. The guaranteed figures shall be inclusive of all instrument tolerances. All measurement instrumentation shall be part of the system/ plant installed by the LSTK Contractor and no special instrumentation for the purpose of guarantee tests shall be required.

## 2.0 **PERFORMANCE TESTS**

### 2.1 **General:**

LSTK Contractor shall prove the performance guarantees during tests of the composite system as specified in this clause under the following headlines:

- ❖ Guarantee Test
- ❖ Measurements during Guarantee Test
- ❖ Inconsistent Measurements
- ❖ Guarantee Test Results

#### 2.1.1 **Guarantee Test:**

The LSTK Contractor will perform the guarantee test described in this document will be successfully completed. During the Sustained Load Test the contractor will demonstrate that the make-up water supply in specified rate operate for a minimum of 72 hours. If the contractor fails to achieve any of the requirements of this test, contractor shall remedy the Works to achieve the above guarantee, in a reasonable time frame, in consultation with Owner.

#### 2.1.2 **Measurements during Guarantee Test:**



For determination of the average performance achieved during the guarantee test, all inputs and outputs shall be measured through appropriate meters specified and installed in system by LSTK Contractor and jointly calibrated and certified to be correct by LSTK Contractor and Owner. No metering tolerances shall be allowed. LSTK Contractor shall have all measurements and records certified by Owner beforehand.

#### 2.1.3 **Inconsistent Measurements:**

If any measurement is demonstrably inconsistent with the bulk of the data, or is otherwise suspected to be incorrect, then meter will be re-calibrated. Inconsistency in metering after the calibration if observed then it has to be rectified or in the worst case, meter to be replaced. However in no case, reading should be adjusted.

#### 2.1.4 **Guarantee Test Results:**

Within a reasonable period of time but not later than 5 working days from the completion of the guarantee test, Contractor shall determine the results thereof and if in LSTK Contractor's judgement, the performance guarantees have been achieved, submits its calculations and report to Owner for Owner's acceptance. The method of calculation for the Guarantee Test shall be mutually agreed by LSTK Contractor, Owner and PMC before starting of Guarantee Test. All data will be collected jointly in presence of LSTK contractor, Owner and PMC. Owner will review

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the report, calculations and the supporting data and accept the same in writing, if the results are in accordance with the provisions of this Section. In case, Owner does not accept the performance guarantee, Owner shall indicate in writing to LSTK Contractor in what respect the performance guarantees have not been met, within 5 working days of receipt of the report by Owner from the LSTK Contractor. In the event of rejection of Guarantee test results by Owner, LSTK Contractor shall take immediate actions to set right as per the provisions of the contract and repeat guarantee test Run to the satisfaction of Owner.

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**SPECIFICATION SHEET**  
**AGITATORS**  
**FOR**  
**POLYELECTROLYTE SOLUTION/ ALUM SOLUTION/  
LIME SOLUTION/ FLASH MIXER**  
  
**SUPPLY AND CONSTRUCTION**  
**OF**  
**ASH POND AND ALLIED SERVICES**  
**FOR**  
**INTEGRATED COAL BASED FERTILIZER COMPLEX**  
**AT**  
**TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

0	13.06.2022	13.06.2022	First Issue	SKK	SKK	MN
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



**PROCESS DATA SHEET  
AGITATOR**

PC183-PNPR-DD-05

0

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REV

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1. Agitator design shall be based on the following parameters:

2. Number of Baffles and Baffle design to be confirmed by agitator vendor.

3. pH of the operating fluid is as given below:-

- Poly Electrolyte- Neutral
- Alum = 2 to 3
- Lime = 9 to 11
- Water = 6 to 8

**Agitator for Dosing System (Quantity = 6 nos.)**

Parameters	Detail
MOC	SS316
GRADE OF MIXING	MILD
MIXING CYCLE	Continuous
VISCOSITY	During Detail Engineering
OPERATING CAPACITY (MIN/NOR/MAX)	During Detail Engineering
IMPELLER TYPE/NO. OF STAGES	PROPELLER/ As required
MOUNTING	TOP MOUNTED
CLASS OF MIXING	BLENDING & MIXING

**Flash Mixer (Quantity = 01 no.)**


MOC	SS316
GRADE OF MIXING	MILD
MIXING CYCLE	Continuous
VISCOSITY	During Detail Engineering
OPERATING CAPACITY (MIN/NOR/MAX)	During Detail Engineering
IMPELLER TYPE/NO. OF STAGES	PROPELLER/ As required
MOUNTING	TOP MOUNTED
CLASS OF MIXING	BLENDING & MIXING

 <b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PC183-PNPR-DD-06	1	
	DOCUMENT NO	REV	
	SHEET 1 OF 2		

**SPECIFICATION SHEET  
FOR  
FLOW METER/ LEVEL TRANSMITTER/ PRESSURE  
GAUGE/ CONTROL VALVE**

**SUPPLY AND CONSTRUCTION  
OF  
ASH POND AND ALLIED SERVICES  
FOR  
INTEGRATED COAL BASED FERTILIZER COMPLEX  
AT  
TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

1	13.06.2022	13.06.2022	Comments Incorporated	SKK	SKK	AV
0	28.01.2022	28.01.2022	FIRST ISSUE	SKK	SKK	MN
<b>REV</b>	<b>REV DATE</b>	<b>EFF DATE</b>	<b>PURPOSE</b>	<b>PREPD</b>	<b>REVWD</b>	<b>APPD</b>

Plant	ASH POND AND WATER RECOVERY SYSTEM			Document No.	Date	Rev.	SHEET		
Project	INTEGRATED COAL BASED FERTILIZER COMPLEX			PC183-PNPR-DD-06	09.03.2022	1	2 OF 2		
<b>INSTRUMENT DATASHEET</b>									
FLUID	Recovery water (with ash particles)	Recycle Water	Sludge	Lime Solution	Alum Solution	Poly Electrolyte Solution	Service water	Service Air	UNIT
DENSITY	1000	1000	NA	NA	NA	NA	NA	NA	kg/m <sup>3</sup>
VISCOSITY	0.612	0.612	NA	NA	NA	NA	NA	NA	cP
VAPOR PRESSURE	0.06	0.06	NA	NA	NA	NA	NA	NA	kg/cm <sup>2</sup> a
<b>FLOW TRANSMITTER</b>									
TAG NO.	FE-101 (Note-1)	FE-102	NA	NA	NA	NA	NA	NA	UNIT
LOCATION	Common Discharge pipeline of P-101A/B	Common Discharge pipeline of P-102A/B	NA	NA	NA	NA	NA	NA	
FLOW (min./Normal/max.)	200/235/250	200/230/250	NA	NA	NA	NA	NA	NA	m <sup>3</sup> /h
PRESSURE DROP at (Min./ Nor/ Max.) flow	Min./Min./Min.	Min./Min./Min.	NA	NA	NA	NA	NA	NA	kg/cm <sup>2</sup>
DESIGN PRESSURE	2.5	4	NA	NA	NA	NA	NA	NA	kg/cm <sup>2</sup> g
DESIGN TEMPERATURE	75	75	NA	NA	NA	NA	NA	NA	°C
OPERATING TEMPERATURE	40	40	NA	NA	NA	NA	NA	NA	°C
OPERATING PRESSURE(min./Normal/max.)	(-)/ 1.5/ (-)	(-)/ 3.0/ (-)	NA	NA	NA	NA	NA	NA	kg/cm <sup>2</sup> g
<b>PRESSURE GAUGE</b>									
TAG NO.	PT-101A/B (Note-1)	PT-102A/B	PI-103A/B	PI-104A/B	PI-105A/B	PI-106A/B	PI-107	PI-108	UNIT
LOCATION	Pump P-101A/B Discharge	Pump P-102A/B Discharge	Pump P-103A/B Discharge	Pump P-104A/B Discharge	Pump P-105A/B Discharge	Pump P-101A/B Discharge			
PRESSURE (min./normal/max )	(-)/1.5/2.5	(-)/3.0/4.0	(-)/3.0/4.0	(-)/1.5/3.5	(-)/1.5/3.5	(-)/1.5/3.5	(-)/5/7	(-)/5/7	kg/cm <sup>2</sup> g
OPERATING TEMPERATURE	40	40	40	40	40	40	40	40	°C
DESIGN PRESSURE	2.5	4	4	3.5	3.5	3.5	7	7	kg/cm <sup>2</sup> g
DESIGN TEMPERATURE	75	75	75	75	75	75	75	75	°C
<b>LEVEL TRANSMITTER/ LEVEL SWITCH</b>									
TAG NO.	LT-101	LT-102	LT-103	LT-104	LT-105	LT-106	NA	NA	UNIT
LOCATION	Recovery Water Tank	Recycle Water Tank	Sludge Tank	Poly-Electrolyte Tank	Alum Tank	Lime Tank			
TYPE	RADAR	RADAR	RADAR	RADAR	RADAR	RADAR	NA	NA	
TOTAL DEPTH OF TANK (RCC Underground)	5.1	4.9	During Detail Engineering	During Detail Engineering	During Detail Engineering	During Detail Engineering	NA	NA	
LEVEL HIGH/ LOW	3200/600	3200/600					NA	NA	mm
OPERATING PRESSURE	Atm	Atm					NA	NA	kg/cm <sup>2</sup> g
DESIGN PRESSURE	Atm. + static head	Atm. + static head					NA	NA	kg/cm <sup>2</sup> g
OPERATING TEMPERATURE	40	40					NA	NA	°C
DESIGN TEMPERATURE	75	75					NA	NA	°C
<b>CONTROL/ ON-OFF VALVE</b>									
TAG NO.	XV-101A/B (Along with Hand Wheel)	NA	NA	NA	NA	NA	NA	NA	
FLOW (Min./Normal/max.)	250	NA	NA	NA	NA	NA	NA	NA	m <sup>3</sup> /h
PRESSURE DROP AT (Min./ Nor/ Max.) FLOW	Minimum	NA	NA	NA	NA	NA	NA	NA	kg/cm <sup>2</sup>
DESIGN PRESSURE	3.5	NA	NA	NA	NA	NA	NA	NA	kg/cm <sup>2</sup> g
DESIGN TEMPERATURE	75	NA	NA	NA	NA	NA	NA	NA	°C
OPERATING TEMPERATURE	40	NA	NA	NA	NA	NA	NA	NA	°C
OPERATING PRESSURE (Min./Normal/max.)	0.5	NA	NA	NA	NA	NA	NA	NA	kg/cm <sup>2</sup> g
Notes:-									
1. There shall be 1000 PPM of Suspended solids in the fluid passing through Pump P-101A/B discharge Pipelines. Accordingly, FT-101A/B and PT-101A/B design shall take care of the same.									



LIME  
FROM P-104A/B (LIME DOZING METERING PUMPS)

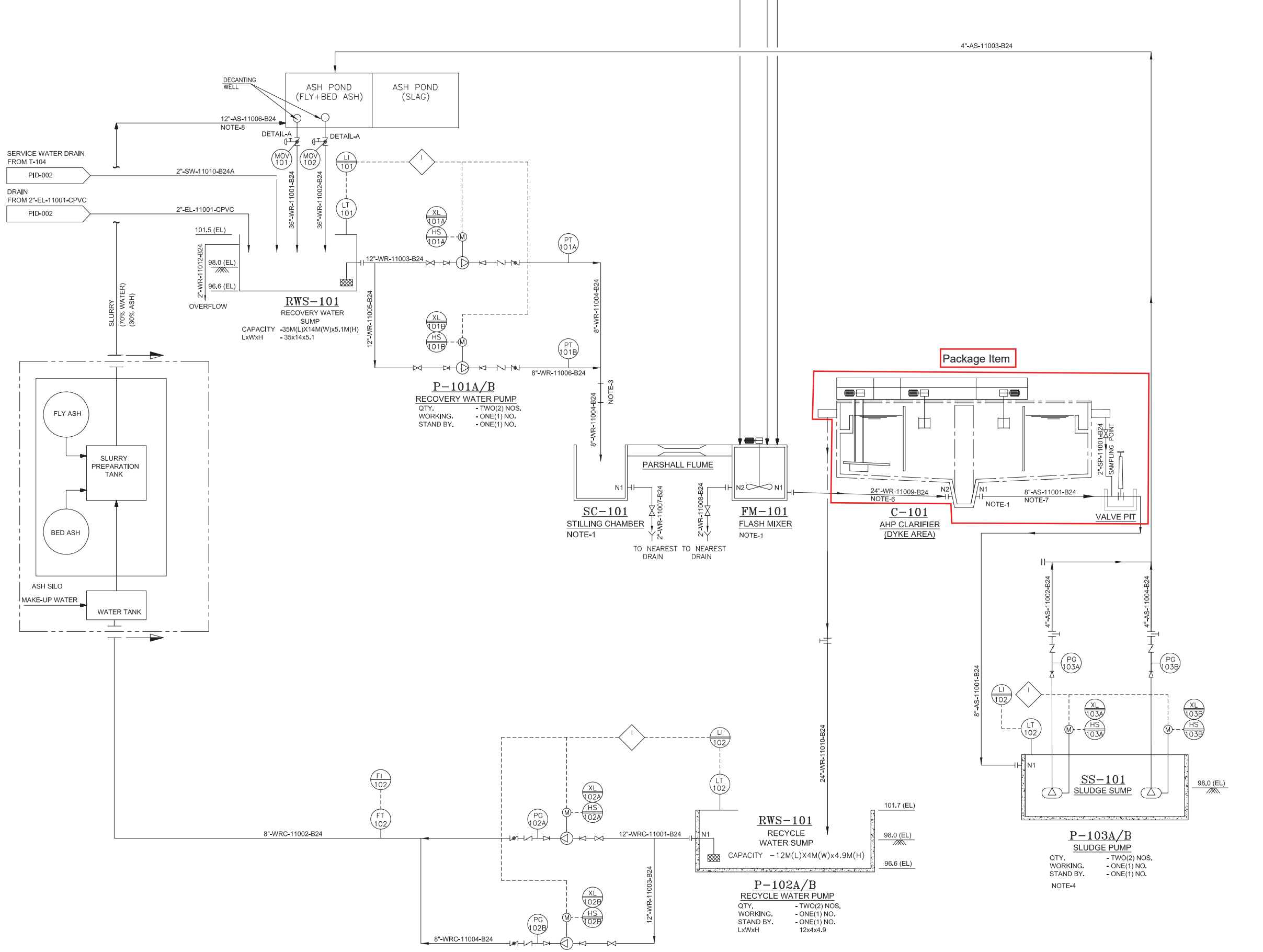
PID-002

LIME  
FROM P-103A/B (ALUM DOZING METERING PUMPS)

PID-002

LIME  
FROM P-102A/B (POLYELECTROLYTE PUMP)

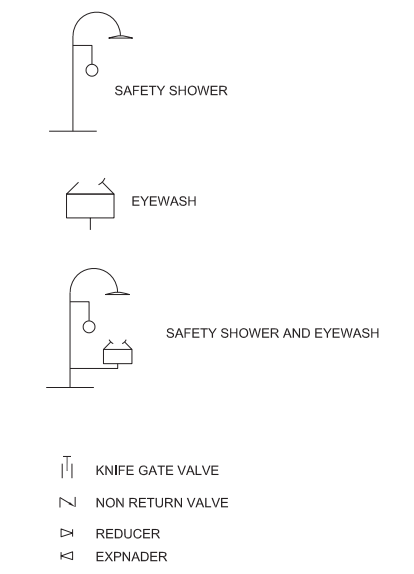
PID-002



LINE SERVICE:

POLYELECTROLYTE	PE
ALUM	AL
LIME	LM
RECOVERY WATER	WR
RECYCLING WATER	WRC
ASH SLUDGE	AS
SERVICE WATER	SW
INSTRUMENT AIR	IA
SERVICE AIR	SA
ASH SLURRY	ASL
SAMPLE POINT	SP
EFFLUENT	EL

LEGEND:

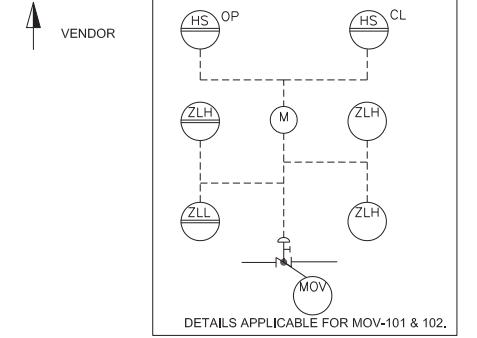


PIPE CLASS

B24	150# MS
B24A	150# CS
CPCV	150# CPCV

NOTE:-

- FOR ELEVATION OF TANKS & CLARIFIER, STILLING CHAMBER & FLASH MIXER REFER ATTACHED DRAWING.
- MARKED ELEVATION OF TANKS ARE TENTATIVE AND MANY CHANGE DURING DETAILS ENGINEERING.
- SPOOL PIECE FOR FLOW METER (ULTRASONIC / MAGNETIC)
- CAPACITY TO BE CONFIRMED DURING DETAILS ENGINEERING.
- DRAIN & VENT TO BE PROVIDED AS PER REQUIREMENT.
- MS ERW FE 410 GRADE PIPE AS PER IS: 3589 (RUBBER LINED INSIDE) ENCLOSED WITH RCC FROM FLASH MIXER TO CLARIFIER.
- MS ERW FE 410 GRADE PIPE AS PER IS: 3589 ENCLOSED WITH RCC / CI CLASS D PIPE FROM CLARIFIER TO SLUDGE SUMP
- SEGMENT SHALL BE PROVIDED IN PIPELINE AT SUITABLE LOCATION FOR CLEANING OF PIPELINE.
- LOW POINT DRAIN & HIGH POINT VENT TO BE PROVIDED.

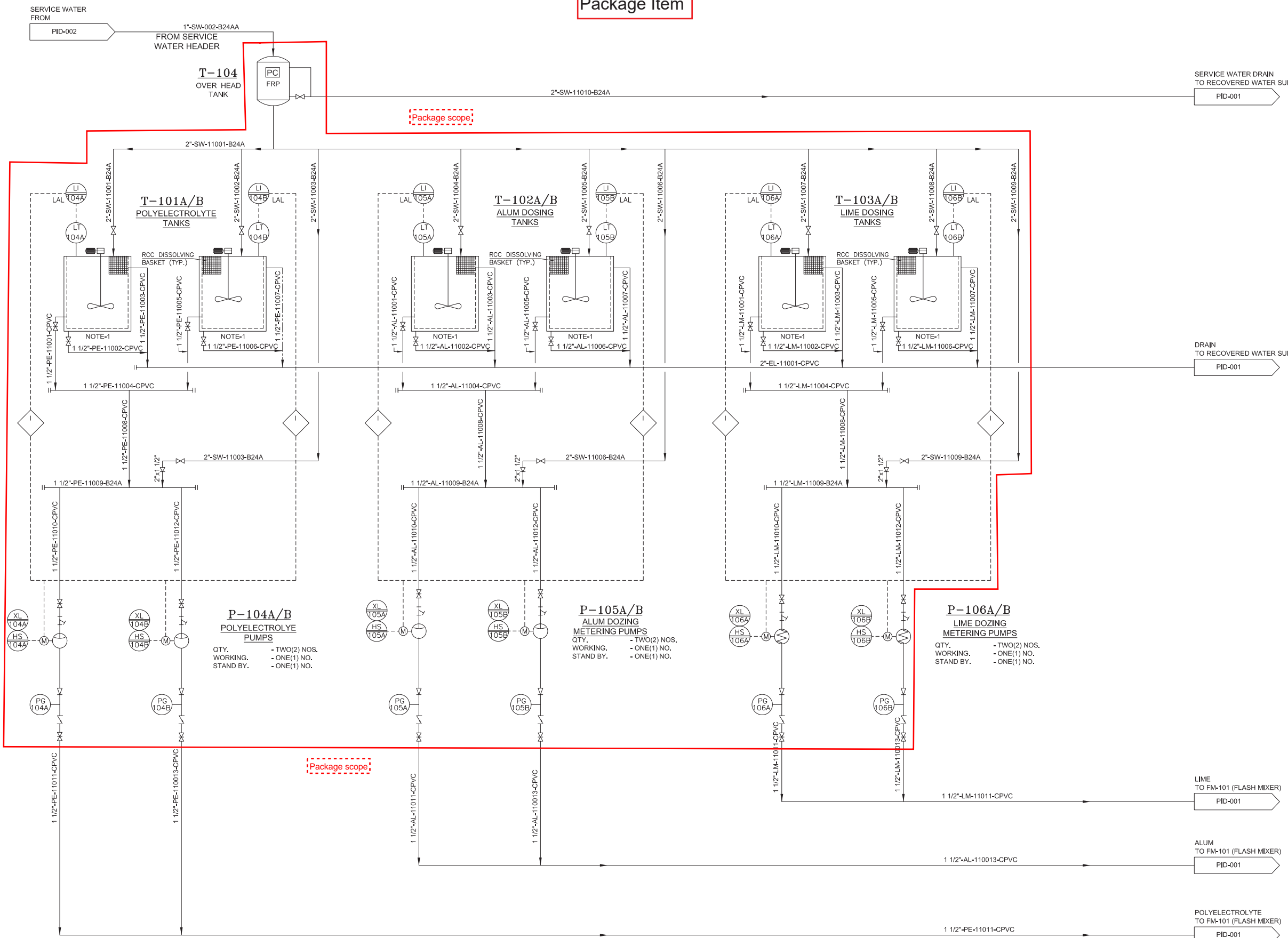


REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
1	09.03.22	REVISED AS PER COMMENT	SK	SK	AV
0	28.01.22	FIRST ISSUE	SK	SK	MN

CLIENT:	M/S TALCHER FERTILIZER LIMITED ANGUL DISTRICT, ODISHA(INDIA)	REV. 1
TITLE:	PIPING AND INSTRUMENTATION DIAGRAM CLARIFIER SYSTEM	SCALE: NTS
PLANT:	ASH POND AND WATER RECOVERY SYSTEM	SIZE: A1
PROJECT:	INTEGRATED COAL BASED FERTILIZER COMPLEX	SHEET NO. 1/3
		DRAWING NO. PC183-PNPR-001
		FILE NO.
		PID-001

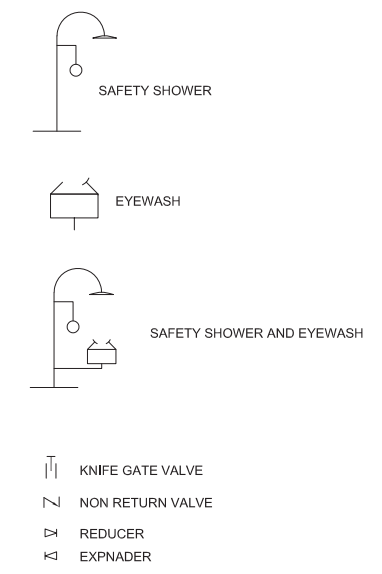
**Package Item**



**LINE SERVICE:**

POLYELECTROLYTE	PE
ALUM	AL
LIME	LM
RECOVERY WATER	WR
RECYCLING WATER	WRC
ASH SLUDGE	AS
SERVICE WATER	SW
INSTRUMENT AIR	IA
SERVICE AIR	SA
ASH SLURRY	ASL
SAMPLE POINT	SP
EFFLUENT	EL

**LEGEND:**

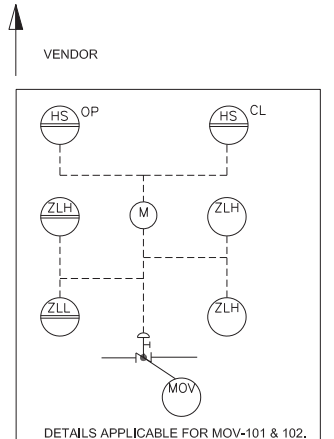


**PIPE CLASS**

B24	150# MS
B24A	150# CS
CPCV	150# CPCV

**NOTE:-**

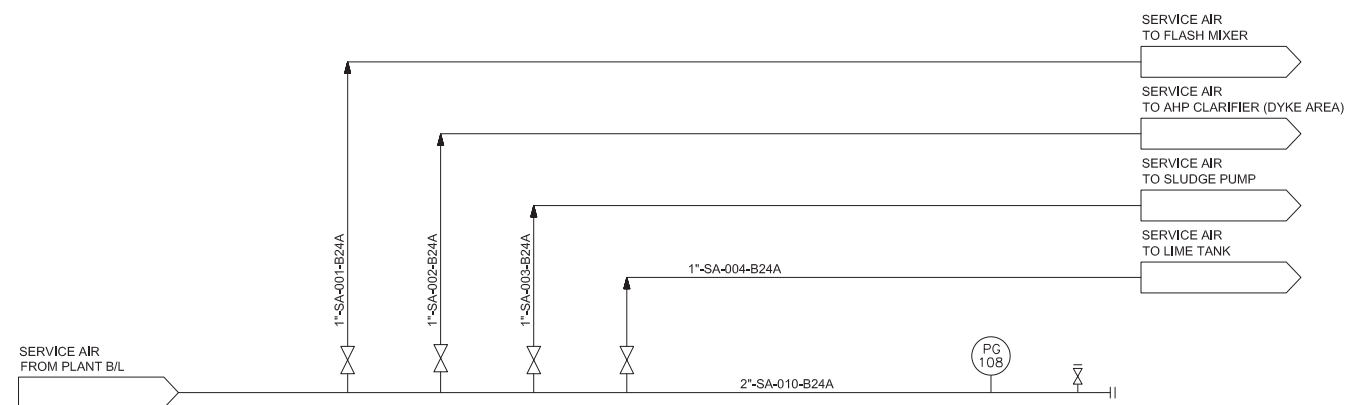
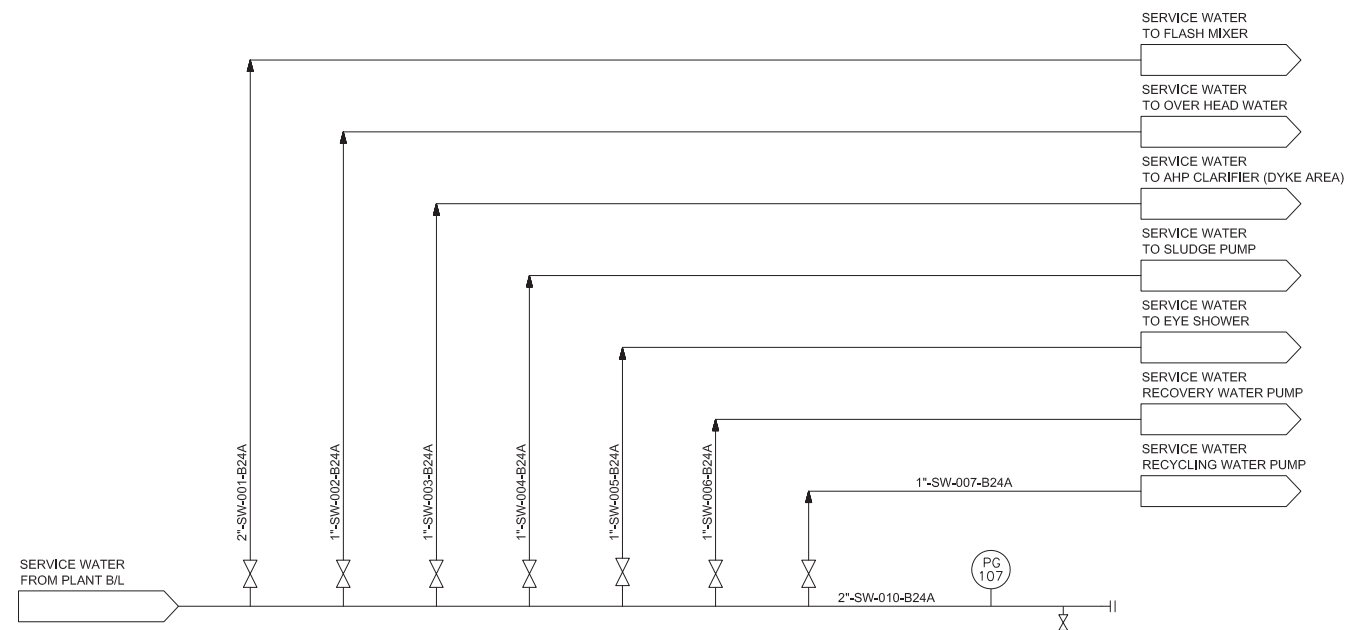
1. SIZE OF DOSING TANKS SHALL BE CONFIRMED DURING DETAIL ENGINEERING AND MCC DOSING TANKS SHALL BE OF RCC.
2. SAFETY SHOWER WITH EYEWASH SHALL BE PROVIDED NEAR CHEMICAL DOSING TANKS.
3. LOW POINT DRAIN & HIGH POINT VENT TO BE PROVIDED.



REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
1	09.03.22	REVISED AS PER COMMENT	SK	SK	AV
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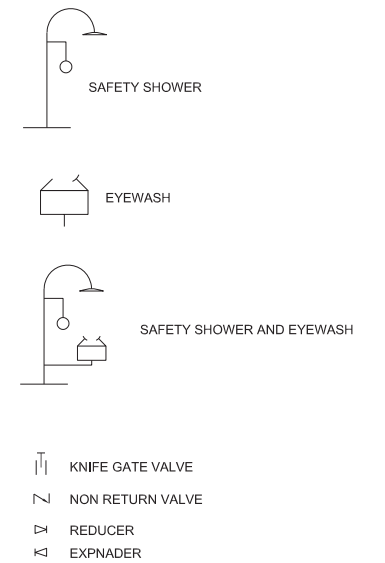
CLIENT:	M/S TALCHER FERTILIZER LIMITED ANGUL DISTRICT, ODISHA(INDIA)	REV. 1	SCALE: NTS
TITLE:	PIPING AND INSTRUMENTATION DIAGRAM DOSING SYSTEM	SIZE: A1	DRAWING NO. PC183-PNPR-002
PROJECT:	INTEGRATED COAL BASED FERTILIZER COMPLEX	SHEET NO. 2/3	FILE NO. PID-002



**LINE SERVICE:**

POLYELECTROLYTE	PE
ALUM	AL
LIME	LM
RECOVERY WATER	WR
RECYCLING WATER	WRC
ASH SLUDGE	AS
SERVICE WATER	SW
INSTRUMENT AIR	IA
SERVICE AIR	SA
ASH SLURRY	ASL
SAMPLE POINT	SP

**LEGEND:**



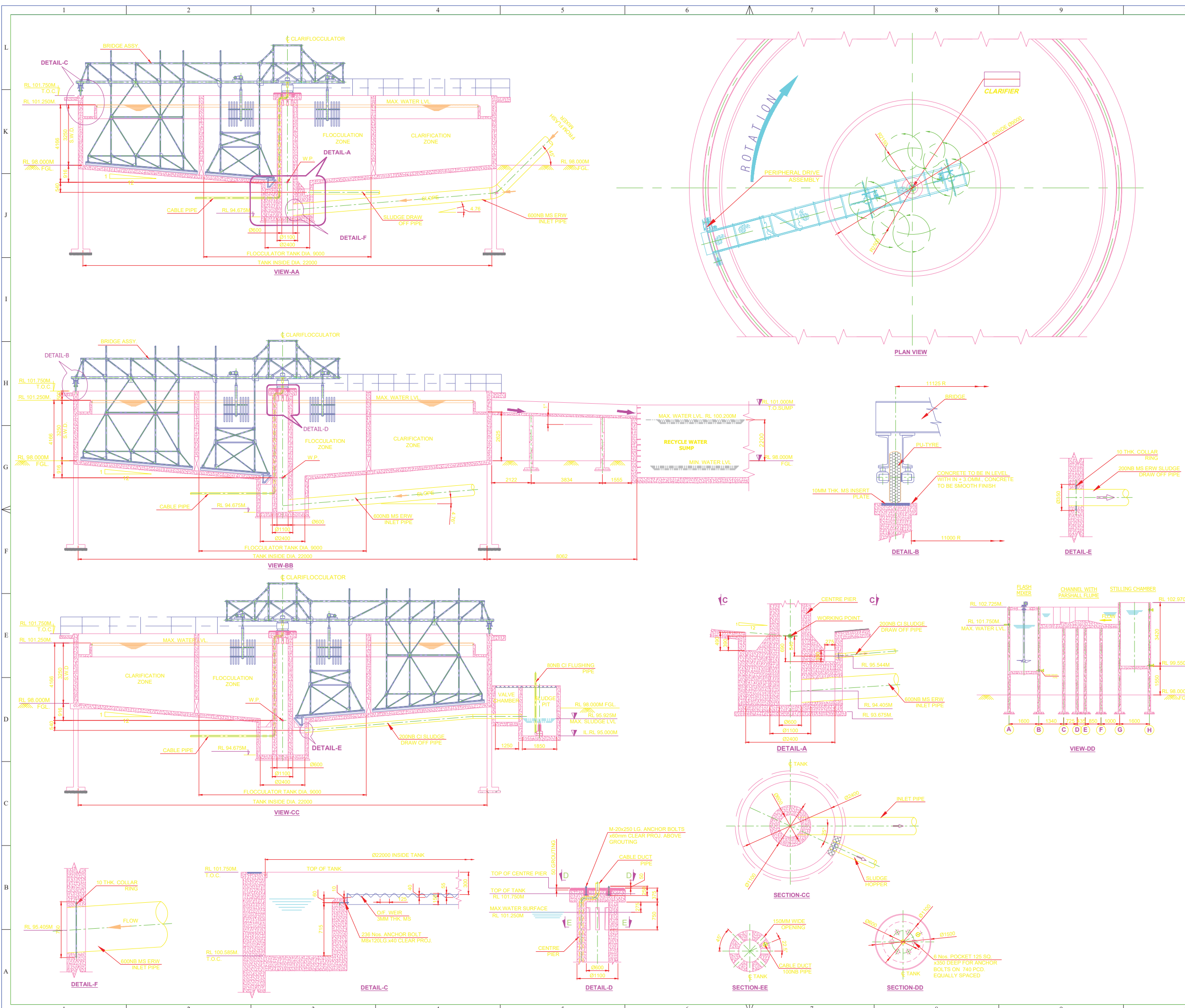
**NOTE:-**

1. LOW POINT DRAIN & HIGH POINT VENT TO BE PROVIDED.

REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
1	09.03.22	REVISED AS PER COMMENT	SK	SK	AV
0	28.01.22	FIRST ISSUE	SK	SK	MN

CLIENT:	M/S TALCHER FERTILIZER LIMITED ANGUL DISTRICT, ODISHA(INDIA)	REV. 1	SCALE: NTS
			SIZE: A1
			SHEET NO. 3/3
TITLE:	PIPING AND INSTRUMENTATION DIAGRAM UTILITIES	DRAWING NO.	PC183-PNPR-003
PLANT:	ASH POND AND WATER RECOVERY SYSTEM	FILE NO.	
PROJECT:	INTEGRATED COAL BASED FERTILIZER COMPLEX	PID-003	



S.NO.	REFERENCE DRG.	DRAWING NO.

**GENERAL NOTES:-**  
 1. ALL DIMENSIONS ARE IN MM AND LEVELS IN M. UNLESS NOTED OTHERWISE.  
 2. THIS DRAWING IS FOR BID PURPOSE.

**LEGEND**  
 FGL - FINISHED GROUND LEVEL  
 FFL - FINISHED FLOOR LEVEL  
 HPL - HIGHEST PAVED LEVEL  
 TOG - TOP OF GROUT

**NOTE:-**  
 1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.  
 2. ALL LEVELS ARE IN M UNLESS OTHERWISE NOTED.  
 3. THIS DRAWING IS ONLY FOR BID PURPOSE.

REV	DATE	DESCRIPTION	BY	CHKD	APPD.
M/S TALCHER FERTILIZER LIMITED			REV.	0	
TALCHER, ANGUL DISTRICT, ODISHA(INDIA)			SHEET 2 OF 3		
DYKE - CLARIFIER			SCALE:- X : X		
PROJECTS & DEVELOPMENT INDIA LIMITED NOIDA			DRG. NO.- PCXX-XXX-XXXX FILE.- PCXXX-XXX-XXXX_RX		



 <b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PC183-PNPR-DD-01	0	
	DOCUMENT NO	REV	
	SHEET 1 OF 10		

**SPECIFICATION SHEET  
FOR  
RECOVERY WATER PUMP/ RECYCLE WATER PUMP/  
SLUDGE PUMP**

**SUPPLY AND CONSTRUCTION  
OF  
ASH POND AND ALLIED SERVICES  
FOR  
INTEGRATED COAL BASED FERTILIZER COMPLEX  
AT  
TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

0	13.06.2022	13.06.2022	FIRST ISSUE	SKK	SKK	AKS
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



PDIL NOIDA

**PROJECT :** Coal Gasification based Ammonia-Urea Project  
**PLANT :** Ash Pond and Water Recovery System

PC183-PNPR-DD-01    0  
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 Sheet    Page 2 of 10



**CENTRIFUGAL PUMP SPECIFICATION SHEET**

**JOB NO.-PC-183**    **ITEM: Recovery Water Pump**    **ITEM NO. P-101A/B**  
**Project: Coal Gasification based Ammonia-Urea Project**    **Plant/Section : Ash Pond and Water Recovery System**    Reqn./P.O No.

Applicable to: (✓) Proposal    ( ) Purchase    ( ) As Built    No. Req. 2    Working/Stand by: 1 / 1 (Note-1)  
 Pump Type : (✓) Hori    ( ) Vert.    Installation : ( ) Indoor    (✓) Outdoor    Duty: (✓) Cont    ( ) Intermittent  
 Driver: (✓) Elect Motor    ( ) Steam Turbine/Hyd. Turbine    Driver Furnished by: ( ) Purchaser    (✓) Pump Supplier  
 Pump Supplier/ Manufacturer:    Model:    Sr. No:

**OPERATING CONDITIONS EACH PUMP**

Liquid Handled:	Recovery Water	CAPACITY	Rated	M <sup>3</sup> /hr	NPSH Reqd.	m
Pumping Temp:	Amb. °C		Nor.	235 M <sup>3</sup> /hr	Pump speed	RPM
Vapour Pr. at PT:	Kg/cm <sup>2</sup>		Min.	M <sup>3</sup> /hr	Efficiency	%
Spec Gr. at PT	1	Suction Pressure	Max.	Kg/cm <sup>2</sup> g	Rat. Power Consu.(Estimated)	Kw
Viscosity At PT.	0.612 Cp		Min.	Flooded Kg/cm <sup>2</sup> g	Max Power Consu.	Kw
pH Value	7.0-8.5	Disch. Pr.		Kg/cm <sup>2</sup> g	Driver Rating	Kw
Corrosion Due to	Ash Particle	Diff. Pr (Design).		1.5 (Note-6) Kg/cm2	Driver Speed	RPM
Solids in suspen.	600PPM	Diff. H at Rat. Cap.		15 M	Shut off Head	m
Max. Particle size		NPSH Available		7 M	Min. Cont .Flow	m

**CONSTRUCTIONAL FEATURES**

Self Priming		Max. Allow Casing Pr. Kg/cm <sup>2</sup> G			Jacketing For		
No. of Stages		Hydro Test Pr. Kg/cm <sup>2</sup> G			Cooling Water	Pr.	Kg/cm <sup>2</sup>
Impeller Type		Nozzle	Suction	Discharge	Available	Temp	oC
Imp. Dia Rated Max.		Size			Cooling Plan No.(API610)		
Casing Type		Rating			Cooling Water Req.		
Casing Split		Facing			Flushing Plan No.-		
Rot. Facing Coup. End cw/ccw		Position			Flushing Medium		
Casing Support		Shaft Seal			Temp		
Casing Drain		Type :Size			Pressure		
Axial Thrust Balanced BY		No. of Packing Rings			Flow		
Running	Stuffing Box brush	Bearing No.	Drive End		Base Plate (common)	Type	
	Wearing Rings					Size	
Clearance	Guide Brush	Sleeve Brg. Size		Coupling	Manufacturer		
	Balancing Disc/Drum	Lubricator			Type, Rating		
For Vert. Subm. Pump Dim: See Sht.		Lubricant Spec.		Size, Spacer length			

**MATERIAL OF CONSTRUCTION**

Casing	CS	Bearing Brush		Mech. Seal	Cover
Impeller	SS	Balan. Disc/Drum			Rot. Ring
Diffuser		Drip Tray			Sea Ring
Imp. Wearing Ring		Companion Flange			Spring/Bellow
Cas. Wearing Ring		Tie Rods			Gasket
Shaft	SS				Gland Seal
Shaft Sleeve				Stuff. Box	Seal Cage
Bearing House					Packing

**TESTS & INSPECTION AS PER ES**

**WEIGHTS**

**DRGS. & DOCUMENTS AS PER ES--5101**

Shop Test	Reqd. For	Witnessed for	Bare Pump	Kg	Out Line Drg. No.
Performance	Each/ One Pump	Each/ One Pump	Bare Plate	Kg	Sect. Drg. No.
Hydrostatic	Each/ One Pump	Each/ One Pump	Coupling/Gear Box	Kg	Seal Sect Drg. No.
NPSH	Each/ One Pump	Each/ One Pump	Driver	Kg	Auxi. Piping Drg. No.
Disassembly	Each/ One Pump	Each/ One Pump			Test Curve No.

ACCESSORIES REQD:    Base Plate    Anchor Bolts    Coupling    Coupling Guard  
 Companion Flang With Gasket    Bolts & Nuts For Comp Flange    ( ) Minimum Return Valve

REMARKS: 1. Y or Yes indicate applicable



**PROJECT :** Coal Gasification based Ammonia-Urea Project  
**PLANT :** Ash Pond and Water Recovery System

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**PDIL NOIDA**

**CENTRIFUGAL PUMP SPECIFICATION SHEET**

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**JOB NO.-PC-183**

**ITEM:** Recovery Water Pump

**ITEM NO.** P-101A/B

**Project:** Coal Gasification based Ammonia-Urea Project



**Plant/Section :** Ash Pond and Water Recovery System

Reqn./P.O No.

**NOTE:**

1. Driver motor to be designed for discharge valve full open condition.
2. Vendor to provide the suitable stainless steel strainer (Mesh Size 1mm) for pump suction.
3. Max. Shut off head shall not exceed 120% of the normal differential pressure.
4. NPSHr and Power calculation to be submitted by pump vendor.
5. All material of construction should be suitable for fluids at specified operating parameters.
6. Differential Pressure is at normal flow. Tank has to be emptied out maximum possible below the suction nozzle of pump. Vendor has to take care while designing the pump. Please refer drawing.
7. Drain and vent connection as applicable shall be with flanged valve connection, companion flanges, gaskets, fasteners.



 <b>पी डी आई एल</b> <b>PDIL</b> <b>PDIL NOIDA</b>	<b>PROJECT :</b> Coal Gasification based Ammonia-Urea Project <b>PLANT :</b> Ash Pond and Water Recovery System	<b>PC183-PNPR-DD-01</b> <b>0</b> DOCUMENT NO.    REV	
	<b>CENTRIFUGAL PUMP SPECIFICATION SHEET</b>	Sheet    Page 4 of 10	
<b>JOB NO.-PC-183</b>	<b>ITEM:</b> Recovery Water Pump	<b>ITEM NO.</b> P-101A/B	
<b>Project:</b> Coal Gasification based Ammonia-Urea Project	<b>Plant/Section :</b> Ash Pond and Water Recovery System	Reqn./P.O No.	

**DRIVER SPECIFICATIONS**

Driver :MOTOR (Note-1)

Type :ELECTRIC

Nos. Required :1W + 1S (Note-1)

Driving Fluid :NA

Steam Conditions :NA



PDIL NOIDA

PROJECT : Coal Gasification based Ammonia-Urea Project  
PLANT : Ash Pond and Water Recovery System

PC183-PNPR-DD-02 0

DOCUMENT NO. REV



CENTRIFUGAL PUMP SPECIFICATION SHEET

Sheet Page 5 of 10

JOB NO.-PC-183

ITEM: Recycle Water Pump

ITEM NO. P-102A/B

Project: Coal Gasification based Ammonia-Urea Project

Plant/Section : Ash Pond and Water Recovery System

Reqn./P.O No.

Applicable to: <input checked="" type="checkbox"/> Proposal <input type="checkbox"/> Purchase <input type="checkbox"/> As Built	No. Req. 2	Working/Stand by: 1 / 1 (Note-1)
Pump Type : <input checked="" type="checkbox"/> Hori <input type="checkbox"/> Vert.	Installation : <input type="checkbox"/> Indoor <input checked="" type="checkbox"/> Outdoor	Duty: <input checked="" type="checkbox"/> Cont <input type="checkbox"/> Intermittent
Driver: <input checked="" type="checkbox"/> Elect Motor <input type="checkbox"/> Steam Turbine/Hyd. Turbine	Driver Furnished by: <input type="checkbox"/> Purchaser <input checked="" type="checkbox"/> Pump Supplier	
Pump Supplier/ Manufacturer:	Model:	Sr. No:

OPERATING CONDITIONS EACH PUMP

Liquid Handled:	Recycle Water	CAPACITY	Rated	M <sup>3</sup> /hr	NPSH Reqd.	m
Pumping Temp:	Amb. °C		Nor.	230	M <sup>3</sup> /hr	Pump speed
Vapour Pr. at PT:	Kg/cm <sup>2</sup>	Suction Pressure	Min.	M <sup>3</sup> /hr	Efficiency	%
Spec Gr. at PT	1		Max.	Kg/cm <sup>2</sup> g	Rat. Power Consu.(Estimated)	Kw
Viscosity At PT.	0.612 Cp	Disch. Pr.	Min.	Flooded Kg/cm <sup>2</sup> g	Max Power Consu.	Kw
pH Value	7.0-8.5		Kg/cm <sup>2</sup> g	Driver Rating	Kw	
Corrosion Due to		Diff. Pr (Design).	3.0 (Note-6)	Kg/cm2	Driver Speed	RPM
Solids in suspen.		Diff. H at Rat. Cap.	30	M	Shut off Head	m
Max. Particle size		NPSH Available	7	M	Min. Cont .Flow	m

CONSTRUCTIONAL FEATURES

Self Priming		Max. Allow Casing Pr. Kg/cm <sup>2</sup> G	Jacketing For		
No. of Stages		Hydro Test Pr. Kg/cm <sup>2</sup> G	Cooling Water	Pr. Kg/cm <sup>2</sup>	
Impeller Type		Nozzle Suction Discharge	Available	Temp oC	
Imp. Dia Rated Max.		Size	Cooling Plan No.(API610)		
Casing Type		Rating	Cooling Water Req.	m <sup>3</sup> /hr	
Casing Split		Facing	Flushing Plan No.-		
Rot. Facing Coup. End cw/ccw		Position	Flushing Medium		
Casing Support		Shaft Seal	Temp	oC	
Casing Drain		Type :Size	Pressure	Kg/cm <sup>2</sup>	
Axial Thrust Balanced BY		No. of Packing Rings	Flow	m <sup>3</sup> /hr	
Running	Stuffing Box brush	Bearing	Drive End	Base Plate Type	
	Wearing Rings	No.		(common) Size	
Clearance	Guide Brush	Sleeve Brg. Size		Coupling	Manufacturer
	Balancing Disc/Drum	Lubricator			Type, Rating
For Vert. Subm. Pump Dim: See Sht.		Lubricant Spec.			Size, Spacer length

MATERIAL OF CONSTRUCTION

Casing	CS	Bearing Brush		Mech. Seal	Cover
Impeller	SS	Balan. Disc/Drum			Rot. Ring
Diffuser		Drip Tray			Sea Ring
Imp. Wearing Ring		Companion Flange			Spring/Bellow
Cas. Wearing Ring		Tie Rods			Gasket
Shaft	SS			Stuff. Box	Gland Seal
Shaft Sleeve					Seal Cage
Bearing House					Packing

TESTS & INSPECTION AS PER ES

WEIGHTS

DRGS. & DOCUMENTS AS PER ES--5101

Shop Test	Reqd. For	Witnessed for	Bare Pump	Kg	Out Line Drg. No.
Performance	Each/ One Pump	Each/ One Pump	Bare Plate	Kg	Sect. Drg. No.
Hydrostatic	Each/ One Pump	Each/ One Pump	Coupling/Gear Box	Kg	Seal Sect Drg. No.
NPSH	Each/ One Pump	Each/ One Pump	Driver	Kg	Auxi. Piping Drg. No.
Disassembly	Each/ One Pump	Each/ One Pump			Test Curve No.

ACCESSORIES REQD: Base Plate Anchor Bolts Coupling Coupling Guard

Companion Flang With Gasket Bolts & Nuts For Comp Flange ( ) Minimum Return Valve

REMARKS: 1. Y or Yes indicate applicable



**PROJECT :** Coal Gasification based Ammonia-Urea Project  
**PLANT :** Ash Pond and Water Recovery System

PC183-PNPR-DD-02	0
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**PDIL NOIDA**

**CENTRIFUGAL PUMP SPECIFICATION SHEET**

Sheet Page 6 of 10

**JOB NO.-PC-183**

**ITEM: Recycle Water Pump**

**ITEM NO. P-102A/B**



**Project:** Coal Gasification based Ammonia-Urea Project

**Plant/Section :** Ash Pond and Water Recovery System

Reqn./P.O No.

**NOTE:**

1. Driver motor to be designed for discharge valve full open condition.
2. Vendor to provide the suitable stainless steel strainer for pump suction.
3. Max. Shut off head shall not exceed 120% of the normal differential pressure.
4. NPSHr and Power calculation to be submitted by pump vendor.
5. All material of construction should be suitable for fluids at specified operating parameters.
6. Differential Pressure is at normal flow. Tank has to be emptied out maximum possible below the suction nozzle of pump. Vendor has to take care while designing the pump. Please refer drawing.
7. Drain and vent connection as applicable shall be with flanged valve connection, companion flanges, gaskets, fasteners.

 <b>PDIL NOIDA</b>	<b>PROJECT :</b> Coal Gasification based Ammonia-Urea Project <b>PLANT :</b> Ash Pond and Water Recovery System	<b>PC183-PNPR-DD-02</b>	<b>0</b>	
	<b>CENTRIFUGAL PUMP SPECIFICATION SHEET</b>	<b>DOCUMENT NO.</b>	<b>REV</b>	
<b>JOB NO.-PC-183</b>	<b>ITEM:</b> Recycle Water Pump	<b>Sheet</b>	<b>Page 7 of 10</b>	<b>ITEM NO. P-102A/B</b>
<b>Project:</b> Coal Gasification based Ammonia-Urea Project	<b>Plant/Section :</b> Ash Pond and Water Recovery System	<b>Reqn./P.O No.</b>		

### DRIVER SPECIFICATIONS

Driver :MOTOR (Note-1)  
 Type :ELECTRIC  
 Nos. Required :1W + 1S (Note-1)  
 Driving Fluid :NA  
 Steam Conditions :NA

**PROJECT :** Coal Gasification based Ammonia-Urea Project  
**PLANT :** Ash Pond and Water Recovery System

PC183-PNPR-DD-03

0

DOCUMENT NO.

REV



## CENTRIFUGAL PUMP SPECIFICATION SHEET

Sheet Page 8 of 10

JOB NO.-PC-183

ITEM: Sludge Pump (In-Tank)

ITEM NO. P-102A/B

Project: Coal Gasification based Ammonia-Urea Project

Plant/Section : Ash Pond and Water Recovery System

Reqn./P.O No.

Applicable to: <input checked="" type="checkbox"/> Proposal <input type="checkbox"/> Purchase <input type="checkbox"/> As Built	No. Req. 2	Working/Stand by: 1 / 1 (Note-1)
Pump Type : <input type="checkbox"/> Hori <input checked="" type="checkbox"/> Vert.	Installation : <input type="checkbox"/> Indoor <input checked="" type="checkbox"/> Outdoor	Duty: <input type="checkbox"/> Cont <input checked="" type="checkbox"/> Intermittent
Driver: <input checked="" type="checkbox"/> Elect Motor <input type="checkbox"/> Steam Turbine/Hyd. Turbine	Driver Furnished by: <input type="checkbox"/> Purchaser <input checked="" type="checkbox"/> Pump Supplier	
Pump Supplier/ Manufacturer:	Model:	Sr. No:

## OPERATING CONDITIONS EACH PUMP

Liquid Handled:	Sludge	CAPACITY	Rated	M <sup>3</sup> /hr	NPSH Reqd.	m
Pumping Temp:	Amb. °C		Nor.	25	M <sup>3</sup> /hr	Pump speed
Vapour Pr. at PT:	Kg/cm <sup>2</sup>	Suction Pressure	Min.	M <sup>3</sup> /hr	Efficiency	%
Spec Gr. at PT	1		Max.	Kg/cm <sup>2</sup> g	Rat. Power Consu. (Estimated)	Kw
Viscosity At PT.	Cp	Disch. Pr.	Min.	Flooded	Max Power Consu.	Kw
pH Value	7.0-8.5		Max.	Kg/cm <sup>2</sup> g	Driver Rating	Kw
Corrosion Due to		Diff. Pr (Design).	3.0	Kg/cm <sup>2</sup>	Driver Speed	RPM
Solids in suspen.		Diff. H at Rat. Cap.	30	M	Shut off Head	m
Max. Particle size		NPSH Available		M	Min. Cont .Flow	m

## CONSTRUCTIONAL FEATURES

Self Priming		Max. Allow Casing Pr. Kg/cm <sup>2</sup> G	Jacketing For	
No. of Stages		Hydro Test Pr. Kg/cm <sup>2</sup> G	Cooling Water	Pr. Kg/cm <sup>2</sup>
Impeller Type		Nozzle Suction Discharge	Available	Temp oC
Imp. Dia Rated Max.		Size	Cooling Plan No.(API610)	
Casing Type		Rating	Cooling Water Req.	m <sup>3</sup> /hr
Casing Split		Facing	Flushing Plan No.-	
Rot. Facing Coup. End cw/ccw		Position	Flushing Medium	
Casing Support		Shaft Seal	Temp	oC
Casing Drain		Type :Size	Pressure	Kg/cm <sup>2</sup>
Axial Thrust Balanced BY		No. of Packing Rings	Flow	m <sup>3</sup> /hr
Running	Stuffing Box brush	Bearing	Drive End	Base Plate Type
	Wearing Rings	No.		(common) Size
Clearance	Guide Brush	Sleeve Brg. Size		Coupling Manufacturer
	Balancing Disc/Drum	Lubricator		Type, Rating
For Vert. Subm. Pump Dim: See Sht.		Lubricant Spec.		Size, Spacer length

## MATERIAL OF CONSTRUCTION

Casing	CS	Bearing Brush		Mech. Seal	Cover
Impeller	SS	Balan. Disc/Drum			Rot. Ring
Diffuser		Drip Tray			Sea Ring
Imp. Wearing Ring		Companion Flange			Spring/Bellow
Cas. Wearing Ring		Tie Rods			Gasket
Shaft	SS			Stuff. Box	Gland Seal
Shaft Sleeve					Seal Cage
Bearing House					Packing

## TESTS &amp; INSPECTION AS PER ES

## WEIGHTS

## DRGS. &amp; DOCUMENTS AS PER ES-5101

Shop Test	Reqd. For	Witnessed for	Bare Pump	Kg	Out Line Drg. No.
Performance	Each/ One Pump	Each/ One Pump	Bare Plate	Kg	Sect. Drg. No.
Hydrostatic	Each/ One Pump	Each/ One Pump	Coupling/Gear Box	Kg	Seal Sect Drg. No.
NPSH	Each/ One Pump	Each/ One Pump	Driver	Kg	Auxi. Piping Drg. No.
Disassembly	Each/ One Pump	Each/ One Pump			Test Curve No.

ACCESSORIES REQD: Base Plate Anchor Bolts Coupling Coupling Guard

Companion Flang With Gasket Bolts &amp; Nuts For Comp Flange ( ) Minimum Return Valve

REMARKS: 1. Y or Yes indicate applicable



**PROJECT :** Coal Gasification based Ammonia-Urea Project

**PLANT :** Ash Pond and Water Recovery System

PC183-PNPR-DD-03

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**CENTRIFUGAL PUMP SPECIFICATION SHEET**

Sheet Page 9 of 10

**JOB NO.-PC-183**

**ITEM:** Sludge Pump (In-Tank)

**ITEM NO.** P-102A/B

**Project:** Coal Gasification based Ammonia-Urea Project

**Plant/Section :** Ash Pond and Water Recovery System

Reqn./P.O No.

**NOTE:**

1. Driver motor to be designed for discharge valve full open condition.
2. Max. Shut off head shall not exceed 120% of the normal differential pressure.
3. NPSHr and Power calculation to be submitted by pump vendor.
4. All material of construction should be suitable for fluids at specified operating parameters.
5. Differential Pressure is at normal flow. Tank has to be emptied out maximum possible below the suction nozzle of pump. Vendor has to take care while designing the pump. Please refer drawing.
6. Drain and vent connection as applicable shall be with flanged valve connection, companion flanges, gaskets, fasteners.

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**PROJECT :** Coal Gasification based Ammonia-Urea Project

PC183-PNPR-DD-03

0

**PLANT :** Ash Pond and Water Recovery System

DOCUMENT NO.

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**CENTRIFUGAL PUMP SPECIFICATION SHEET**

Sheet Page 10 of 10

**JOB NO.-PC-183****ITEM:** Sludge Pump (In-Tank)**ITEM NO.** P-102A/B**Project:** Coal Gasification based Ammonia-Urea Project**Plant/Section :** Ash Pond and Water Recovery System

Reqn./P.O No.

**DRIVER SPECIFICATIONS**

Driver :MOTOR (Note-1)

Type :ELECTRIC

Nos. Required :1W + 1S (Note-1)

Driving Fluid :NA

Steam Conditions :NA



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SHEET 1 of 4



**SPECIFICATION SHEET  
FOR  
POLYELECTROLYTE PUMP/ ALUM PUMP/ LIME PUMP  
  
SUPPLY AND CONSTRUCTION  
OF  
ASH POND AND ALLIED SERVICES  
FOR  
INTEGRATED COAL BASED FERTILIZER COMPLEX  
AT  
TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

0	13.06.2022	13.06.2022	First Issue	SKK	SKK	AKS
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



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		DOCUMENT NO	REV.	
		SHEET 2 of 4		

JOB NO. PC- 183	ITEM: DOSING PUMP	ITEM NO. P-104A/B, P-105A/B & P-106A/B		
Project: Coal Gasification based Ammonia-Urea Project		Plant/Section : Ash Pond and Water Recovery System		Nos. Reqd. :2 (1W+1S) For Each Tag
<b>OPERATING CONDITION</b>		<b>PERFORMANCE</b>		
Service: POLYELECTROLYTE/ ALUM/ LIME DOSING		NPSH Required		
		No of Stages		
Duty: Continuous Yes (X) No ( )		RPM		
Liquid Handled : Poly-Electrolyte Solution/ Alum Solution/ Lime Solution		Efficiency		
Location : Outdoor (X) Indoor ( )		Max. Power Absorbed on the shaft of @ <b>Set Pr.</b>		
Capacity, Minimum / Normal / Liters /hr		: Pump		
Capacity, Maximum 500 Liters /hr		: Reducer		
Suction Pressure Atmospheric				
Discharge Pressure 15 MLC				
Fluid Temperature: Nor. / Max. Ambient				
Vapor Pressure At P T. Kg/cm <sup>2</sup> a		Tests Required :		
Viscosity At P.T. Cst				
Sp. Gravity At P.T.				
Crystallization Point N/A °C				
NPSH. Available *				
Corrosion due to		<b>DRIVER : STEAM TURBINE ( ) MOTOR (X)</b>		
Solid in Suspension		Driver to be supplied by Purchaser ( ) Pump Supplier (X)		
Max. Acceptable NPSHR		Recommended HP		
Diff. Press 1.5 Kg/cm <sup>2</sup>		Recommended RPM		
Flow Control 0-100 % Manually				
<b>CONSTRUCTION**</b>				
Type:		Lubrication System		
Cylinder : Hori ( ) Vert.( ) Angle ( )		Lubricating Pump		
No.	mm	Stoke	mm	Cooling Heating System
Pluger/ Piston Dia.		mm		
Average Piston Speed		m/s		
Piton Guides: No.		Distance mm		
Connecting Rod : Center to Centre		mm		
Small end Bearing		mm		
Big end Bearing		mm		
Main bearing		mm		
No.	Center to Center		mm	Capacity of Injection Fluid m3/hr
Cross head Sliding Block : Surface		mm <sup>2</sup>		
Valve		Valve Seats		
Valve Spring		NOZZLE	SIZE	RATING
Seal Gasket		FACING	POSITION	
Piston Seal System		Suction		
		Discharge		

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JOB NO. PC- 183	ITEM: DOSING PUMP	ITEM NO. P-104A/B, P-105A/B & P-106A/B
Project: Coal Gasification based Ammonia-Urea Project	Plant/Section : Ash Pond and Water Recovery System	Nos. Reqd. :2 (1W+1S) For Each Tag
<b>MATERIAL OF CONSTRUCTION**</b>		
Cylinder		Connecting Rod
Cylinder Liner		Small end Bearing
Plunger/Piston	Surface Treat :	Big end Bearing
Power Frame		Main Bearing
Packing		Cross head Sliding Block
Packing Gland		Piston Guides
Valve		Seal Gaskets
Valve Seats	Valve Spring	Other Parts in contacted with Fluid
<b>COUPLING BETWEEN DRIVER &amp; PUMP**</b>		<b>MFR. FINAL DATA**</b>
Type:		Manufacturer :
		Pump Serial No. :
Reducer: Type		Test Curve No. :
Ratio: ; Axes:		Outline Dwg. No. :
Speed Variator:		Pump Sheet Drg. No. :
Belts Or Chain Tracks:		Seal Diam. Dwg. No. :
Coupling Between : Variator & Driver		Wr. Clearance Diam. :
:Reducer & Variator/ Driver		Mech Seal/Packing :
:Pump & Reducer		
Cooling Water:		
Inlet Temp. °C Capacity: m3/hr		
<b>ACCESSORIES TO BE SUPPLIED**</b>		
Pressure Indicator : Discharge Side		
:		
:		
:		
Temp Indicator For Bearing Metal:		
Low Pressure Oil Pump :		
Motor :		
High Pressure Oil Pump:		
Motor:		
V-Belt:		
Pulley:		
Oil Cooler:		
Motor Bed:		
Safety Valve On Discharge Side:		
Companion Flange For Suction Side & Discharge		
Low Oil Pressure Safety Alarm Switch Or Device		



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PC183-PNPR-DD-04

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JOB NO. <b>PC- 183</b>	ITEM: <b>DOSING PUMP</b>	ITEM NO. <b>P-104A/B, P-105A/B &amp; P-106A/B</b>
Project: <b>Coal Gasification based Ammonia-Urea Project</b>	Plant/Section : <b>Ash Pond and Water Recovery System</b>	Nos. Reqd. : <b>2 (1W+1S) For Each Tag</b>

**DRIVER SPECIFICATION**

<b>Driver</b>	: <b>P-104A/B, P-105A/B &amp; P-106A/B</b>
<b>Type</b>	: <b>Electric Motor</b>
<b>Nos. Required</b>	: <b>2( 1W+1S)</b>
<b>Driving Fluid</b>	: <b>Not Applicable</b>
<b>Steam Condition</b>	: <b>Not Applicable</b>
<b>Hazardous Area Classification</b>	: <b>Non Hazardous</b>

**NOTES:**

- 1)
- 2) ***Pulsation dampener is to be provided at Suction & discharge side.***
- 3) ***Pump to be hermitically sealed glandless type.***
- 4) ***Connection details: Inlet / Outlet piping 1 1/2" 150 # / 1 1/2" 150 #.***
- 5) ***\*NPSH available should be confirmed if any.***
- 6) ***\*\* Vendor to fill the necessary data.***
- 7) ***Strainer shall be provided for each pump and same is in pump vendor's scope***

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## SECTION VI- 4.0

### TECHNICAL SPECIFICATION- ELECTRICAL

**PLANT : ASH POND AND ALLIED SERVICES**

**PROJECT : INTEGRATED COAL BASED FERTILISER  
COMPLEX, AT TALCHER, ANGUL DISTRICT,  
ODISHA (INDIA)**

0	06.06.2022	06.06.2022	Issued for Tender	RK	SKB	SKB
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

	<b>ASH POND AND ALLIED SERVICES</b> <b>TECHNICAL SPECIFICATION – ELECTRICAL</b>	PC183/E/206/S-VI/4.0	0	
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### CONTENTS

SECTION NUMBER	DESCRIPTION
1.0	Scope
2.0	Basis of Design
3.0	Area Classification
4.0	System Details and Utilization Voltages
5.0	Power Supply and Distribution
6.0	Sub Station
7.0	Protection & Metering
8.0	Control and Monitoring
9.0	Equipment Specification
10.0	Cabling
11.0	Illumination System
12.0	Earthing and Lightning Protection
13.0	Cable Tray
14.0	Capacitor Banks
15.0	Structure
16.0	Spares
17.0	Vendor's Services
18.0	Testing & Inspection
19.0	Documentation
20.0	Tools & Tackles
21.0	Review of Drawings & Documents by Owner/ Consultant
22.0	Vendor List
23.0	Quality Assurance
24.0	Coordination with Other Contractors

### LIST OF ATTACHMENTS

	<b>ASH POND AND ALLIED SERVICES</b> <b>TECHNICAL SPECIFICATION – ELECTRICAL</b>	PC183/E/206/S-VI/4.0	0	
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Technical Specification No.	Description
PC183-TS-0803	Power Transformers
PC183-TS-0805	Medium Voltage Switch Boards
PC183-TS-0806	High Voltage Switch Boards
PC183-TS-0808	Sheet Steel Distribution Boards
PC183-TS-0809	Lighting Sub Distribution Boards
PC183-TS-0810	Induction Motors
PC183-TS-0811	Interlocking Sw. Socket and Plug
PC183-TS-0813	Battery Charger
PC183-TS-0814	Battery
PC183-TS-0815	Cables
PC183-TS-0816	Prefabricated Ladder Type Cable Racks
PC183-TS-0817	Local Control Stations
PC183-TS-0818	Junction Box
PC183-TS-0819	Electricals for Over Head Cranes and Hoists
PC183-TS-0822	Capacitor Bank & Associated Equipment
PC183-TS-0829	Auxiliary Service Transformer
PC183-TS-0839	Air Pressurisation System
ES:8028	Electrical erection, testing & commissioning

Drg. No	
PC183-1230	Overall Single Line Diagram (Key SLD)
PC183-1231	Single Line Diagram with Feeder Details - 11kV Switchboard
PC183-1232	Single Line Diagram with Feeder Details - 415V Switchboard
PC183-1233	Typical Single Line Diagram for MLDB
PC183-1234	Single Line Diagram with Feeder Details - DCDB
PC183-1235	Typical Single Line Diagram for PDB
PC183-1236A	Typical Single Line Diagram for LSDB (9 Way)
PC183-1236B	Typical Single Line Diagram for LSDB (12 Way)
PC183-1236C	Typical Single Line Diagram for LSDB (18Way)

	<b>ASH POND AND ALLIED SERVICES</b> <b>TECHNICAL SPECIFICATION – ELECTRICAL</b>	PC183/E/206/S-VI/4.0	0	
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Electrical Sketches	Description
PC183-PDS:E 113	Foundation Details of 11/0.433kV Transformers
PC183-PDS:E 115	Typical Details of Transformer Room Door
PC183-PDS:E 116	Sump Pit for Transformer Oil
PC183-PDS:E 119	Typical Foundation Arrangement for Panels in Sub-Station
PC183-PDS:E 120	Typical Foundation Details for HT/LT Circuit Breaker Panels
PC183-PDS:E 207	Details of Bracket Arm for Street Lighting Pole
PC183-PDS:E 208	Installation Arrangement Area Lighting Fixtures
PC183-PDS:E 210	Junction Box for Street Lighting Pole
PC183-PDS:E 213	Typical Street Lighting Pole
PC183-PDS:E 510	Details of Concrete Cable Trench
PC183-PDS:E 511	Cable Rack Arrangement in Trenches
PC183-PDS:E 516	Typical Arrangement of Cables buried in slit
PC183-PDS:E 530	Pre-Fabricated Cable Tray Straight Run
PC183-PDS:E 531	Pre-Fabricated Cable Tray Horizontal Tee
PC183-PDS:E 532	Pre-Fabricated Cable Tray Horizontal Cross
PC183-PDS:E 533	Pre-Fabricated Cable Tray 900 Horizontal Bends
PC183-PDS:E 534	Pre-Fabricated Cable Tray 900 Vertical Bend Bending Rad. 1000 mm
PC183-PDS:E 535	Pre-Fabricated Cable Tray 900 Vertical Bend Bending Radius 600 mm
PC183-PDS:E 536	Pre-Fabricated Cable Tray Coupling Arrangement
PC183-PDS:E 537	Pre-Fabricated Cable Tray Fixing Arrangement
PC183-PDS:E 538	Pre-Fabricated Cable Tray Reducing Coupler Plate
PC183-PDS:E 601	General Notes on Earthing and Lightning Protection
PC183-PDS:E 602	Earthing Conductor Details
PC183-PDS:E 603	Arrangement of Connections of Earth Conductors
PC183-PDS:E 604	Typical Details of Connection in Earth Pit
PC183-PDS:E 605	Earth Pit Details
PC183-PDS:E 606	Typical Arrangement of Earthing for Motor and Start Stop Push Button
PC183-PDS:E 611	GI/AI Accessories for Earth Electrode
PC183-PDS:E 613	Earthing of storage tank & vessel
PC183-PDS:E 615	GI Earth Bus
PC183-PDS:E 617	Typical Arrangement for Neutral and Equipment Earthing

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## 1.0 SCOPE

- 1.1 The scope includes work/service for engineering, manufacture, testing at works, Third Party Inspection, supply of all electrical equipment, dispatch, storage, handling, erection, testing at site and commissioning of complete electrical system required for 'Ash Pond and Allied Services.
- 1.2 This specification shall be read in conjunction with all drawing and documents attached and other relevant reference as specified therein.
- 1.3 The scope of work/ services of Contractor shall comprise complete electrics of the Ash Pond and Allied Services. The scope of work/ services shall broadly comprise but not limited to the following:
- 1.3.1 Detailed engineering, Coordination, General Services etc
- a. Detailed engineering.
  - b. Preparation of drawings/ document/ to suit Project implementation schedule. Preparation of drawings/ documents/ calculations/ formats/ test reports/ test certificates; Erection, Testing & Commission Manuals/ Operations & maintenance Manuals/ Reports/ QAP etc for approval/ Review/ reference/ record and/ or for any other requirement; submission to Owner/ Consultant in requisite sets, getting approval from Owner/ Consultant, making approved copies available to manufacturers, inspectors, erection & commissioning engineers, supervisors, owner/ Consultant etc as required in requisite sets well before those are actually required by them to fulfil their obligations.
  - c. Design, manufacture, testing of equipment/ cables/ cable trays/ earthing and other erection materials etc at manufacturer's works, submission of documents with manufacturer's test reports/ type test reports to Owner/ Consultant prior to inspection call.
  - d. Quality Assurance at each stage of manufacture including procurement of raw materials/ bought out items and arranging inspections by Owner/ Consultant/ Third Party.
  - e. Obtaining dispatch clearance from Owner in writing.
  - f. Packing, loading, forwarding, delivery at site/ store, loading/ unloading, storage as per manufacturer's recommendation; shifting from stores and handling in store as well as at site for erection.
  - g. Arrangement of testing/ checking instruments/ kits/ sets/ apparatus with valid calibration certificates issued by duly accredited laboratories/ institutions, to carry out tests stipulated in specification and documents referred therein/ other applicable standards.
  - h. Deputing electrical contractors, supervisors electricians, cable jointers etc. on full time basis. for carrying out electrical work.
  - i. Installations of equipment/ cables/ materials.
  - j. Conducting pre-energisation tests to ensure that installation is fit to be energized.
  - k. Erection shall not be considered complete unless pre-energisation tests are carried out, results are tabulated & submitted to owner/ consultant and results are found satisfactory.
  - l. Conducting functional/ pre-commissioning checks/ Cold trial runs; no-load & load tests,
  - m. Commissioning the installation.



	<b>ASH POND AND ALLIED SERVICES TECHNICAL SPECIFICATION – ELECTRICAL</b>	PC183/E/206/S-VI/4.0	0	
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- n. Conducting Performance Guarantee tests and taking corrective steps (inclusive of replacement of equipment/ materials if required) till results are satisfactory/ acceptable.
- o. Conducting Pre-Acceptance Tests/ checks and tabulating the results/ observations
- p. Liquidations of defects/ discrepancies/ observations noted during erection, pre-energisation tests, commissioning, trial runs, performance guarantee tests, Pre-acceptance tests/ checks etc.
- q. Submissions of all final/ 'As built' drawings/ documents after incorporation of changes made in soft as well as hard copies, duly certified by Contractor to the effect that those are 'Final' and/ or 'As built'
- r. Conducting Final Acceptance Tests/ Checks
- s. Co-ordinate with the Owner/ Consultant, other contractors/ agencies working at site as required for proper, smooth and timely execution of work/ implementation of the project
- t. Preparation of drawings/ documents, applications for getting the installation inspected and approved by Electrical Inspectorate of state and/ or Central Electricity Authority and all coordination for getting the installation approved for energisation & use. Carrying out all modifications/ alterations required by statutory authorities. All expenses on these activities shall be carried out and borne by Contractor . The obligation of owner shall be limited to
  - Signing of application as Owner of installation and
  - Payment of fee for inspection of installation.

Approved drawings and certificates shall be submitted to the Owner/Consultants well ahead of schedule so that the actual commissioning of equipment does not get delayed for want of inspection and approval by the Electrical Inspectorate and other statutory bodies. The actual inspection work by the Electrical Inspector shall be arranged by the Contractor and necessary coordination and liaison work in this regard shall be the responsibility of the Contractor .

1.3.2 Manufacture, testing at works, getting inspected by owner and/ or their consultant/ third party, packing, transportation and delivery to site in well packed condition, insurance during transit and till commissioning & handing over, storing at site as per recommendation of manufacturer/ supplier/ direction of supervising engineer of Owner/ Consultant until required for erection, transportation to work place. Erection, testing & commissioning, handing over of complete electrical system of 'Dyke & Associated Facility' , but not limited to :

- a. Transformers viz.
  - 11/0.433 kV Transformers
  - Lighting Transformers
- b. Switchgears:
  - 11 kV Switchgear
  - 415 Volt Switchgears/ switchboards including PMCCs, MCCs, EPMCCs MLDBs, ASPBs (welding receptacle & other non-plant / non-critical loads are generally feed through ASPBs), LSDB, PDB, Junction boxes etc as required.
  - Capacitor Bank with APFC
  - Local control Panels, Local Control stations, Switch Sockets.
- c. 415V Motors and other special application/ voltage motors as required.
- d. All Cables viz

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- Power Cables
  - Control Cables
  - Earthing Cable
  - Signal cables,
  - Optical fibre cables
- e. Erection/ installation & all sundry materials for installation, testing & commissioning of equipment/ panels/ fittings/ cables (including jointing & termination of cables) comprising (but not limited to) the following:
- Foundations,
  - Chequered Plates
  - Brackets, support structures, erection materials & accessories, as required
  - Cable trays, racks, pipes, ducts, cable channels etc as required.
  - Testing checking kits/ instruments
- f. Complete Illumination system - Normal, Emergency and Evacuation Lighting including Substation, Ash Pond and Allied Services etc.
- g. Associated outdoor area lighting & street lighting etc.
- h. Complete Earthing & lightning protection of Ash Pond and Allied Services including Substation etc. .
- i. 110V DC Batteries, Battery Charger and DC Distribution Boards.
- j. Complete Electrics for Ventilation systems of Substation etc.
- k. Complete Electrics for EOT Crane, Hoists
- l. Cable trench/Cable tray with supporting structure alongwith anchor fasteners required for fixing of structures / supports, for complete Dyke & Associated Facility.
- m. Cable rack with all supporting structure for cable tray.
- n. Conveyor system with conveyor control panel etc
- o. Klaxons/ Hooters, Beacon
- p. Steel wire ropes and U clamps
- q. Motorised Flappers
- r. Brakes.
- s. Roller operated limit switch for flow diversion.
- t. Safety tripping devices such as stop push buttons, belt sway switches, zero speed limit switches, pull cord switches, gravity take up, chute choking devices, Bunker level indicator etc
- u. The scope shall also include the erection, testing, commissioning of above equipments.
- The contractor shall clear the site after commissioning of the equipments / system and obtain the Site Clearance Certificate from owner's Engineer-in-charge
- v. Any and all other Materials, Equipment and Services so as to make a totally integrated and functional system together with all accessories and associated equipment, ensuring safety, maintainability and reliability in compliance with all applicable codes, standards, guidelines, statutory regulations and safety requirements in force.

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- w. Any other equipment, not specified, but required for safe, proper, trouble free and efficient operation of the system
- x. Contractor shall consider any other requirement which is not covered in this NIT, but required for successful operation of the plant.
- y. Spares & consumables for complete electrics as follows:
- Commissioning Spares (as per Clause No. 16.0 of Technical Specification-Electrical) and Spares for 2 Years operation (Mandatory) for all equipments (as per SOR) shall be supplied by the Contractor as part of contract.
  - Contractor shall provide recommended spares (other than mandatory spare) for all the equipment (item-wise) with recommended quantity.
  - Spares and consumables required and first oil fills including short fall during erection, testing, cold trials, commissioning, performance evaluation tests, guarantee tests etc and till handing over of installation shall be supplied by the Contractor as part of contract.
- z. Tools & Tackles.
- aa. Testing Equipments/ instruments
- bb. Arranging services of major equipment suppliers during installation and commissioning.
- cc. Training of Owner’s Personnel for Operation & Maintenance of the Plant.
- dd. Any and all other items/ facilities/ services not specifically mentioned but essential/ required for completeness of the systems/ equipments/ facilities.
- 1.3.3 The scope of work shall also include digging of earth and refilling for directly buried cables, earth strips, cable protection pipes, earth pits, ground mounted lighting pole foundations; civil works such as making earth pit inspection chambers with covers, grouting of equipment base plate, channels, supports and foundation bolts, chipping of concrete or in brick work for earth strips, pipes or other minor chipping for foundation preparation, if required, cutting holes in walls for racks, risers, light fitting brackets, sealing of cable entries and making good the same after installation of the equipment and levelling, and other minor similar jobs as per directions of Owner / Engineer-in-Charge.
- 1.3.4 All major Civil work (like making all foundations and cable trenches etc) and minor civil work (like cutting, chipping, grouting, making opening in floor / wall etc. for equipment foundation and cabling work) pertaining to electrical equipment are in the scope of work of the contractor and shall be done as per technical specification of civil enclosed elsewhere in the NIT.
- 1.4 This Technical Specification contains specifications of the major equipments to indicate the basic requirement and serve as a guideline. However, it shall be the responsibility of the contractor to offer a complete quality electrical system of superior quality, even if the specifications of certain items are not given.. The items for which technical specifications are not indicated herein shall be of IS/IEC standard and specifications of these shall be subject to owner’s approval in case of order.
- 1.5 The bidder shall offer the best and proven most suitable type of energy efficient equipments manufactured by well known reputed manufacturers having proven performance track record of minimum 2 years , as per vendor list appended in this bid package.
- 1.6 1 No. 415 V Feeder (63 A) at Existing Substation near 132 KV Switchyard shall be made available by Owner for Construction Power. Tapping of Construction Power (on chargeable basis) from this feeder (including supply & erection of all required materials like structural supports for cable tray, cable trays, power cables, control cables, protection & metering, cable termination etc. as well as underground cabling work) and further distribution shall be in Contractor’s scope.

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In construction Power, Contractor shall ensure that the minimum power factor of 0.9 shall be maintained at their end by providing suitable power factor improvement devices.

Contractor shall have to distribute construction power with adequately rated distribution and sub distribution boards/feeder pillars, power supply cables and other associated materials for feeding loads to carry out construction and fabrication activities at his own cost.

However during non availability of construction power, Contractor shall have to arrange emergency power, if required, through DG set at their own cost.

- 1.7 Contractor shall provide adequate area lighting at site of construction, fabrication yards, storage yard and office etc. by means of suitable lighting fixture, lighting masts, flood lighting poles etc. which are to be supplied and maintained by the contractor as per safety aspect.
- 1.8 Relay Co-ordination & Relay Settings etc. of the entire electrical installation of 'Dyke & Associated facility' shall be conducted by the Contractor using latest software preferably ETAP at appropriate stage of engineering.
- 1.9 For control, monitoring, load management, data logging and printing of status of all important electrical equipment and feeders, a Programmable Logic Controller (PLC)/RTU based Electrical Control and Monitoring System (ECMS) shall be provided by Electrical Distribution System (EDS) LSTK Contractor. However, Contractor has to provide the required multifunctional dual channel transducers (Only where Current Data is critical and used in process control), Digital Multi-function Meters, latest version numerical/Communicable type protective relays with non-volatile memory, comprehensive unit providing protection, metering, control & communication with communication port & interlinked with Online Energy/Load Management System and required microprocessor based devices if any in panels, communicable door mounted Motor Protection Relays in all motor feeders of PMCC & MCC, proper communication facility in supplied UPS, Battery Chargers, VFD, Soft starter, MOV and other critical equipment for proper communication with ECMS / DCS system. The interface of electrical equipments with ECMS / DCS shall be through IEC 61850 communication protocol for Numerical relays and IEC 61850/Modbus for Multifunction Digital Meters, Motor Protection Relay (MPR) and other equipment, Ethernet communication module shall also be used. 100% redundancy shall be provided for communication i.e. the relay should have minimum 2 Nos. IEC-61850 communication port in addition to Front Port.  
  
All connection of numerical relays to Ethernet / Network Switch and looping of MFMs inside the switchboards and Network / Ethernet Switches, as required, for interfacing i.e. all connection / wiring from individual switchboards up to the respective Substation ECMS cabinets and Ethernet / FO cables between the switchboards shall be in Contractor's scope. However, wiring / connection of Ethernet / FO Cables in I/O Racks shall be in EDS Contractor's scope.
- 1.10 The scope shall also include obtaining all required statutory approvals from all statutory bodies. Contractor shall carry out all modifications/alterations required by statutory bodies.  
  
All approvals for permanent installations shall be obtained in the name of Owner. Approval for equipment & installation for Construction Power shall be in Contractor's name.
- 1.11 Quantities indicated in the Schedule of Rates (SOR) are approximate and these may increase or decrease or some items may even be deleted at the time of actual execution.
- 1.12 In case of any discrepancies between Technical Specification – Electrical and Technical Specification of equipment/item/work in respect of description of equipment/ item/work, the details indicated in the Technical Specification – Electrical shall prevail.
- 1.13 Final location of equipments as well as route of cable trays shall be finalised during detailed engineering.

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## 2.0 BASIS OF DESIGN

### 2.1 General

2.1.1 Contractor while performing design and engineering activities shall adhere to following guidelines.

- a) If any equipment is not covered in this design philosophy but required for successful operation of the project, Contractor shall prepare additional specifications for equipment or bulk material taking reference of Indian/International Codes and good engineering practices prevalent in fertilizer industry and obtain owner's approval for the same.
- b) The standard drawings attached with this package define the basic system design and distribution philosophy for the package. This is for guidance purpose only. Contractor shall develop detailed drawings and submit for owner's approval.
- c) Contractor shall be responsible to verify the rating and consider providing equipment with adequate rating but not less than the specified rating. Compliance should be without any extra cost and time implications.
- d) Contractor shall obtain approval from all statutory authorities such as Central Electricity Authority (CEA)/Electrical Inspectorate–CPCB etc. for all electrical facilities including electrical switchboards & panels supplied and installed by contractor.
- e) Contractor shall Liaison and in all interface coordination with contractors of other units of project at construction, erection, testing & commissioning phase for any common facility and for smooth execution.
- f) Equipment specification sheet/data sheets for all equipment shall be prepared by the contractor based on relevant codes and Technical specifications/ Data sheets attached as reference. Data sheet shall contain all technical data and information which are essential for review and technical acceptability, detailed engineering, installation, testing, repair and maintenance, replacement etc.
- g) Contractor shall clearly specify in their purchase specifications the requirement of conducting special tests/type tests, which are envisaged for various electrical equipment which shall have no impact on cost and time.
- h) Bidder shall must visit the site and collect all relevant information required for designing of complete system before quoting. Bidder shall make themselves familiar with the work actually involved and actual site conditions. Failure to do so shall not absolve the Bidder of their responsibilities based on adverse site conditions.
- i) All the electrical equipments shall be of proven design and technology.
- j) Normal & Emergency Load details (rating of all motor, Lighting, Switch socket etc.) load shall be submitted.
- k) Sizing calculations for all the electrical equipments shall be submitted for review/approval, in case of award of order. Owner/Consultant's Comments, if any on the same shall also be considered and modification in any equipment shall be done accordingly, without any time and price implication.
- l) Seismic zone as applicable shall be considered for design of all electrical equipment.

### 2.2 Statutory requirement Codes and Standards

2.3.1 The design, installation, testing & commissioning shall conform to compliance of following statutory requirements :

- Indian Electricity Act
- Indian Electricity Rules
- The Indian Factories Act
- The Indian Explosives Act.
- Statutory requirement of Govt of Odisha and Govt. of India.
- Guidelines, instructions, directions issued by Pollution control Boards of state as well as central government. Guidelines, instructions, directions issued by Chief Controller of Explosives (CCoE), CPCB, CMRI, DGMS, CEA etc.
- Guidelines of Tariff Advisory Committee

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- Guidelines of Insurance Companies Association.
- Any other applicable Rules/Acts/Regulations.

The design, installation, testing & commissioning shall be in accordance with established codes, good engineering practices and latest versions of following documents valid/ applicable on the date of acceptance of bid. The stipulations in these documents shall be considered as minimum requirements:

- Indian Standard Specification or equivalent IEC Standards
- Publications of IEEE
- API Standards
- National Electrical safety Code(NESC)
- Standards of Underwrites laboratory(UL)
- American Society for Testing Material (ASTM)
- American National Standards Institute (ANSI)
- Other International Standards

Contractor shall be responsible for obtaining necessary statutory approvals from all the statutory bodies/authorities e.g. Electrical Inspectorate, PESO (earlier CCoE) as applicable before commissioning of electrical facilities. The CEA clearance for electrical equipment and components thereof shall be obtained by the contractor.

Contractor shall carry out all modifications / alterations required by all statutory bodies. However, necessary statutory fee shall be deposited by the Owner.

### 2.3

Some of the bare minimum relevant Indian Standards are as listed below. However, system/equipment design shall be in line with latest edition of all applicable standards.

IS: 325, IEC:60034	Three phase induction motors
IS: 335	New insulating oil for transformers and switchgears
IS: 722	AC electricity meters
IS: 732	Code of practice for electrical wiring installations system voltages not exceeding 650V
IS: 737	Specification for wrought aluminum and aluminum alloys, sheet and strip (for engineering purpose)
IS: 996, IEC:60034	Single phase AC motors
IS:1248	Direct acting analogue electrical measuring instruments and their accessories:
IS: 1367 Part-13	Hot dip galvanised coatings on threaded fasteners.
IS: 1646	Code of practice for fire safety of buildings and electrical installations
IS: 1913	General and safety requirements for Luminaries (Tubular fluorescent Lamp)
IS: 2071	Method of high voltage testing
IS: 2099	High voltage porcelain bushings
IEC:62305	Code of practice for the protection of buildings and allied structures against lightning
IS/IEC60079	Electrical apparatus for Explosive gas atmosphere
IS: 2544	Porcelain post Insulators for system with normal voltage greater than

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	1000 volts
IS: 2633	Methods of testing uniformity of coating on zinc coated articles
IS: 2705	Current Transformers
IS: 3034	Code of practice for fire safety of industrial buildings, electrical generating distributing stations.
IS: 3043	Code of practice for earthing
IEC 61869-1	Instrument transformers — General requirements
IS: 11171	Specification for dry type transformers.
IEC 61869-2	Additional requirements for current transformers
IEC 61869-3	Additional requirements for inductive voltage transformers
IS: 3177 IEC60034	Crane duty motors
IS: 3347	Dimensions for porcelain transformer bushings
IS: 3637	Gas operated relays
IS: 3639	Fittings and accessories for power transformers
IS: 3646	Interior illumination: Part I & Part II
IS: 3716	Application guide for insulation co-ordination
IS/IEC:60529	Degree of protection provided by enclosure for rotating electrical machinery
IS: 4722	DC motors
IS: 4759	Hot dip zinc coating on structural steel and allied products
IS: 5082	Specification for wrought Aluminum alloys bars, rods, tubes and sections for electrical purposes
IS: 5561	Electric power connectors
IS: 5571	Guide for selection of electrical equipment for hazardous areas
IS: 5572	Hazardous areas other than mines for electrical insulations area having flammable gases and vapours
IS: 5578	Guide for marking of insulated conductors (1st rev)
IS: 6362	Designation of methods of cooling of rotating electrical machines
IS: 6600	Guide for loading of oil immersed transformers
IS: 6665	Code of practice for Industrial lighting
IS: 7689	Guide for control of undesirable static electricity
IS: 8084	Interconnecting Bus bars for AC voltage above 1 KV upto and including 36 KV
IS: 9676	Reference ambient temperature for electrical equipment
IS: 10028	Code of practice for selection, installation and maintenance of transformers
IS: 10322-1	Specification for Luminaries,Part-1,General requirements

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IS: 11353	Guide for uniform system of marking & identification of conductor & apparatus terminals
IS: 11448	Application Guide for AC electricity meters
IS: 12360	Voltage bands for electrical installations including preferred voltage and Frequency
IS: 12459	Code of practice for fire protection of cable runs
IS: 12615	Energy efficient motors
IS: 13234	Guide for short circuit calculations
IS: 13346	General requirements for electrical apparatus for explosive gas atmosphere.
IS: 13408	Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres
IEC: 60255	Electrical Relays
IS/IEC: 60947	Low voltage switchgear and control gear
IS: 60034-5	Degree of protection provided by Integral design of rotating electrical machines
IS: 60079-0	Explosive atmospheres, Equipment General Requirements
IS: 60079-1	Explosive gas atmospheres – Part-1 Equipment protection by Flame proof enclosures “d”.
IS: 60079-7	Equipment protection by increased safety “e”
SP: 30	National Electrical Codes (NEC) - BIS Publication
IS/IEC 62271	HV Switchboard.
IEC 61439-1/2	LV switchboard (PCC/PMCC/MCC) for TOTAL TYPE TESTED (TTA). Type Test Certificates for short circuit withstand of 50kA for 1 sec. along with ACB mounted in the Switchboards shall apply.
IEC 61641	Switch Board with INTERNAL ARC CONTAINMENT test.
ANSI C-37:23	Metal enclosed bus
ANSI C-37:24	Effect of Solar radiation on metal enclosed bus.
IEC 60034	Rotating Electrical Machinery
IEC 61131	Programmable controllers
IEC 60871-1 /IS 13925	Shunt Capacitors for AC power Systems Specifications

Any other standard may be followed provided it is equivalent or more stringent than the standards specified above.

2.4 In case of any conflict/deviation amongst various documents the order of precedence shall be as follows:

- Statutory rules/regulation
- Technical Specification – Electrical
- Data sheets



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- Technical specification – Equipment /Installation Standards, etc.
- Applicable IS/IES standards

In case of contradiction / conflict among documents and statutory requirement, Contractor shall refer to Owner for clarification. However, most stringent specification shall be followed with Owner's approval. Owner decision shall be considered as final.

## 2.5 Site Conditions

The equipment shall be designed for the following site conditions:-

- Minimum ambient Temperature 1 deg.C
- Maximum ambient Temperature 46 deg.C
- Design Reference Temperature 50 deg.C
- Relative Humidity 100%
- Altitude above mean sea level Lower than 1000 Mtrs.
- Atmospheric pollution Dusty due to presence of Coal Dust & Urea Dust and corrosive due to presence vapours of Ammonia.

Equipment/ cables selected shall be derated for (a) higher ambient temperature, (b) restriction in temperature rise (c) variation in voltage, (d) variation in frequency (e) installation conditions viz. proximity to heat sources, bunching, layering, separation from others/ laying in conduits etc. with respect to the conditions for which it was designed & manufactured. Various de-rating factors considered shall be informed with supporting documents.

Equipment to be installed in MCC rooms/ Electrical Rooms/ Control rooms shall be designed for + 50° C so that in case of failure of Ventilation facilities, the operation/ functioning of equipment is not be affected.

## 3.0 SYSTEM DETAILS AND UTILIZATION VOLTAGES

3.1 The various voltage levels for in plant power distribution shall be as follows:

A. Normal Power	11KV ± 10%, 50Hz ± 5%, 3Ph, 3 W
B. Emergency Power	Voltage Variation ± 5%, 50Hz ± 3%, 3Ph, 3 W Contractor shall indicate Emergency Power required at OUSS.
C. Distribution Equipment	a) 415V±10%, 3 Ph, 4 W/240V ± 10%, 1 Ph, 2W, 50 Hz ± 5% solidly grounded neutral.
Combined variation in voltage & frequency	± 10%
Control Supply for: - 415V motors  - Switch Gear Breaker controlled feeders:	AC 240V ± 10%, 50 Hz ± 5%, 1Ph (For contactor controlled motors)- Electrical UPS located in Substation.  DC 110V ± 5% (For breaker controlled motors) – Battery Charger

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a. Closing, tripping & spring charging motor	DC 110V ± 5%, 2 W - Battery Charger
b. Auxiliary power	AC 240V ± 10%, 50 Hz ± 5%, 1Ph, 2W
- Instrumentation and Automation, DCS & Auxiliaries	AC 115 V ± 10%, 50 Hz ± 3% 1Ph, 2W – Instrumentation UPS located at Control Room
Voltage Ratings	
- Motors above 150 KW up to 1000 KW.	3.3 KV, 3 Ph AC
-Motors up to150 KW	415 V, 3 Ph AC
- Space heaters	240V, 1 Ph AC
- Lighting	415V/240V AC
- Panic Lights	110V DC
- Power Sockets/Receptacle	415V, 3 Ph AC/240V, 1 Ph AC

3.2 The fault level for 11kVV switchboards shall be 40kA for 3 sec.

3.3 The fault level for 415V switchboards shall be 50kA for 1 sec.

3.4 System Earthing

The neutral of 415V supply system shall be solidly earthed.

## 5.0 POWER SUPPLY AND DISTRIBUTION.

5.1 Power supply from 11 KV switch board in Offsite & Utilities Substation(OUSS) of Plant

5.1.1 2 Nos. 11 kV Feeders and 1 No. 11 kV Feeder (Emergency Bus) shall be made available in 11 kV Switchboard at Offsite & Utilities Substation. Tapping of power supply from 11 kV Switchboard at Offsite & Utilities Substation (OUSS) including supply, erection & testing of all required material such as structural supports for cable tray, cable trays, cables, cable terminations at both ends etc. shall be in Contractor's scope. Further distribution to equipment at 415/240 V, 110 V DC etc. through proper type and size of cables, their supply, erection, testing and commissioning etc. shall be in Contractor's scope.

5.1.2 The electrical system layout and interconnections (power as well as control) shall be such that the problem in electrical system of one plant should not affect the electrical system of other plant and vice versa.

5.1.3 Supply, Laying, termination, supporting, Erection, Testing and Commissioning of all power, control and lighting cables from switchboards to equipments in Contractor's scope. Cable trench/ cable tray for all power, control & lighting with support structure shall be in Contractor's scope.

5.1.4 Inter tripping & Interlocking cable between shall be in the scope of Contractor.

5.1.5 The entry of cables in the switchboards shall be from bottom only.

5.1.6 All switchboards shall be provided with minimum two incoming feeders and one bus tie having auto/manual changeover facility.

5.1.7 It shall be possible to have momentary paralleling of power sources at 415V PMCC /PCC/MCC and trip the desired circuit breakers.

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5.1.8 The normal operation of the Power & Motor Control Centre (PMCC) and Motor Control Centre (MCC) shall be as under:

- i. Bus-coupler shall be provided between all the sources. Incomer and Bus-coupler breaker rating shall be same for all the switchboards. Each incoming feeder shall independently feed the loads on respective buses with full rated bus tie breaker open and the load on each bus balanced. In order to ensure maximum degree of reliability and continuity, automatic transfer from one incoming feeder to other shall be possible through auto/manual closing of bus tie breaker in case of sustained loss of power on any bus section.
- ii. The bus tie breaker shall be provided with auto/manual selection. The bus tie breaker shall be independent in manual mode. In auto selection mode, the bus tie breaker is electrically interlocked with incoming circuit breakers, so that it cannot be closed unless one of the incoming breakers is open.
- iii. When one of the incoming feeder trips, the bus tie breaker is closed automatically based on the philosophy described and the total load is transferred to other healthy incoming feeder which is capable of carrying the entire load. Sufficient switchgear capacity is to be provided. Time for changeover is suitably selected based on downstream system requirement of reacceleration of motors etc.
- iv. Auto Change Over scheme shall be provided for incomer feeders and bus coupler feeder of 11kV switchboard, 3.3kV Switchboards and 415V Switchboards. Under normal operating conditions, incomer-1 and incomer-2 breakers shall be closed and bus coupler breaker shall remain open with 'Local-Remote-Off' switch in 'Remote' position. The bus coupler breaker shall close automatically under the following conditions being fulfilled:
  - Either of the incoming breaker trips due to under voltage (70% or below).
  - Voltage on the healthy bus is more than 80% for the set period.
  - Residual voltage on the bus with no power supply comes down to 30% or below.

Required nos. of bus PT, line PT and under voltage relays shall be provided to achieve the desired automatic changeover.
- v. Auto transfer shall take place only on sustained loss of power on either of bus sections. Auto transfer shall be blocked in case of fault on either of bus sections or no power on both incomers.
- vi. Paralleling of two incoming feeders is not foreseen. However, facility for momentary paralleling shall be provided for intentional changeover without interruption of supply with synchro check relay in Bus Coupler panel. There shall also be provision of selective tripping of one feeder out of three feeders with a Delay (two incoming feeders and one Bus Coupler).

**5.2** Deleted.

**5.3** Lighting Distribution

5.3.1 In Substation Main Lighting Distribution Board (MLDB) shall be in provided. MLDBs shall have two incomers through 415/433 V Lighting Transformers. One Incomer of MLDB shall be feed from PCC/PMCC and One Incomer shall be fed from EPMCC. In other areas the Lighting Distribution Boards shall receive power from MLDB. One third lighting load shall be connected to the emergency power (DG Source) to provide emergency light during failure of normal power. The MLDB Incomers shall have Metering facility with Digital communicable Multi-function Meters

5.3.2 Both the lighting transformers feeding MLDB and their respective circuit breakers shall have same rating. Both the lighting transformers shall be designed for 100% load of MLDB.

10% of light or required Number of lights for safe evacuation, whichever is higher, shall be used as panic light (240V AC), in case of complete shutdown for the plant area excluding Substation & Control Room.

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The both normal and emergency section of Main Lighting Distribution Board shall have separate Sections of busbars for indoor and outdoor lighting. Indoor / Outdoor bus Sections shall be connected by means of suitably rated contactor operated through digital clock timer. There shall be provision to Switch ON & OFF Outdoor Type feeders from ECMS in Remote Mode.

- 5.3.3 Manual by-pass circuit for outdoor lighting shall be wired up to a switch located in Electrical control room / shift office, so that outdoor lighting can be switched ON or OFF manually to bypass the automatic switching.
- 5.3.4 All outdoor lighting fixtures and outside lighting of Sub-Station, Offices, Control Rooms etc., shall receive power from outdoor lighting bus.
- 5.3.5 Main Lighting distribution board shall feed Lighting Sub Distribution as per SLD. Six, Nine or Twelve way Lighting Sub Distribution board shall be used.

#### **5.4 DC Power**

- 5.4.1 110 V DC system shall be provided for control of circuit breaker feeders and panic lighting. It shall be obtained from Ni-Cd batteries.
- 5.4.2 The battery shall be provided with SCR controlled automatic rectifier-cum battery chargers and shall consist of Main Float cum Load charger, Standby Float cum Load charger and Boost Charger and 1 No. Battery Bank of 100% capacity (of 5 hours backup at 100% capacity) with isolation facility for ease of operation & maintenance.
- 5.4.3 Battery Charger shall have 110 V DC system.
- 5.4.4 The battery and charger combinations shall be such as to ensure continuity of D.C. supply at load terminals without even momentary interruption.
- 5.4.5 AC Ammeter and AC Voltmeter on Charger Input; DC Ammeter, DC Voltmeter for charger output/ battery voltage and on demand type Battery Charge / Discharge Ammeter shall be provided.
- 5.4.6 For all other specifications of Battery Charger , refer PC183-TS-0813.

#### **6.0 SUB-STATION / MCC Room**

- 6.1 New Substation including Transformer Room, shall be considered for accommodation of all electrical equipments.
- 6.2 Actual size of substations shall be based on the final dimensions of substation equipments. Substation shall include Operator Room and Staff Room, Toilet (both Indian and western WC etc.).
- 6.3 The sub-station building shall have single storey construction with Cable Trench Arrangement (Minimum Cable Trench Depth 1.5 Meters). The switch room shall have Kota stone flooring.
- 6.4 In addition to the entry to substation for operating personnel, a separate entry of minimum 3.5M (H) X 3M(W) with rolling shutter shall be provided for drawing in all equipment for installation. The rolling shutters should be manually operated with gear box. The Sub-station shall also have an emergency door opening outwards.
- 6.5 Wall adjacent to the transformer bays and walls separating transformers shall be 355 mm thick (inclusive of plastering) in case of brick construction or 240 mm thick in case of RCC construction. RCC roof slab shall be provided for Transformer,
- 6.6 Roof slab for
  - a Power transformer : Yes
  - b Distribution transformer : Yes
- 6.7 Batteries in substation : Separate room

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- 6.8** Switchgear room : Ventilated
- 6.9** Battery charger in substation : Air conditioned
- 6.10** Nickel- Cadmium Battery : Separate room (Ventilated)
- 6.11** Thyristor controlled panels : Air-conditioned
- 6.12** The layout of equipment shall be such that it shall have adequate space for installation, operation, maintenance and future expansion. The clearance of equipment from the walls/other equipment shall be adequate to ensure safety of working personnel. Generally the following norms shall be maintained for 11 kV/415 V Switchboards:
- a) The clear space of 2.5 M at rear side of 11kV Switchboard.
  - b) A clear space of 1.5M behind the double front switchboards and 1M for single front.
  - c) A clear space of 3.0M between the two boards facing each other.
  - d) A clear space of 2.5M on either side at entrance/exit.
  - e) A clear space of 2.0M between two boards in same line after future panel space of switchboard.
  - f) A clear space of 1M in switch room from top of equipment.
- 6.13** The battery room shall form a part of the sub-station. Battery room shall be provided with minimum two flameproof exhaust fans and louvered opening in opposite wall/door. A sink with water tap shall be provided with water connection. Eye wash shower shall also be provided. Floor of the battery room and walls up to 2 M height shall have acid/alkali resistant protective epoxy coating. Light fittings, exhaust fan, on/off switches etc. in this room shall be chemical resistant type and flame proof type.
- 6.14** Location of battery charger shall be nearer to battery room.
- 6.15** All doors and windows shall have anodized aluminium frame and provided with toughened glass.
- 6.16** Continuous fixed type glass ventilators on all sides shall be provided near the ceiling height for natural lighting.
- 6.17** Arrangement shall be provided for lifting heavy equipment to be brought into the sub-station.
- 6.18** The Sub-stations shall also have an emergency door opening outwards.
- 6.19** Separation walls between transformers / substations shall be provided.
- 6.20** Transformers shall be located in bays adjacent to the sub-station building. All bays shall have oil drained floor, surfaced with gravel or other suitable material.
- 6.21** In order to prevent leaking oil from reaching and polluting the water bearing stratum, transformers shall have the following provisions, depending on the oil capacity of the transformer.
- Oil Capacity up to 2,000 litres:  
Transformers installed adjacent to sub-station shall be provided with oil soak pit with a layer of pebbles of about 40 mm granulation.
- Oil Capacity exceeding 2,000 litres:  
Transformers installed adjacent to sub-station shall be provided with oil collection pit and sump pit as per Drg. No. PC183-PDS:E 114 for draining away of any oil, which may escape or leak from the tanks, to a waste oil tank.
- 6.22** A clear space of at least 1.5 meter shall be maintained all around the transformers.
- 6.23** Separate common oil pits are required for Transformers.

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The volume of common oil pit will be 125% of the volume of oil of the transformer, which contains the largest volume of oil in transformers.

The oil pit will be closed type of water-proof concrete construction.

The oil pit will be connected to individual pit under each transformer and drain line of each transformer will be at least 150 mm dia pipe with a minimum slope of 1:96 as per TAC Regulation.

Transformer fire/drainage of oil will be considered for only one transformer at a time.

Level of pit will be so selected that there would not be accumulation of oil/water/oil-water mixture in the pit under each transformer.

Pit shall be provided with 2 x 100% sump pump for common oil sump. 1 No. Portable sump pump shall also be provided.

Oil Pit under Transformer and its Cooler Bank: Gravel filled open oil pit will be provided under each transformer and its cooler bank. The pit shall be such that it can take oil/water surge of 20% of the volume of the transformer oil. Level of pit shall be such that there will not be accumulation of oil/water in the pit. The gravel size will be 60 mm. Each pit will be connected to the drain line leading to new common oil pit.

- 6.24** Fire protection for substations shall be provided to comply with requirements of relevant BIS (Bureau of Indian Standards) and other Indian/ International standards, as applicable. In case Indian standards are not available for any equipment, standards issued by IEC/ BS/ VDE/ IEEE/ NEMA/NFPA or equivalent agency shall be applicable.

In case of contradiction / conflict, most stringent specification shall be followed.

## **7.0 PROTECTION & METERING**

- 7.1** Selection and co-ordination of protection and metering system shall be such as to ensure:

- Selective, sensitive and reliable protection of equipment against damage due to internal or external faults or atmospheric discharge.
- Isolation of fault in the shortest possible time.
- Simplicity of the scheme with maximum protection.
- Uninterrupted operation of healthy system.
- Personnel & plant safety.

- 7.2** Protective relays shall be of latest version, numerical / communicable type with non-volatile memory, comprehensive unit providing protection, metering, control and communicable with communication port for interlinking with online energy/Load Management System. 100% redundancy shall be provided for communication i.e. the Relay should have minimum 2 Nos. IEC-61850 communication port in addition to Front Port.. Numerical Relay shall have communication on IEC-61850 protocol in redundant mode and meters shall have communication on MODBUS protocol. Relay shall have 4 CT input for O/C and E/F protection. There should be option for derivation of E/F internally.

Relay shall meet the requirement for withstanding electromagnetic interference according to relevant parts of IEC 60255 / IEC 61850. Failure of single component within the equipment shall neither cause unwanted operation nor lead to a complete system breakdown.

The relay should support (tested for) IEC 61850 Edition 2 with parallel redundancy protocol as per IEC 62439-3 with two nos. of port and one additional port at front for local communication. Use of any type of converter is not acceptable.

- 7.3** The Numerical relay shall be provided with integral (no separate unit) arc flash protection system based on both current & light detection method. Relay should have provision of 3 nos. arc sensor, each for cable chamber, busbar chamber & circuit breaker chamber. Sensor shall cover any flash over occurring in the respective chambers. Facility should be

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there to adapt selective logic schemes for tripping only respective breaker or Incomer breaker.

- 7.4** The relay should support (tested for) IEC 61850 Edition 2 with parallel redundancy protocol as per IEC 62439-3 with two nos. of port and one additional port at front for local communication. Use of any type of converter is not acceptable.
- 7.5** Numerical relay shall indicate MWH, MVAR, MVA, V, A, Hz, PF. It shall have future provision for connecting with substation HMI. Separate multifunction meter with communication (for centralized energy monitoring) shall be used and shall not be part of protective device.
- 7.6** Relays shall support features like remote relay parameterization, disturbance recorder etc. It shall be possible to set/operate the relay from the front facia. Lock out relay shall be conventional type with hand reset facility.
- 7.7** Special protection if required for any feeder such as differential, restricted earth fault, directional distance power relays etc. shall also be through numerical relay having serial port for monitoring.
- 7.8** In general all protection shall be through microprocessor based numerical relay. However high speed tripping relay shall be separate.
- 7.9** All Auto-changeover logic to be built in Numerical Relay. Numerical Relays shall have sufficient I/O to cater the same and there should be minimum 10 % spare I/O for future use. External I/O Card/ Module are not acceptable.
- 7.10** All Process Stop and other important Parameters shall be routed through Numerical relays for recording and Time-stamping. Hardware Annunciator is not required. Common Audio Visual Alarm for each Bus section of Switchboard shall be provided through Numerical relays.
- 7.11** Bare minimum protection for power distribution system shall be as indicated below. However, Contractor shall provide any other necessary protection required for complete protection of system:.
- 7.12** Protection devices for power distribution system shall be as indicated below (Figure inside bracket refers to note below) (YES – Applicable)

Sl. No.	Relay Description	Relay No.	HV Tr. Fdr. Sec Wdg. Volt=> 3.3 KV	HV Tr. Fdr. Sec Wdg. Volt< 3.3 KV	HV /LV Motor Fdr., HV Breaker controlled contactor controlled	O/G Bkr. HV Plant Fdr.	O/G Bkr. MV PMCC	I/C HV	I/C MV PMCC
1.	IDMTL Over-Current Relay	51	YES	YES	-----	YES	YES	YES (2)	YES
2.	IDMTL Earth-Fault Relay	51N	YES (4)	YES	-----	YES	YES	YES (2)	YES
3.	Standby / Backup Earth Fault Relay (earthed neutral)	51G (11)	YES (24)	YES (24)	-----	-----	-----	-----	-----
4.	Motor Protection Relay with (50, 50N, 46, 49, 50L/R, 95)	99	-----	-----	YES	-----	YES	-----	-----
5.	Instantaneous Restricted Earth Fault Relay (Earthed side)	64R (11)	-----	-----	-----	-----	-----	YES (25)	YES
6.	Instantaneous Over current Relay	50	YES	YES	-----	-----	-----	-----	-----
7.	Instantaneous Earth Fault Relay	50N	YES (5)	YES	-----	-----	-----	-----	-----
8.	Differential Protection Relay	87	YES (6)	-----	YES (7)	YES (8)	-----	-----	-----
9.	High speed tripping relay	86 (20)	YES	YES	YES	YES	YES	YES	YES
10.	Trip Circuit Supervision Relay	95 (20)	YES	YES	YES	YES	YES	YES	YES

11.	Transformer Auxiliary Relay	63	YES	YES	-----	-----	-----	-----	-----
12.	Under Voltage Relay with timer	27 / 2	-----	-----	YES	-----	-----	YES (9)	YES (9)
13.	Check Synchronisation Relay	25	-----	-----	-----	-----	-----	YES (10)	YES (10)
14.									

Notes for Relay Protection Philosophy

1. All the numerical relays shall be of communicable type and connected to ECMS on IEC 61850 (Ethernet based) communication protocol with time stamping and time synchronization.
2. In case of HV switchboards with continuous parallel operation of incomers, following additional relays shall be provided:
  - a. One set of 87B (Bus differential) and 95 B (Bus wire supervision) for each bus section.
  - b. 32 (Directional IDMTL over current and earth fault) relays for the incomers.
3. In case of grid power supply EHV incomer following additional relays shall also be provided:
  - a. Relay 21 for distance protection, Relay 59 for overvoltage protection with timer, Relay 67 for directional over current protection, Relay 67N for directional earth fault protection, Relay 81 for under frequency / df/dt protection and Relay 98 as dead bus charging relay.
  - b. Minimum protection relays for EHV Transformer shall be 50, 50N, 51, 51G, 51N, 63TX, 64R, 86, 87T, 87F & 95.
4. Instantaneous earth fault (50N) shall be provided only for transformer with delta primary.
5. Directional IDMTL earth fault (67N) shall be provided for transformer with star primary.
6. For transformers rated 5 MVA and above.
7. For motors rated 1500 kW and above, excluding VFD fed motors.
8. .
9. Wherever auto-transfer feature is provided.
10. For switchgears where continuous or momentary paralleling of Incomers is envisaged, check synchronizing relay shall be provided.
11. 51G and 64R relays for input transformer of VFD system shall be decided by VFD Manufacturer.
12. The bus tie feeders in HV switchboards shall be provided with 51, 51N, 86 and 95 relays.
13. HV capacitor bank feeders shall be provided with 51, 51N, 59 (over voltage), 60 (Neutral displacement), 86 and 95 relays.
14. The following feeders shall be provided with timers for delayed tripping on bus under voltage while the under voltage relay shall be common for the bus
  - a. HV and MV capacitor feeders.
  - b. HV and MV breaker controlled motor feeders.
  - c. Contactor controlled motor feeders with DC control supply.

Numerical relays where ever provided for motor and capacitor feeders shall use in built under voltage relay and timer for delayed tripping on bus under voltage.
15. One no. DC supply supervision relay (80) shall be provided for each incoming DC supply to the switchboard.
16. .
17. In case of numerical relays, all relays shall be comprehensive units including all protection, metering and control.
18. Under voltage and over voltage function along with associated timer shall be part of the numerical relays.
19. Auto changeover scheme control & logic between Incomers and bus coupler shall be built in the numerical relay.



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20. Tripping relays (86) shall be separate relay. There shall be two nos. high speed tripping relay for motor feeder. One for electrical fault and one for process fault. Electrical fault relay shall be hand reset type and process fault relay shall be self reset.
21. Breaker control switch shall be hardwired type.
22. Stand by earth fault relay 51G shall be provided in the incomer of switchboard fed from transformers where transformer & switchboard both are located remotely from HV substation as well as in same HV substation.
23. For transformers located remotely away from HV Substation, a local power isolating device in the form of breaker panel without any protection relay shall be provided before transformer. A local emergency stop push button (Lockable) shall also be provided in transformer bay for tripping remote breaker.
24. Restricted earth fault relay 64R shall be provided for transformer rating  $\geq 1$  MVA in the incomer of switchboard fed from transformers having secondary winding star connected. This shall trip the HV side breaker.
25. .
26. Relay 87 and 64R shall be separate numerical relay. Hence shall not be part of main comprehensive numerical relay. CT for 87 and 64R can be clubbed, as two core of single CT.
27. Accuracy class of the current transformers shall be
  - Class PS for differential and special requirements.
  - Class 0.5 / 0.2 S for metering purpose.
  - Class 5P20 for protection purpose
 All the CTs shall have rated burden of minimum 15 VA and secondary rated current of 1 A.
28. Accuracy class of the potential / voltage transformers shall be
  - Class 5P for protection purpose.
  - Class 0.5 / 0.2 S for metering purpose.
 All the PTs shall have secondary voltage 110 V or  $110\text{ V} / \sqrt{3}$  and rated burden of minimum 50 VA per phase for both metering and protection core.
29. All the incoming, outgoing and tie breaker feeders of any HV & MV Switchboard shall be provided with numerical relays only with communication facility as protection devices. Releases shall not be acceptable in any case.
30. Numerical relays in all HV motor feeders shall be suitable for RTD / BTD inputs.
31. Each bus section shall be provided with separate under voltage relays.
32. Multifunction meter shall be provided to keep a record of power consumption and supervision of all concerned parameters like current, voltage, power, frequency, power factor etc. as specified. All the metering instruments shall be flush mounted.
33. Separate Communicable Digital Multifunctional meters shall be provided in all feeders with Numerical Relays for communication with ECMS system.
34. Motors shall also be provided with Unbalanced (-Ve) Sequence Protection Relay (46), as required.
35. Numerical under voltage relays (27) with time delay relay including VT fuse failure relay shall be provided for Bus VTs.
36. All Motor feeders of PMCC & MCC (irrespective of Rating) shall have door mounted communicable (Modbus / Profibus) type Motor Protection relay (MPR) with display.
37. No Meters, transducers or measuring equipments to be installed in the Protection CT circuit.
38. Cable Differential relays for both the end to be supplied by Downstream user contractor i.e. Contractor. Cable Differential relay will be of Fiber Optic Cable based communication only.
39. All required Alarms and Trips shall be incorporated in the Numerical relays. Sufficient LED shall be available in the Relays.
40. Trip Circuit Supervision relay shall be part of Numerical relay.
41. All Motors above 5.5KW and Outgoing Feeders above 100A shall Earth Fault protection with CBCT and Digital Earth Fault Relay with display.

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42. Capacitor Feeder : 59, 27,50, 51, 50N, 51N, 60, CBFP etc.

**7.13** Metering instruments shall be provided to keep record of power consumption and supervision of all concerned parameters like current, voltage, power (Active, Apparent and Reactive), frequency, power factor, Energy (Active & Reactive) etc. All the instruments shall be flush mounted. All meters shall be digital multifunctional meters with communication port for Load management at remote location. Additionally digital type ammeter, voltmeter and Hour Meter shall be provided separately for various feeders as indicated below :

The metering devices in HV and MV switchboards shall be as below:

- Type of metering: Analogue/As part of the Numerical relay  
(Figure inside bracket refers to note below) (YES - Applicable)

Sl. No.	Feeder type	A	V	Hz	PF	MW	MWH	HM	MVAR	MVAH	MVA
1.	HV Incomer	YES	YES	YES	YES	YES	YES	----	YES	YES	YES (1)
2.	HV Bus Tie	YES	----	----	----	----	----	----	----	----	----
3.	HV Transformer	YES	----	----	----	YES	YES	----	----	----	----
4.	HV Bus PT	----	YES	----	----	----	----	----	----	----	----
5.	HV Plant Feeder	YES	----	----	----	----	YES	----	----	----	----
6.	HV Motor	YES	----	----	----	----	YES (kWh)	YES	----	----	----
7.	HV Capacitor	YES	YES	----	----	----	----	----	YES	----	----
8.	PMCC Incomer	YES	YES	----	YES	----	YES (kWh)	----	----	----	----
9.	PMCC Bus Tie	YES	----	----	----	----	----	----	----	----	----
10.	PMCC Bus PT	----	YES	----	----	----	----	----	----	----	----
11.	ACB Outgoing (Non Motor)	YES	----	----	----	----	YES (kWh)	----	----	----	----
12.	MV Motor (>55 KW)	YES	----	----	----	----	----	----	----	----	----
13.	MCC / ASB Incomer	YES	YES	----	----	----	----	----	----	----	----
14.	MCCB O/G (250A and above)	YES	----	----	----	----	YES (kWh)	----	----	----	----
15.	MLDB Incomer	YES	YES	----	----	----	YES (kWh)	----	----	----	----

Notes for Metering:-

1. MVA meter in external power supply incomers shall include maximum demand indication also.
2. Separate analogue type voltmeters with voltmeter selector switch and analogue type ammeters with ammeter selector switch shall be provided for incomers of all switchboards.
3. Ammeter (size 48mm x 48mm) shall be provided in space heater circuit of breaker fed HV & MV motors.
4. Apart from metering which shall be part of the numerical relays, Communicable digital multi-function meters of Accuracy Class 0.5/ 0.2( for Incomers only with suitable Metering CT shall be provided in all the breaker feeders of HV & MV Switchboard i.e. in incomers, bus coupler, outgoing plant feeders, transformer feeders, motor feeders, capacitor bank feeders, etc.
5. Multi function meters with serial communication over RS-485 or fiber optic cable, preferably with IEC protocol shall be provided in all the breaker feeders.

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6. Power factor meter shall be provided for synchronous motors in addition to the metering provided for induction motors.
7. For current feedback to DCS/PLC and VFD feeders motor current transducers shall be provided and mounted in switchgear panel.
8. CT operated Ammeter for all motor feeders above 5.5 KW, all MOV and LOPs shall be provided at both LCS and feeder end of switchboard.
9. All ammeters for LV motors shall be connected through CT. Only HV motors shall have 3 ammeters or ammeter selector switch or Voltmeter and Voltmeter Selector Switch.
10. Hour run meter shall be provided in all breaker controlled motor feeder.

## 8.0 CONTROL AND MONITORING

The following provision shall be made for control and monitoring of following electrical equipments.

### 8.1 Transformers

- TNC switch in primary & secondary side of switchgear.
- Emergency trip from secondary side for tripping primary side of transformer.
- VCB with all required protection to be considered in 11kV switchboards. .
- Lockable 'OFF' push button in transformer room to trip sending end switchgear.
- Indication lamp for 'ON' 'OFF' 'Auto-trip', 'Non-trip' and 'Trip Circuit Healthy', 'Ready to Close' , 'Ready for Service', 'Test', 'Service', 'Space Heater ON'.
- Ammeter and voltmeter on both primary and secondary side.

### 8.2 Motors Controlled Through Circuit Breakers

- TNC switch, L/R Switch with Ammeter on LCS
- Current monitoring at DCS/PLC through Dual Channel Current Transducer with Display facility installed at switchgear end, where required from process point of view.
- Indication Lamps in switchgear for 'ON', 'OFF', 'Auto-trip' and 'Trip Circuit Healthy', 'Ready to Start', 'Ready for Service', 'Test', 'Service', 'Space Heater ON, 'Space Heater ON for Motors'.
- Emergency trip in switchgear.
- Winding and bearing temperatures of motors shall be available at DCS in control room.
- Process interlock in CCR, where required.
- Control and Feedback for Motor Start & Stop command, Trip Indication, ON Indication, OFF Indication, Local / Remote Indication and Ready to Start Indication in remote (DCS/PLC etc.)
- Motors controlled through Circuit breakers should also be provided with ammeter, KVAh, KWH and running hour counter. Theses shall be incorporated in Numerical relay Or Multi-function Meter.

### 8.3 Medium Voltage Motors Controlled Through Contactors

- Start & Stop Push Button (Mushroom Stay Put Type) with Ammeter, Local/Remote switch on LCS
- Current monitoring in DCS, where required from process/Instrument point of view.
- Emergency Trip in PCC/MCC.

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- Process interlock in CCR, where required shall be wired through separate auxiliary relay.
- Indication lamp for 'ON', 'OFF', 'Ready to Start' and 'Fault' in switchgear.
- Control and Feedback for Motor Start & Stop command, Trip Indication, ON Indication, OFF Indication, Local / Remote Indication and Ready to Start Indication in remote (DCS/PLC etc.)
- Motor space heater & Panel board space heater shall be provided with Ammeter & LED in
- Switchgear.
- All Motor feeders of PMCC & MCC (irrespective of Rating) shall have door mounted communicable (Modbus / Profibus) type Motor Protection relay (MPR) with Earth fault protection and display.

## 9.0 EQUIPMENT SPECIFICATION

### 9.1 General Features

- 9.1.1 The equipment shall be suitable for tropical climate conditions and corrosive and saline atmosphere.

All electrical equipment accessories and wiring shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

Fine mesh screen of corrosion resistant material preferably SS shall be furnish on all ventilating openings to prevent entry of insects.

- 9.1.2 The equipment to be installed in indoor plant area shall be enclosed in dust, damp and vermin proof enclosure equivalent to IP 65 as per relevant Indian Standards/IEC.
- 9.1.3 The equipment excluding motors to be installed in outdoor plant area shall have IP 65 enclosure. Motors of plant shall have IP 55 enclosure.
- 9.1.4 4 mm FRP (fire retardant and UV stabilized) canopies shall be provided for all outdoor equipments like motors, starters, LCS, SDBs, sw. sockets etc. PA stations shall have acoustic hood.
- 9.1.5 The switch boards, to be installed inside the building shall have enclosure IP 4X for HV switchgear, for LV switchgear degree of protection shall be IP 52 up to 1600A rating and IP-4X above 1600A rating. Equipment requiring ventilation opening such as battery charger/UPS etc. located in air conditioning room may have IP 43 enclosure however, opening for the ventilation shall be covered with fine wire mesh.
- 9.1.6 Creepage distance shall be 31mm/kV (for highest system voltage) for all equipment.
- 9.1.7 All the electrical equipment shall be provided with rolled aluminium/stainless steel heavy duty double compression type cable glands and crimping lugs for the cable terminations
- 9.1.8 The outside surface of all equipment shall be painted after suitable pre-treatment by the application of two coats of anti-rust and corrosion resisting epoxy based paints.
- 9.1.9 All similar equipment ( viz. HV Switchboard, LV Switchboard – PCC, PMCC, MCC, EPMCC, ASB, LDB, DCDB, Transformers, Numerical relays, UPS, Battery Chargers, Motors, etc.) supplied against a package should be of single Make only – for ease of O&M and spare management.

### 9.2 Power Transformers

- 9.2.1 The transformers shall be double wound, copper conductor, and Dyn11 type. Transformers shall rated for 11/0.433 kV, as required.
- 9.2.2 The rating of power transformers shall be selected keeping following into considerations:

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- (a) Duty : Continuous
- (b) Outdoor type : ONAN (ONAN rating shall have 25% spare capacity above continuous peak load)
- (c) Indoor type : Dry Type  
Epoxy cast resin/ resin encapsulated type
- (d) Maximum loading : 80% when one of the transformers is out of service
- (e) Peak efficiency at : 35% - 40% of load
- (f) Class of Insulation : B or better for oil filled  
: F or better for dry type

9.2.3 Maximum temperature rise over ambient of 50 Degree Celsius shall be limited to:

(a) Outdoor transformers:

Top oil (measured by thermometer) : 50 ° C

Winding (measured by resistance) : 55 ° C

(b) Indoor transformers:

Winding (by resistance method) : 90 ° C or lower as permissible for class of insulation offered

9.2.4 Special consideration shall be given in specifying the percentage impedance of the transformers to suit the switchgear short-circuit capacity available.

9.2.5 Bare minimum protection devices for transformer have been as indicated below; however Contractor shall provide any other necessary protection relays required for complete protection of system.

Primary Side.

IDMTL Over Current, IDMTL Earth Fault, High Set Over Current, Instantaneous Earth Fault, Standby Earth Fault, Restricted Earth Fault , Differential (for sizes of 5 MVA and above), \*Buchholz Alarm and Trip,\*Winding Temperature Alarm,\* Trip, \*Oil Temperature Alarm, \*Oil Level Alarm & Trip, \*Trip for Winding Temperature and Oil Temperature. All protection except REF shall be provided on secondary side, if the primary side circuit breaker is located in other sub-station. REF protection shall trip the primary Inter-tripping of primary and secondary circuit breaker of transformer shall be provided for all faults through lockout relays.

CT for Restricted Earth Fault protection shall be provided in the transformer.

9.2.6 High Velocity Water Spray (HVWS) System shall be provided for transformers fire protection having oil capacity more than 2000 Liters and rating upto 20MVA.

9.2.7 Following Push buttons shall be provided for transformers :

- Lockable 'OFF' push button in transformer room to trip the breakers on primary side.
- Push button shall be provided on breaker on secondary side for permission to close breaker on primary side
- Emergency trip PB on breaker on secondary side for tripping breaker on primary side of transformer.

9.2.8 The instruments such as OTI/WTI, Buchholz relay and MOG shall have Magnetic Reed Switches. The mercury switch contacts are not acceptable.

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- 9.2.9 For all transformers, conservators shall be provided with Magnetic Oil Gauge (MOG) having 1NO contact activated on Low oil level. For transformers above 2000KVA Air cell shall be provided in the conservator.
- 9.2.10 Transformer rooms shall have slab and shall be under shed.
- 9.2.11 All Routine Tests shall be performed in compliance with B.S.171, IEC publication No.60076, IS 2026 (parts I to V), CBIP and IS: 2026 (Part III) before dispatch from Manufacturer's works and at erection site during commissioning or latest editions or any other authoritative standard. Certificates for Type Tests on similar type Transformers shall be submitted.
- 9.2.12 For all other specification refer PC183-TS-0803.
- 9.3 Deleted
- 9.4 **Switchboards**
- 9.4.1 General
- 9.4.1.1. There shall be three positions for Breaker/Contactor trolley: - Service, Test and Isolate. In service position, the power connections shall be made; but in test and isolate mode, the power connection of bus bars shall be automatically removed.
- ACB feeder for PMCC & MCC shall be single front for ease of operation & maintenance. Non-ACB feeders for motors or power may be double front type.
- Breaker duty cycle shall be O-0.3sec-CO-3min-CO.
- Separate CT shall be provided for differential/REF protection.
- LV circuit breaker shall be 4 Pole type except for outgoing motor feeders which shall be 3 Pole type.
- 9.4.1.2. Suitable shutter arrangement shall be provided to protect the person from accidental contact with live bus in trolley chamber.
- 9.4.1.3. The degree of protection shall be IP 4X for HV switchboards and IP 52 for LV Switchboard up to 1600A rating and IP-4X for LV switchboards above 1600A rating.
- 9.4.1.4. All HV, MV & LV Switchboards shall be LOTO compliance.
- 9.4.1.5. 11 kV Switchboard shall conforms to IS/IEC 62271-200, IAC-A FLR-50KA/40KA 1 Sec, PM, LSC 2B which means that the switchgear panels shall be four side internal arc tested, shall have metal partitions and shall confirm to loss of service continuity. LV switchboard shall conform to IEC 60947. All 3 compartments (Busbars, Circuit breaker & Cable compartment) shall be tested for Internal arc for the said rating.
- 9.4.1.6. Each HV compartment should have individual exhaust channel / pressure relief flaps to let out over-pressurized hot gases at the top of the switchboard in case of an internal fault. Suitable factory fitted arc duct arrangement shall be provided for vending out the arc out of the switchgear room.
- 9.4.1.7. The switchgear shall have integral making type earth switch with proper Mechanical & Electrical interlock.
- 9.4.1.8. The observation window on the CB compartment door shall be made of special toughened/laminated glass substantiated in type test reports as proving it arc proof. Observation window shall be of same material and construction as the type tested design/construction as specified in IEC.
- 9.4.1.9. Each cubicle shall be equipped with anti-condensation heater controlled by thermostat.
- 9.4.1.10. LV switchboard (EPMCC/PMCC/MCC) shall be TOTAL TYPE TESTED (TTA) design as per IEC 61439-1/2. Type Test Certificates for short circuit withstand of 50kA for 1 sec along with ACB mounted in the Switchboards shall be provided.

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- 9.4.1.11. LV switchboard (EPMCC/PMCC/MCC) shall comply with Internal Arc Containment test as per IEC 61641.
- 9.4.1.12. The busbars and connection shall be made of electrolytic grade copper only. Aluminium busbars are not acceptable. All busbars of 11kV switchgear including bus duct shall have Raychem sleeving.
- 9.4.1.13. Front access doors with single action operator will be provided to the HV circuit breaker compartment and LT Relay compartment. Bolted type CB door locking arrangement shall not be accepted.
- 9.4.1.14. An electro-mechanical device shall be provided to ensure the auxiliary circuits have been securely connected between the fixed and moving portions of the switchgear, before allowing closing operation of the circuit breaker. The voltage rating of the device shall be the same as the voltage used for the closing circuit.
- 9.4.1.15. Tripping and closing coils shall be of continuous rated type to ensure longer life. All Feeders of 11 KV shall have Double Trip coil for safety.
- 9.4.1.16. Circuit breakers shall be provided with a mechanically operated visual indicating device to display the circuit breaker switching state and a mechanical operation counter
- 9.4.1.17. The circuit breaker operations of closing and opening shall be possible with the circuit breaker compartment door closed.
- 9.4.1.18. It shall be possible to trip the circuit breaker locally by mechanical means. Voltage Transformer (VT) shall be cast-resin with built-in primary fuses, VT's shall be draw out type.
- 9.4.1.19. Voltage transformer shall be independent of circuit breaker carriage
- 9.4.1.20. Electrical interlocks and castle key interlocks shall be provided between Bus-bar Earthing Switches and all Bus-bar Isolators of each Bus-bar Section in such a way that Bus-bar Earthing Switches can not be closed when the Bus-bar Isolator of any circuit in the section is closed.
- 9.4.1.21. Bus VT Miniature Circuit Breaker (MCB) ON auxiliary contacts and under voltage relay contacts shall be monitored in the interlocking scheme to confirm the dead bus condition.
- 9.4.1.22. All CT & PT must be suitable for continuous operation of min. 20 % overload and for service under all rated and fault conditions.
- 9.4.1.23. Current transformers shall be in accordance with IEC 61869-1 & 61869-2. The rated output shall match the requirements of the equipment connected. The secondary current rating shall be 1 A, .Unless otherwise specified, cores for measuring instruments shall have accuracy classes of not more than 0.5 % and saturation factors less than 5.
- 9.4.1.24. Secondary terminals of current transformers shall be wired up to a terminal block with short-circuiting links, located at an accessible place. At this terminal block one side of each transformer shall be connected to earth.
- 9.4.1.25. The CT rating plate and the terminals must be accessible after the Power cables have been installed.
- 9.4.1.26. The busbars and connection shall be made of electrolytic grade copper only. Aluminium busbars are not acceptable. All busbars of 11kV switchgear including bus duct shall have Raychem sleeving suitable for Line to line voltage . Proper shroud to be provided in the joints.
- 9.4.1.27. Tripping and closing coils shall be of continuous rating type.
- 9.4.1.28. Clearance between gland plate to cable termination point in all switchboards shall be adequate but not less than 300mm to ensure proper cable termination.

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- 9.4.1.29. FRP supports shall be used for bus bars with adequate clearances and creepage distance to prevent flash over due to effect of dust moisture.
- 9.4.1.30. Protective relays shall be mounted on the front of the switchgear panel.
- 9.4.1.31. All logic like, Auto/Manual changeover etc. shall be built in the Numerical relay. Adequate number of I/Os shall be provided to meet the requirement. 10% spare I/Os shall also be provided. External I/O Card/ Module is not acceptable.
- 9.4.1.32. All relays used for protection shall be microprocessor based numerical type only with latest communication protocol IEC-61850 and shall have large graphical display. All relays shall have coating for protection against harsh environment conditions. All numerical relays shall be of one make only. Selected models of numerical relays shall have metering, control, status and protective functions. It shall be possible to save minimum 5 records of each event. Important functions and features, in addition to the fault measuring capabilities, shall include:
- Programmable scheme logic,
  - Remote communication interface for setting / interrogation from ECMS,
  - Local communication interface (HMI-keypad and / or serial PC communication),
  - Time-tagged events, fault and disturbance records,
  - Display of measured/processed quantities,
  - Self-monitoring (Hardware / Software),
  - Inter-protection communication,
  - Electronic transducer communication.
- 9.4.1.33. All protection relays shall be provided with test plugs and all CT, VT wiring shall be wired through the test plugs in HV, MV & LV Switchboards.
- 9.4.1.34. The protection scheme(s) shall include all hardware and software to permit remote setting / interrogation / fault evaluation from the ECMS (engineering) workstation or from the computer monitoring system.
- 9.4.1.35. All protection relays shall be equipped with communication port using IEC protocols to work as an integrated part of the ECMS hierarchy. Should the relay schemes be offered from multiple Bidders / Contractors, all third party user interface software products shall be supplied to the ECMS platform to bring together all types of protective relaying into a unified control system hierarchy.
- 9.4.1.36. Completely separate and isolated circuits shall be used for Switchgear control, tripping / protection, alarms, and auxiliary devices. These circuits shall have separate control power buses and feeders, suitably protected, for each power bus section.
- 9.4.1.37. Each control circuit shall be protected by a two-pole miniature circuit breaker with auxiliary N/C contact. The auxiliary contacts of all MCB's of the same circuit type, e.g. circuit breaker motor control, disconnect switch motor control, alarm, space heater, trip, etc., shall be wired in series to a group / common alarm terminal.
- 9.4.1.38. Each 11kV outgoing/incoming and transformer feeder control panel shall include voltage detectors to indicate phases "ALIVE". The voltage detectors shall be connected to each phase on the cable side.
- 9.4.1.39. Contractor shall supply minimum 1 No. laptops with licensed software for communication & configuration of all make & Type of Numerical Relays.
- 9.4.1.40. GPS system and associated hardware & software shall be provided for synchronisation of clocks of numerical relay and metering LA & ECMS



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- 9.4.1.41. All meters shall be digital multifunctional meters with backlight LCD display and communication port. Additionally digital type ammeter, voltmeter and Hour Meter shall be provided separately for various feeders as indicated above.
- 9.4.1.42. All the motor / capacitor feeders controlled through vacuum circuit breakers shall be provided with surge arrestors. Lightning Arrestor (LA) shall be provided on each bus of 11KV Switchboard.
- 9.4.1.43. A continuous ground bus shall be provided at the bottom of the switchgear and in cable connection side for grounding the switchgear, breaker trolley as well as to ground the cable glands.
- 9.4.1.44. 11KV Breaker shall be with Integral Earthing switch system with proper interlocks.
- 9.4.1.45. Control supply bus and space heater supply bus-bars (Copper) of adequate rating shall be provided throughout the length of switchboards with as many sections as sections in power bus-bars.
- 9.4.1.46. Control supply shall be tapped from control bus in each cubicle/ panel itself through DP MCB of suitable rating.
- 9.4.1.47. The minimum thickness of sheet steel used in HV and LV switchgear including charger, UPS, ASPB etc. shall be as under:-
- a) Base Channel minimum 3.0 mm
  - b) Load Bearing Members minimum 2.0 mm
  - c) Doors and covers minimum 1.6 mm
- 9.4.1.48. A bottom channel of not less than 100 mm shall be provided.
- 9.4.1.49. The maximum height of the switchboard and other control panels shall be limited to 2200 MM. Maximum height of component requiring operation shall be limited to 1800MM.
- 9.4.1.50. The switchboards shall have adequate short-circuit ratings and be suitably sized for the load and spare capacity foreseen. The short time rating of bus bar shall be 3 seconds for HV switch boards and 1 second for other boards.
- 9.4.1.51. The HV switch boards and power control centres shall normally have four spare circuit breaker panel (size shall be as per largest outgoing feeder breaker), two on each side of bus-section.
- 9.4.1.52. For other boards (PMCCs, MCCs, MLDBs, ASPBs, DCDBs etc.) sufficient number of spare feeders to the extent of min. 20% for each type & rating shall be provided.
- 9.4.1.53. The 415V switch boards shall have PVC insulated bus bar system suitable for rated voltage. At joints of these bus bars removable shrouds shall be provided.
- 9.4.1.54. All HV & LV Switchgear, UPS, Battery Charger etc. shall have designated space in each Bus section for Network Switches and other communication equipments.
- 9.4.1.55. For interfacing with DCS system, separate marshalling panels (with 20% spare terminals) shall be provided on each bus section in all HV & MV switchboards in the same panel line-up. The marshalling panels shall be of full height same as that of switchboards. The horizontal bus bar chamber at the top shall be continuous through this marshalling panel also, for future extension of the MV switchboard. All critical control signals for DCS interface shall be hardwired between substations and DCS. Other non-critical data of Electrical system will be sent to DCS with redundant communication facility between DCS and ECMS.

Hardwired signals (with minimum requirement specified below) from various Motor feeders of a bus section for DCS interface shall be wired and terminated in the marshalling cabinet:

- DCS Start permissive
- Process Start command (Auto)

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- Remote Start command (Manual)
  - Process Stop command
  - Process Trip command (for breaker controlled motor feeder)
  - Breaker/Contactor 'ON' indication
  - Breaker/Contactor 'OFF' indication
  - Ready to Start indication
  - Electrical Fault Trip indication
- 9.4.1.56. Following monitoring signals, as a minimum, shall be taken from substation to DCS interface, through redundant MODBUS SERIAL LINK communication from ECMS system.
- Load Data viz. KW, PF, A, etc.
  - L/R indication
  - Process Trip indication
  - Electrical Fault Trip indication
  - Trip Details
- 9.4.1.57. Auto changeover scheme shall be provided for incomers and bus couplers on all PMCCs/PCCs/ MCCs. Under normal operating conditions, incomer-1 and incomer-2 breakers would be closed and bus coupler breaker would remain open with 'auto-manual' switch in 'auto' position. The bus coupler switch would close automatically under the following condition being fulfilled:-
- i. Either of the incoming breaker trips due to under voltage (70% or below).
  - ii. Voltage on the healthy bus is more than 80% for the set period.
  - iii. Residual voltage on the bus with no power supply comes down to 30%.
  - iv. Auto change over shall be locked on loss of power on both the incomers.
- Auto changeover shall also be provided on switchboards catering to emergency loads.
- 9.4.1.58. Paralleling of two incoming feeders is not foreseen. However, facility for momentary paralleling shall be provided for intentional changeover without interruption of supply.
- 9.4.1.59. Every enclosure door that provides access to live parts operating at 240 V AC and above shall be mechanically interlocked with a circuit interrupting device on the supply side such that when the door is open, the equipment is de energised.
- 9.4.1.60. Separate redundant AC and DC control supply shall be provided for each Switchboard.
- 9.4.1.61. Control supply for motor feeders having MCCB in PMCC/MCC/ASB etc. and VFD panels etc. shall be feed from 240V UPS ( Electrical) and motor controlled with breaker shall have 110 V DC control supply irrespective of its being HV or LV.
- 9.4.1.62. For motors with auto-starting provision, trip of a running motor shall start standby motor automatically.
- 9.4.1.63. All the HV/LV switchgear shall be fed through two separate transformers, each transformer having capability to take care of 100% load of the associated switchgear and shall have the facility of auto changeover in case of failure of one transformer as well as option of manual changeover for maintenance purpose.
- 9.4.1.64. Max. 3 runs of 400 sq.mm power HV cable shall be terminated in single panel. For more than 3 runs of cable complete dummy/adaptor panel shall be provided.
- 9.4.1.65. The CB ON and OFF lamp shall be provided at rear and front side of 11kV/3.3kV switchboards.
- 9.4.1.66. All breakers service ON/OFF contact multiplier contactors shall be mechanically latched type and independent of control supply. Loss of supply and restoring the supply shall not affect the status of the relay/ contactor.
- 9.4.1.67. All breakers shall be electrically operable and mechanical operation from the breaker shall be possible locally. Manual breakers are not acceptable.

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- 9.4.1.68. Separate Ammeter shall be provided for panel and motor feeder Space heater circuit for each panel.
- 9.4.1.69. The terminal strips used shall be of stud and nut type and control wiring shall be done with ring tong lugs only.
- 9.4.1.70. Dual channel output with display type current transducer for all HV and LV switchboard feeder shall be provided requiring Ammeter at control panel.
- 9.4.1.71. All motor (HV/LV) power feeders shall have separate earth fault protection through CBCT and earth fault relay. LV motor (above 5.5. KW) and power feeder above 100A shall have CBCT and Digital earth leakage relay with display.
- 9.4.1.72. All external hardware shall be of stainless steel only.
- 9.4.1.73. The control compartment and power compartment shall be separate.
- 9.4.1.74. All HV and LV breakers shall have remote switching facility as well as ON/OFF/TRIP indication at ECMS.
- 9.4.1.75. Following Set of accessories as detailed below shall be provided for each 11kV/3.3 KV Switchboard :
- a) Breaker handling trolley – 2 Nos.
- Following Set of accessories as listed below shall be provided for each 415 V Switchboard :
- a) Breaker lifting and handling trolley : Minimum 2 nos.
- b) Test cabinet with coupling cables for testing the breaker in draw out position : Minimum 1 No.
- c) Racking in/out handle for breakers : Minimum 4 nos.
- d) Racking in/out handle for draw out MCC modules : Minimum 2 for each MCC
- 9.4.1.76. Alarm relays with reverse flag shall be provided to annunciate failure of main incoming A.C. and D.C. power supplies and annunciation D.C. supply in each panel. Lamp indications shall be provided individually for main D.C. supply-1 fail, main D.C. supply-2 fail, and panel annunciation D.C. supply fail. A common A.C. electric bell shall be provided to give an audible alarm in case of failure of D.C. supply-1/D.C. supply-2/annunciation D.C. supply in any panel. A common push-button shall also be provided for cancellation of lamp indications and audible alarm.
- 9.4.1.77. Gland plate for single core cables shall be non-magnetic.
- 9.4.1.78. For all other specifications, refer PC183-TS-0805, PC183-TS-0806, PC183-TS- 0808 and PC183-TS-0809.
- 9.4.1.79. Separate panel shall be considered for incomer Line PT & Bus PT (11 kV & 3.3 KV Switchboards) and PT shall be draw out type. 4 pole MCB shall be provided on LV side of Bus & Line PT.
- 9.4.1.80. Inspection window shall be provided for HV termination in the switchboard for carrying out thermography, provided internal arc test certificates for this design is available with the bidder.
- 9.4.1.81. All Incomers and bus couplers shall be provided with synchronising facility. Synchrocheck relay shall be provided in each bus PT & contacts shall be multiplied and wired in each outgoing feeders of each bus section.
- 9.4.1.82. All 11kV and 415 V Switchboards shall preferably be of same make for ease of operation & maintenance.
- 9.4.1.83. Supervision of installation, testing and commissioning including testing of Relays of all switchboards shall be done through OEM only.

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- 9.4.1.84. All Cable Differential Relays shall be FO Cable type only. Supply & termination of the FO cable & associated HDPE duct, as required, for feeder differential protection shall be included in Contractor 's scope.
- 9.4.1.85. All Numerical Relays shall be of same Make and Model (series).
- 9.4.1.86. 11kV Circuit Breaker shall have integrated earth Switch with proper Mechanical & Electrical Interlocks& Electrical Interlocks.
- 9.4.1.87. 11kV Breaker rack in rack out facility should be operable when breaker panel door is closed position.
- 9.4.1.88. LV Switchgear design shall be such that the feeder doors should not open in locked out tagged out condition .
- 9.4.1.89. Current transformers shall be in accordance with IEC 61869-1 & 61869-2. The rated output shall match the requirements of the equipment connected. The secondary current rating shall be 1 A. Unless otherwise specified, cores for measuring instruments shall have accuracy classes of not more than 0.5 % and saturation factors less than 5.
- 9.4.2 11 KV Switchboard
- 9.4.2.1 The 11 KV switchboard shall be indoor, metal enclosed, draw out type, equipped with VCBs, stored energy mechanism working on 110 V DC and shall feed power to the various substations through transformers and other outgoing feeders.
- 9.4.2.2 Degree of protection shall be IP4X as per IS/IEC 60529,IEC 60298. Switchgear sizes and configuration shall be rationalized to minimum spare holding.
- 9.4.2.3 A study shall be conducted by contractor to determine the rated short circuit capacity for the selection of equipment. However, Rated short circuit breaking capacity shall be as determined by the study or 40 KA for 3 sec, whichever is higher. HV Switchboard shall be suitable for Internal Arc (AFLR) withstand current of "rated short circuit current" for 1 sec.
- 9.4.2.4 Incoming, bus coupler and outgoing feeders shall be provided with ON, OFF, Trip, Trip Circuit Healthy indications. Process trip lamp/annunciator window to be provided wherever applicable.
- 9.4.2.5 Control supply shall be 110 V DC.
- 9.4.2.6 Extra anti-condensing space heater shall be provided in Bus –Bar and Cable chamber of 11KV Switchboard.
- 9.4.3 Low Voltage Switchgears
- 9.4.3.1 415 V switchboards shall include the following:
- Power-cum-Motor Control Centres (PMCCs)
  - Main Lighting Distribution Boards (MLDBs)
- 9.4.3.2 Low voltage switchboards shall be metal clad, arranged with self supporting units and assembled together in a row.
- 9.4.3.3 Internal physical separation / segregation of 415 V Switchboards shall be 3 B for Non-ACB feeders and 4 B for ACB feeders.
- 9.4.3.4 The switchboards shall be suitable for extension at both the ends.
- 9.4.3.5 Bus bars shall be of uniform cross section and supported on non-hydroscopic FRP insulators with adequate clearances and creepage distance to prevent flash over due to effect of dust/moisture.
- 9.4.3.6 The horizontal busbars as well as vertical droppers of LV switchboards shall have heat shrinkable insulated sleeves.

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- 9.4.3.7 Sufficient bus supports shall be given to give adequate mechanical strength during short circuits.
- 9.4.3.8 A continuous ground bus shall be provided at the bottom in the PCC/ PMCC/ EPMCC /MCC for grounding the PCC/PMCC/MCC.
- 9.4.3.9 Rated short circuit breaking capacity shall be 50 KA for 1 sec.
- 9.4.3.10 The PMCC,EPMCC, MCC, Main lighting distribution board and auxiliary services power board shall be provided with withdraw able air circuit breakers for incoming feeders and bus ties.
- 9.4.3.11 All feeders of 415 V switchboards shall be provided with MCCB except feeder rated more than 400A, for which ACB shall be provided. All outgoing feeders shall be draw-out type in all the switchboards.
- 9.4.3.12 All ACBs shall be electrically operated- EDO type only. Manual breakers are not acceptable. Each electrically operated breaker shall be provided with antipumping (94), Breaker fail (52BF) and trip free feature, trip annunciation (30) and lockout (86) relays. Lockout relay shall be hand reset type.
- 9.4.3.13 All ACBs shall be without any internal releases. The required protections shall be wired by means of external numerical relays.
- 9.4.3.14 Motor feeders below 75 KW rating shall be contactor controlled and 75 KW & above, these shall be ACB controlled with combined motor protection relay. All other feeders of 415 V switchboards shall be provided with MCCB except feeder rated more than 400A, for which ACB shall be provided. All outgoing feeders shall be draw-out type in all the switchboards.
- 9.4.3.15 Switchboards shall be provided with thermostatically controlled anti-condensation heaters.
- 9.4.3.16 All units in the MCC shall be completely accessible and removable from front. Both power and control connections shall be stab-in type.
- 9.4.3.17 Bus bar clearances shall conform to relevant Indian Standard/IEC for equipment voltages up to and including 500 V AC.
- 9.4.3.18 The switchboards shall be compartmentalized and individual feeder modules shall be draw-out type. Fixed type modules shall not be acceptable.
- 9.4.3.19 The draw out modules shall be standardized and it shall be possible to interchange any module with a module of same size. The components to control the equipment like MCCB, starter, auxiliary relay etc. shall be wired as a unit on the individual module. Safety shutter shall be provided to prevent direct access to live parts when the chassis is removed.
- 9.4.3.20 The entire draw out construction should be designed for safe operation during placement or removal of chassis. An earthing arrangement shall be provided which will make contact first before the power contacts are made and break last. Each module shall control one motor in general.
- 9.4.3.21 The door shall be interlocked so that it cannot be opened unless the isolating switch on that module is OFF. However, it shall be provided with a door defect mechanism for intentional opening when on line for testing and inspection purpose.
- 9.4.3.22 Control switches for breaker control shall be provided in each breaker cubicle. Circuit breaker shall be interlocked to prevent withdrawal of a closed breaker or insertion of a closed breaker. Each breaker shall be provided with anti pumping device.
- 9.4.3.23 Provisions shall be made to manually close/trip circuit breakers on loss of control voltage.
- 9.4.3.24 LV motor and power feeder above 100A shall have CBCT and Digital earth leakage relay.
- 9.4.3.25 All external hardware shall be of stainless steel only.

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- 9.4.3.26 The control compartment and power compartment shall be separate.
- 9.4.3.27 The LV PMCC/MCC/PCC control supply shall be 240VAC, 50Hz UPS supply fed from UPS Distribution Board of Separate 240 V AC UPS System dedicated for MCC control supply; Control Room & Substation lights, ECMS Equipment, Fire Detection & Alarm System etc. Breaker control supply shall be 110V DC.
- 9.4.3.28 All low voltage switchboards shall be provided with 20% spare outgoing feeders or minimum 1 No. of each rating & type (fully wired) and with all the components The timers shall be electronic type only. Pneumatic or synchronous type timers are not acceptable.
- 9.4.3.29 Each outgoing motor feeder shall consist of a number of components mounted in a module duly wired. In general outgoing feeder rated below 75 KW shall consist of:
- a) MCCB.
  - b) Control supply On/Off switch and fuse
  - c) Power Contactor
  - d) Electronic Digital Motor Protection Relay with built-in Earth Fault, Overload, Stalling, Single phase protection, etc. Thermal Overload Relay are not acceptable.
  - e) C.T for metering
  - f) Overload reset button.
  - g) Process Trip / ON / OFF indicating lamp with separate indicator fuse.
  - h) Auxiliary contactors for multiplication / control.
  - i) Test position limit switch and test PB
  - j) CT operated Ammeter for all motor feeders above 1.5 KW, all MOV and LOPs at both LCS and Feeder end.
  - k) Selector switches as per requirement.
- 9.4.3.30 Provision for indication of minimum following electrical parameters in 415V PCC / PMCC/ MCC shall be made:
- a) ON OFF, TRIP, TRIP CIRCUIT HEALTHY, TEST, SERVICE Position, Ready to close indication in ACB feeders.
  - b) The KWH meters on incomers shall have provisions for sealing for tariff purpose, as required.
  - c) MCC shall conform to the following as a minimum :
    - Motor starters rated for utilisation category AC3 and protection equipment with a minimum of type 2 co-ordination.
    - The number of modules per tier shall not exceed 6.
    - MCC incomer sizes and configurations rationalised to minimise spares holdings.
- 9.4.3.31 In PMCC, MCC and EPMCC Non-ACB feeders for motors or power may be double front type. ASDB, UPSDB, DCDB shall be single-front type.
- 9.4.4 Lighting Sub Distribution Boards
- 9.4.4.1 LSDB shall be provided with incoming and outgoing feeders as indicated in specification sheets of this specification.
- 9.4.4.2 All MCBs shall be of 10KA breaking capacity conforming to IS/IEC: 60898-1.
- 9.4.4.3 Two types of LSDB shall be provided, one suitable for safe area and other suitable for hazardous area.

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- i) LSDBs for installation in safe area shall be fabricated out of 2.5 mm thick rolled cold sheet steel.
- ii) The enclosure for installation in hazardous area shall be made of Cast Aluminium (LM-6) alloy in flameproof construction conforming to IP65. Both type of LSDB shall be dust, vermin and weather proof construction
- iii) Rain hood fabricated out of 14 SWG aluminium sheet shall be provided as an additional protection. 4 nos. holes suitable for 12mm bolts shall be provided outside the enclosure for fixing the LSDB.
- 9.4.4.4 The miniature circuit breakers (MCBs) shall be so mounted inside the enclosure that their operating knobs project outside for ease of operation. The cut out for the knobs on the enclosure shall be lined with gaskets. For further protection against ingress of dust, the portion where the knobs have protruded out shall be provided with another external cover, internally hinged at one side and with a knurled knob. The external cover shall be flushed with the main cover. Continuous neoprene gasket shall be provided to make the board completely dust and weatherproof.
- 9.4.4.5 All external hard ware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated.
- 9.4.4.6 The LSDB shall have bottom entry arrangement for all incoming and outgoing cables provided with heavy-duty Ex'd' double compression type rolled aluminum cable glands suitable for 1.1 KV XLPE-A-FRLS PVC outer-sheathed cables for hazardous area and Industrial type double compression Al cable gland for safe area.
- 9.4.4.7 Three phase and neutral bus bar system of adequate size shall be provided to which all outgoing and incoming MCBs shall be connected.
- 9.4.4.8 The internal wiring shall be carried out by means of single core PVC insulated 4 sq. mm stranded copper conductor cables.
- 9.4.4.9 Individual earth terminals shall be provided for the earth conductor of the outgoing cables beside the phase and neutral terminals.
- 9.4.4.10 Suitable label inscription consisting of black perspex with engraving for the board and circuit nos. of all outgoing feeders shall be provided. The label inscription of the board shall contain description and code no. as indicated in specification sheet. The circuit nos. of outgoing feeders shall be serially indicated as 1R, 1Y, 1B, 2R, 2Y, 2B.....
- 9.4.4.11 Two earthing terminals outside the board shall be provided.
- 9.4.4.12 The board shall be complete with terminal block, cable glands, cable lugs and other accessories as required.
- 9.4.4.13 The sub-distribution board must be certified by Central Mining Research Institute, Dhanbad or other statutory authority for use in specified hazardous area.
- 9.4.4.14 Typical SLD is attached for various types of LSDBs with incoming and outgoing feeders with this specification.
- 9.4.4.15 Suitable size Earth bus shall be provided inside the panel at bottom.
- 9.4.4.16 For all other specifications, refer PC183-TS-0809
- 9.4.5 Direct Current Distribution Boards
- 9.4.5.1 The Direct Current Distribution Boards (DCDBs) shall be single front, floor mounted non-drawout type for supply of 110 V DC control power to switchgears and panic lighting. Each Substation station shall have separate DCDB.
- 9.4.5.2 DCDB shall have 20% spare outgoing feeders of each rating & Type (fully wired) and with all the components

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9.4.6 Following potential free contact shall be available for each Motor feeders for indication in ECMS in addition to process requirement:

- Motor ON
- Motor OFF
- Ready to Start
- Motor Process Trip
- Motor Elect Trip

## 9.5 Motors

9.5.1 The rating of LV and HV motors shall be selected from the sizes as recommended in relevant Indian Standard/IEC.

9.5.2 All electric motors shall meet the standard IEC 60034-30-1.

9.5.3 The margin between the installed power and absorbed power shall be as recommended by the driven machine supplier but shall not be less than the following:-

Motor Rating	Margin above Driven M/C Absorbed Power
Less than 22 KW	25%
22 KW to 55 KW	15%
75 KW and above	10%

9.5.4 Voltage Ratings:

Voltage rating for the motors of different ratings shall be as below:

Upto 150 KW: 415 V, 3-phase, 50 Hz AC

All motors shall be designed for 3-Phase supply only.

9.5.5 The motors shall have maximum continuous rated duty S1 as per relevant Indian Standard/IEC. Rated duty for special duty motors wherever required e.g. cranes etc. Shall be considered as per driven equipment requirement.

9.5.6 All LV motors shall be TEFC type as per relevant Indian Standards/IEC while HV motors shall be TEFC/CACA type. All motors shall be Class-F insulated with temperature rise limited to that of Class-B.

9.5.7 Normally the motors shall be suitable for DOL starting. However, motors started through VFD shall be suitable to run at 30% to 100% of rated speed and compatible with the VFD.

9.5.8 All motors 30 KW and above shall have space heater provision.

9.5.9 All LV motors shall be of efficiency class 'IE3' as per latest applicable version of IS: 12615. All HV Motors shall be of high efficient and high power factor type.

9.5.10 The starting current i.e. breakaway current of 415 V Motors shall not exceed the values indicated in IS: 12615. Also there shall be no further positive tolerance on the values of breakaway of current.

9.5.11 Type test certificate of similar motor for use in specified hazardous area (if applicable) shall be furnished.

9.5.12 The duty cycle of the motor shall meet the process and driven machine requirement.

9.5.13 The mechanical parameters such as duty, mounting type, shaft extension, direction of rotation, starting torque requirements etc. shall be adequate for the application. Sleeve or anti friction type bearings shall be used. Vertical motors shall have thrust bearings suitable for the load imposed by the driven machinery. Motors with sleeve bearings may require proximity probes to measure shaft vibration adjacent and relative to the bearings.

9.5.14 Motor rated above 30 KW shall have on line greasing provision and for motor rated above 45 KW, grease outlet feature shall be provided.



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- 9.5.15 Motors rated 1000 kW and above shall have suitable measures to prevent flow of shaft currents and shall have 2 sets (i.e. 6 nos.) of PS class CTs for differential protection.
- 9.5.16 The motor shall be capable of withstanding the electro dynamic stress and heating imposed if it is started along with the driven equipment at voltage of 110% of the rated value.
- 9.5.17 During starting of large motor, the voltage may drop to 80% of the rated voltage for a period of 60 seconds. All electrical equipment, while running, shall successfully ride over such period without affecting system performance.
- 9.5.18 The motor may be subjected to sudden application of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and motor residual voltage. The motor shall be designed to withstand any torsional and/or high current stresses, which may result, without experiencing any deterioration in the normal life and performance characteristics.
- 9.5.19 Shaft voltage shall be limited to 200 mV.
- 9.5.20 For all other specifications, refer PC183-TS-0810.

#### 9.6 Rectifier-cum-Battery Charger

- 9.6.1 The Rectifier-Cum-Battery Charger shall be fully automatic using silicon controlled rectifier and shall consist of units as described below:-
- i) Main Float cum Load charger: To supply continuous load and keep the battery in healthy state.
  - ii) Standby Float cum Load charger: To supply continuous load & keep the battery in healthy state in case any abnormality in Main charger.
  - iii) Boost charger: To charge the battery set initially and recharge (after meeting emergency or sudden application of heavy loads.)
- 9.6.2 Battery Charger shall have 110 V DC system.
- 9.6.3 Substation shall be provided with redundant battery charger with 2x100% battery banks and connected to each Charger.
- 9.6.4 The battery and charger combinations shall be such as to ensure continuity of D.C. supply at load terminals without even momentary interruption.
- 9.6.5 AC Ammeter and AC Voltmeter on Charger Input; DC Ammeter, DC Voltmeter for charger output/ battery voltage and on demand type Battery Charge / Discharge Ammeter shall be provided.
- 9.6.6 Following analog signals through suitable transducer shall also be provided for hook-up in ECMS:
- Status of charging current (float & boost charging)
  - Battery current
  - Incoming voltage
- 9.6.7 Following potential free contacts shall also be provided for hook-up in ECMS
- DC under voltage
  - DC overvoltage
  - DC earth leakage
  - AC incoming power supply failure
  - AC input fuse blown-off
  - Thyristor/ diode failure
  - DC output fuse blown-off
  - DC battery fuse blown-off

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- Filter Capacitor fuse blown-off
- Load on Battery (using current direction sensing with time delay)
- Battery undervoltage/ Disconnected during discharge (using zero current sensing)
- Cubicle fan failure/ cubicle temperature high (for chargers with forced cooling).

9.6.8 For all other specifications, refer PC183-TS-0813.

#### 9.7 **Battery Sets.**

9.7.1 These shall be Ni-Cd Battery Sets shall be rated to meet the total DC power requirement for 2 hour after complete power failure.

9.7.2 Battery shall be designed with minimum temperature as 5<sup>0</sup>C.

9.7.3 Load Test of all Battery to be done at site. Battery will be accepted based on load test only.

9.7.4 For all other specifications, refer PC183-TS-0814.

#### 9.8 **PRESSURIZATION SYSTEM**

9.8.1 For all other specifications, refer PC183-TS-0839.

#### 9.9 **EMERGENCY STOP PUSH BUTTON STATION**

9.9.1 Emergency Stop push button station shall also conform to the Specification Sheet.

9.9.2 The enclosure shall be of Die cast Aluminum alloy and shall be of weatherproof construction. Rain hood fabricated out of 14 SWG Aluminum sheet shall be provided as an additional protection. The enclosure shall be suitable for mounting on wall or on steel structure. 4 Nos. holes suitable for 12 mm bolts shall be provided outside the enclosure for fixing the control stations.

9.9.3 All the components shall be mounted on a base plate inside the enclosure. No wiring shall be carried out on the front cover.

9.9.4 Each control station shall be provided with minimum 2 mm thick stainless steel nameplates indicating the code number and description of the equipment controlled by it. Similar labels shall be provided for all indication lamps, push buttons, control switches. The nameplate and label shall be fixed with screws only.

9.9.5 The enclosure shall be provided with two external earthing terminals with studs of 8 mm. dia. and shall be marked with earthing symbol.

9.9.6 LCS shall be painted with epoxy paint to shade 631 as per IS: 5.

#### 9.10 **Conveyor Control Panel (PLC Based)**

9.10.1 The conveyor control panel (CCP) is required to perform the various control operation to obtain the material flow in the desired patterns. Bidder/Vendor to develop control schematic diagram, trip/interlock logics and furnish the same for the safe & proper operation of all conveyor motors. Also refer instrumentation design philosophy for the same.

9.10.2 The conveyor control panel shall generally comprise of the following items.

- 415/240V single phase, 50Hz, double wound, air cooled control transformer of suitable rating with secondary leg earthed.
- Stabilized power supply units in 1+1 configuration.
- 2 pole rotary switch of suitable rating to control incoming supply.
- H.R.C. fuses.
- Individual and group selector switches. Group selector switches to be used in interlock conditions.
- Test interlock switches.

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- Start stop push buttons.
- Bypass arrangements for safety devices.
- Input, output and logic cards.
- Remote alarm intimating/acknowledgement Push Button Selector Switch (PBSS) of illuminated type.
- Fault annunciation window with type of fault & equipment, card no. inscribed.
- Alarm acceptance & testing, facilities.
- Lamp testing facilities.
- Indication lamp for :
  - Equipment on
  - Equipment off
  - Equipment tripped
  - Thermal overload operation
  - Zero speed switch operation
  - Belt sway switch operation
  - Gravity takes up switch operation
  - Bunker level probe operation
  - Any other as per system requirement
- Space heater of adequate capacity.
- Double Compression type Stainless steel cable glands.
- Pressure clamp type terminals of Elemex make.
- Bag counters / totalizers.

#### 9.11 **Vibrating Screen**

- 9.11.1 This shall include electromagnetic drive unit, transformer rectifier unit, control panel, local control station etc. and complete in all respects.
- 9.11.2 The drive unit shall consist of a stator, mounted suitably on the main frame housing a powerful electromagnetic coil, an oscillating armature separated from the stator by an air gap and supported on springs or fastened by clamps.
- 9.11.3 The frequency of the vibration shall be in synchronization with the supply frequency.
- 9.11.4 The rate of discharge shall be controlled by the pull of the magnetic coil which can varied by changing the input voltage to the coil. This variation should be possible from zero to the maximum rate.
- 9.11.5 The control panels & local panels shall be fabricated from 2mm cold rolled sheet steel, dust and vermin proof type (minimum IP55 degree of protection). Necessary stop push button and On indication lamp shall be provided as a minimum along with control switch on local panels.

#### 9.12 **MOTORISED FLAP GATES**

- 9.12.1 Flap gates shall be of robust construction and actuated by means of a suitable geared motor. The geared motor shall be capable of providing the thrust required to operate the gate against the falling material load.
- 9.12.2 The equipment shall be capable of being operated manually by means of a suitable chain-link mechanism, when the motor is under repair.
- 9.12.3 Suitable platform with access ladders and handrail shall be provided to approach for normal & maintenance purpose.

#### 9.12.1 **EOT crane & hoists**

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- 9.13.1 Electrical system of EOT crane shall include supply, installation, testing & commissioning of following items
- Squirrel cage induction motors of duty suitable for required crane application
  - Power control panel
  - Control stations
  - Limit switches
  - Electromagnetic brakes
  - Power & control cables with accessories
  - Earthing
  - Any other items, not specified, but required for safe and proper operation.
- 9.13.2 The bidder shall provide one no. 415V feeder from their PMCC/EPMCC for each crane / hoist based on the power requirement (running and peak) of EOT crane, and terminate the feeder cable in an isolator located at one end of the bay at a height of 1.5m from the operating floor. Moreover further distribution of power from this isolator to respective loads of EOT crane system shall also be in bidder scope.
- 9.13.3 Electrical equipments located indoor shall have minimum IP-65 degree of protection.
- 9.13.4 The minimum clearance and creepage distance of M.V. equipment shall be 20 and 28 mm respectively and shall be positively maintained after connections.
- 9.13.5 Enclosure for limit switches, pendant push button, junction boxes and magnets etc. shall be of cast aluminium. Enclosure for control panel, transformer etc may be of sheet steel. The thickness of the sheet steel for the enclosure shall not be less than 2.5 mm. All enclosures shall be suitably painted to withstand atmospheric pollution.
- 9.13.6 The power rating of the motors shall be 25% higher than the design requirement of the driven equipment, under the specified service and duty conditions.
- 9.13.7 All motors shall be of squirrel cage type and so designed that smooth acceleration or deceleration of the load is possible without any jerks. Further a maximum displacement of 2 mm when starting and stopping the motor in quick succession shall be guaranteed.
- 9.13.8 The motors for main hoist and micro hoist shall be suitable for intermittent duty type S4 with 60% C.D.E. and 300 starts / stops per hour. The motors for long travel and cross travel shall be suitable for S2 duty for 60 minutes.
- 9.13.9 Brakes for main and micro hoist motor shall be suitable for S4 duty, while for long and cross travel hoist motor shall be suitable for S2 duty.
- 9.13.10 For other specifications refer ES:8208 and relevant mechanical specifications enclosed elsewhere in ITB
- 9.13 Local Control Stations**
- 9.14.1 Local Control Stations shall be provided for all motors for testing and maintenance purpose when the selection is made is "LOCAL MODE" Operation. The essential features of the LCS shall be as given below:
- 9.14.2 LCS shall be pressure die cast aluminium housing (preferably),, dust & vermin proof, weatherproof, suitable for wall or pedestal mounting with equipment mounted on a base plate inside and behind a front cover (bolted type).
- 9.14.3 Provision for pad locking in OFF position shall be provided.
- 9.14.4 Local control stations for breaker controlled HV and LV motors shall be provided with T-N-C switch, Ready to Start Indication, ON indication, Space Heater ON Indication, Trip

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Indication, Local-OFF-Remote Control switch and ammeter. Moreover, space heater ON indication lamp, trip indication lamp shall also be provided at the switchgear panel.

- 9.14.5 Local control stations for contactor controlled LV motors shall be provided with start/stop push buttons, ammeters and Space Heater ON Indication (for motor rated 30KW and above), ON indication, Local-Remote switch (as required) for the motors having rating 5.5 KW and above. If required from process point of view, ammeter shall be provided for motors below 5.5 KW also.
- 9.14.6 Each element for start and stop shall be provided with 1 NO + 1 NC contact. The push button construction shall be such to avoid mal-operation due to vibrations.
- 9.14.7 All local control stations shall have weather proof IP-65 enclosure and be suitable for installation in relevant hazardous area, gas group and temperature class. Canopies of suitable size shall be provided with all local control stations.
- 9.14.8 All components shall be completely wired up to terminal block and also provided with earthing terminals.
- 9.14.9 Inscriptions on corrosion resistant metal strips giving drive description, mechanism number and functional requirement shall be provided.
- 9.14.10 Two numbers of LCS shall be provided for the motors, which are installed at elevated platforms. One shall be installed at ground level and the other near the motor.
- 9.14.11 The ammeter shall be flush mounting, moving iron spring controlled type, of accuracy class 1.5 as per IS: 1248, with square face of minimum size 72 mm × 72 mm having scale range 0-90 degree. The ammeter shall be provided with uniform scale up to CT primary current and compressed end scale up to the 8 times the C.T. primary current. Adjustable red pointer shall be provided to indicate the full load current of the motors. Zero adjusters shall be provided for operation from the front of the meter. All ammeters shall be operated through 1 Amp. CTs only.
- 9.14.12 Complete Push Button along with its actuator mounted on the cover with wiring done through flexible cables with proper protection.
- 9.14.13 Preferably Ring Type lug and suitable TB to be used for connection, to avoid loose connection.
- 9.14.14 All spare hole to be plugged with suitable metal plugs.
- 9.14.15 For all other specifications, refer PC183-TS-0817.

#### 9.14 Switch Sockets

- 9.15.1 Both 3 Phase switch sockets and 1 Phase switch sockets shall be provided at Min. 20 M interval. Maximum 2 Nos. 63A switch sockets and 2 Nos. 16A switch sockets shall be connected in one circuit.
- 9.15.2 Following minimum cable sizes to be considered for individual switch sockets, however actual sizes shall be subject to approval satisfying the current and voltage drop criteria.
  - i) For 25A Sw. Sockets  
Switch sockets: 3Cx25 sq.mm A2XFY cable for incoming and outgoing  
Plug: 4Cx2.5 sq.mm. flexible copper conductor cable
  - ii) For 63A Sw. Sockets  
Switch sockets: 3.5Cx50 sq.mm A2XFY cable for incoming and outgoing  
Plug: 4Cx2.5 sq.mm. flexible copper conductor cable
  - iii) For 250A Sw. Sockets  
Switch sockets: 3.5Cx240 sq.mm A2XFY cable for incoming and outgoing

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Plug: 4Cx95 sq.mm. flexible copper conductor cable

9.15.3 For all Other Specifications, Refer PC183-TS-0811.

#### 9.15 **Conduits**

9.16.1 Conduits shall be of heavy gauge with minimum wall thickness of 1.4 mm (upto 25 mm dia) and 2 mm (above 25 mm dia) rigid steel, hot-dip galvanized, cut square, reamed, threaded and screwed tight at all joints.

9.16.2 Conduits entrances to pull boxes and switches shall have double lock nuts & insulating bushings. No running thread shall be used.

9.16.3 Flexible metallic conduit shall be used for connection to equipment which are subject to vibration and also for connection to level /limit/pressure switches. Conduit runs shall be supported at an interval of 750 mm for vertical run and 1000 mm for horizontal run.

Conduits shall be sized so that conduit fill (ratio of total cable area to conduit area) shall not exceed the following :

One Cable : 53%

Two Cable : 31%

Three Cables & Up : 40%

#### 9.16 **EMERGENCY SAFETY DEVICES**

a) Following emergency safety device shall be provided at the specified intervals to trip the conveyor under abnormal operating conditions:-

- i. Pull cord switch
- ii. Belt sway switch
- iii. Zero speed switch
- iv. Emergency stop push button
- v. Gravity take up switch
- vi. Chute choking device
- vii. Bunker level indicating device

In addition status of all safety switches on CCP also to be also provided.

#### **PULL CORD SWITCH**

a) The pull card switch shall be installed only on the normal walk way side of each conveyor at an interval of 20 m with a minimum of one for each conveyor for tripping the conveyor under emergency.

b) The switch shall be heavy duty type pedestal mounted, enclosed in a dust proof cast aluminium IP-65 enclosure/stainless steel IP-65 enclosure with removable cover, complete with rope clamping arrangement and a set of normally open/normally close contacts rated or open on the operation of deriving shaft through the lever which shall be actuated by pulling the flexible steel wire rope of about 5 mm dia.

c) The operating position of the switch shall have latches for safety purpose and resetting of the latch shall only possible by local manual operation. The lever shall operate on either side of its normal vertical axis.

d) The switch shall be provided with sturdy terminal spring to take the tension of 100 meters long steel wire rope. An arrangement for the adjusting the angle of lever on the shaft shall be provided. The switch shall be complete with 1 no. of earthing terminal, double compression type brass nickel coated cable glands, terminal blocks and cable lugs etc. for termination of 3X2.5 sq.mm XLPE insulated armoured and PVC sheathed copper conductor FRLS cable. The complete details, of limit switch and assembly sketches shall be furnished.

#### **BELT SWAY SWITCH**

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- a) The belt sway switches shall be provided along with timer (range 2 min. to 15 min.) to stop the conveyor in case of excessive sway in the belt on either side. These shall be mounted on the both side of the conveyor at an interval of 50 meters or minimum one pair for shorter length of conveyor. The switch shall be heavy duty type, enclosed in dust and weather proof cast aluminium IP-65 enclosure/stainless steel IP-65 enclosure.
- b) The switch shall comprise of horizontally mounted spring return type vertical lever which shall be suitable for operation on its neutral vertical axis, a roller fitted on the lever which is suitable to rotate around its vertical axis. The resetting of the switch shall be possible by local manual operation. The switch shall be complete with a set of normally open/normally close contacts rated for 10A, 240V AC 1 no. earthing terminal, compression type cable glands suitable for 3x2.5 sq.mm (Cu) control cable, cable lugs, terminal block etc. The complete details of switch and assembly sketch shall be furnished.

### **ZERO SPEED SWITCH**

- a) 240V UPS power to be provide to all zero speed switch.
- b) The zero speed switch with timer of suitable range shall be required to provide adequate protection to conveyor against the following:-
  - Excessive belt slip and belt under speed.
  - Belt breakage or snapping
- c) The switches shall be provided one per conveyor. The switches shall be heavy duty type enclosed in dust and weather proof cast aluminium IP-65 enclosure/stainless steel IP65 enclosure. The switch shall be turn on mounted type having centrifugal switch chamber on one side and extended rotating spindle with pulley at other end.
- d) The pulley mounted on the spindle shall be so designed that it shall be able to rotate with the friction against the belt surface with as minimum slip as possible. The arrangement shall be provided to adjust the belt speed within the desired limits. This shall be mounted on the tail end side of the conveyor.
- e) The switch shall be complete with a set of normally open/normally close contacts rated for 10A, 240V AC, and 1 no. earthing terminals, cable glands, suitable for 3CX2.5 sq.mm copper conductor control cable, cable lugs, terminal block etc. The complete details of the switch and assembly sketches shall be furnished.

### **EMERGENCY STOP PUSH BUTTON**

- a) The stop push button shall be provided in staggered manner at an interval of 20 m with a minimum of one on each side of conveyor for tripping the conveyor under emergency.
- b) The push button shall be heavy duty type enclosed in dust and whether proof cast aluminium enclosure/ SS enclosure and shall be suitable for wall/structure mounting.
- c) The push button shall be red colour, un-shrouded type having a set of normally open/normally closed contact rated for 10A, 240V AC and shall have padlocking facility. The push button shall be complete with 1 no. earthing terminal cable glands suitable for 3CX2.5 sq.mm copper conductor control cable, cable lugs and terminal block etc.

### **STEEL WIRE ROPE & 'U' CLAMPS**

- a) Galvanized steel wire rope shall be 6/19 construction, ordinary right hand lay, 5 mm dia. conforming to IS-3459 and provided with PVC sleeve of suitable thickness.
- b) The steel wire shall be provided all along with conveyor with one end tied to 'U' clamp and other end to lever of pull cord switch as per drawing no. **PDS/E-025** attached.

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- c) Steel 'U' clamp fabricated out of 50X7 flats, complete with all nuts & bolts for fixing 5 mm dia. galvanized steel wire rope as per drg. No. **PDE/E-025**. The 'U' clamp shall be duly painted to withstand the corrosive chemical atmosphere prevailing inside the conveyor gantries due to urea dust.

### **Klaxon**

- a) Electric Klaxon, heavy duty type, enclosed in a dust and weather proof cast aluminium epoxy painted enclosure, suitable for still air range of 250 meters and rated for half hour at 240V single phase 50Hz AC supply.
- b) The Klaxon and beacon shall be provided all along with conveyor at an interval of 100 meters apart with a minimum of 1 per conveyor and 1 per transfer tower and at any convenient location to sound the alarm before the start up of plant and any abnormal operation in conveyor system.

### **9.17 DRY TYPE LIGHTING TRANSFORMERS**

- 9.18.1 The dimensions of the transformer shall be furnished with bid.
- 9.18.2 Type test certificate of similar type of dry type lighting transformer shall be furnished by the bidder.
- 9.18.3 One winding RTD shall be provided in each phase of the windings.
- 9.18.4 Additional Fitting: The transformer shall be provided with digital temperature scanner unit to monitor the winding temperature. The scanner shall be provided with 2 output contacts for alarm and trip signal. The temperature scanner shall be mounted on enclosure.
- 9.18.5 Transformers shall be natural air cooled type.
- 9.18.6 The losses shall be indicated by the vendor and shall be guaranteed, within tolerable limits at rated voltage and frequency as per level 3 of IS: 1180.
- 9.18.7 Class-H insulating material shall be used.
- 9.18.8 Type test certificate of similar type of dry type lighting transformer shall be furnished.
- 9.18.9 Spares for 2 years of operation and maintenance shall be quoted in the SOR.
- 9.18.10 Commissioning Spares as required shall be supplied.
- 9.18.11 Any other spare parts not specified, but required, shall also be quoted.
- 9.18.12 All spare parts shall be identical to the parts used in the equipment
- 9.18.13 For all Other Specifications, Refer PC183-TS-0829.

### **9.18 Electrical Control & Monitoring System (ECMS)**

- 9.19.1 Electrical Control & Monitoring System (ECMS) shall be provided for Supervision, control, monitoring, data acquisition, data logging & printing of status of all important electrical equipment & feeders and Load Shedding Scheme as per the recommendations of the system study report as per process requirement and in consultation with Owner/Consultant for entire fertilizer complex, by EDS LSTK Contractor.

Data concentrator Panel and other ECMS System Equipments including PC console, chairs, furniture etc. for 'Dyke & Associated Facility' shall be in EDS LSTK Contractor's scope. However, Contractor has to consider space for same in separate room in Substations, as per NIT.

Contractor shall provide multifunctional dual channel transducers in all the breaker feeders as well as contactor feeders of all important & critical Loads. Also, supply & installation of Network Switches and extend all signals up to Network Switches shall be in the scope of Contractor. Network Switch shall have 20 % spare parts.



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Minimum Inputs and Outputs to be considered for ECMS for proper operation/control, effective monitoring and load management shall be inclusive of but not limited to the following:

a. **Transformers:**

Oil Temperature, Winding temperature, Conservator Oil Level and moisture ppm of Oil through 4-20 mA signal / Modbus communication and status of Buchholz Relay.

b. **Incomer /Bus coupler/ Feeder ( Power/Motor)**

KW, KVA, KVAR, KWh, PF, VOLTAGE, CURRENT

ON, OFF, TEST, SERVICE, TRIP ON FAULT, TRIP CIRCUIT HEALTHY, CONTROL SUPPLY ON, RELAY WATCH DOG, FAULT DETAILS, DISTURBANCES RECORDER.

Remote ON & OFF Control from ECMS.

c. **LT motor feeder of breaker controlled motors in EPMC/PMCC/MCC**

KW, KVA, KVAR, KWh, PF, VOLTAGE, CURRENT

ON, OFF, TEST, SERVICE, TRIP ON FAULT, TRIP CIRCUIT HEALTHY, READY TO START, PROCESS TRIP, EMERGENCY STOP, LOCAL/REMOTE selection on LCS, CONTROL SUPPLY ON, RELAY WATCH DOG, FAULT DETAILS, DISTURBANCES RECORDER.

Remote ON & OFF Control from ECMS.

d. **LT motor feeder of Contractor controlled motors in EPMC/PMCC/MCC**

ON, OFF, TRIP ON FAULT, READY TO START, PROCESS TRIP.

e. **Breaker Controlled Power feeder in PCC/MCC/ASPB**

KW, KVA, KVAR, KWh, PF, VOLTAGE, CURRENT

ON, OFF, TEST, SERVICE, TRIP ON FAULT, TRIP CIRCUIT HEALTHY, CONTROL SUPPLY ON, RELAY WATCH DOG, FAULT DETAILS, DISTURBANCES RECORDER.

Remote ON & OFF Control from ECMS.

f. **UPS**

Load on Inverter, Load on Bypass, Load on Battery, Battery on float/ boost charging mode , Charger failure , Inverter failure ,AC mains failure, DC under voltage, DC Over voltage ,Automatic retransfer of load to inverter inhibited ,

Fan failure ,AC Voltage , current & frequency of each inverter , AC incoming power supply Voltage & voltage , DC current at each rectifier output.

g. **Battery & Battery Charger**

Status of charging current (float & boost charging) , Battery current ,Incoming voltage, Load Voltage DC, Load current DC, DC under voltage

DC overvoltage , DC earth leakage ,AC incoming power supply failure ,AC input fuse blown-off ,Thyristor/ diode failure ,DC output fuse blown-off ,DC battery fuse blown-off ,Filter Capacitor fuse blown-off ,Load on Battery (using current direction sensing with time delay) ,Battery under voltage/ Disconnected during discharge (using zero current sensing) ,Cubicle fan failure/ cubicle temperature high (for chargers with forced cooling).

h. **VFD**

KW, KVA, KVAR, KWh, PF, VOLTAGE, CURRENT, SPEED , SPEED REFERANCE.

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ON, OFF, TRIP ON FAULT, TRIP CIRCUIT HEALTHY, FAULT DETAILS

Remote ON & OFF Control from ECMS.

All Multi-function Meters of all HT, LT Switchboard , LDB, etc. to be connected with ECMS.

All connection/ wiring up to I/O Rack shall be in the scope of Contractor. Connection/wiring from Network Switch to Data Concentrator Panel & Centralized ECMS shall be in Owner's scope. However, cable tray, support for cable trays etc. for Cables from Network Switch to Data concentrator Panel & Centralized ECMS System (within battery limit of Dyke & Associated Facility) shall be in Contractor's scope.

Redundant Power Supply from 240 V UPS Distribution Board to all ECMS equipment, OWSs, EWSs etc. (up to termination to I/O Racks, OWSs, EWSs etc.) shall be in Contractor's scope.

9.19.2 All relays and energy meters shall have communication facility for serial communication (Relays on IEC-61850 protocol and Meters on MODBUS protocol).

#### 9.19 Junction Boxes

9.22.1 Junction boxes shall be provided on the machine body, where the terminal block of electrical equipment is not adequate for the termination of aluminium cables or to terminate an external multi-core control cable.

9.22.2 Separate junction boxes shall be provided for power and control cables. These shall be mounted at convenient and easily accessible locations.

9.22.3 These shall be of cast aluminium enclosure having IP65 degree of protection and adequately sized, with terminal blocks, cable lugs and cable glands as required.

9.22.4 The cabling between these junction boxes and electrical equipment shall be in Contractor's scope of work.

### 10.0 CABLING

#### 10.1 Cables

10.1.1 All HV & LV power and control cables for HV/LV switchgear shall be supplied and laid by the contractor. Terminations at switchgear end and at the equipment end shall be in contractor's scope. Supporting and laying of these cables shall also be in contractor's scope. Termination of HV/LV cables at HV/LV motor end and HV switch gear end including supply of heat shrink type termination kit for HV cables shall be in contractor's scope. Supply and execution of heat shrink type straight through jointing kits for HV cables shall be in the scope of the Contractor (if required).

10.1.2 Cables shall be sized considering the following factors.

- Maximum continuous load current
- Voltage drop
- System voltage
- Laying conditions
- De rating due to ambient air temperature, ground temperature, grouping and proximity of cables with each other, thermal resistivity of soil etc. shall be taken into account
- Short circuit withstand criteria.

10.1.3 All HV power cables shall be made of stranded aluminium conductor with XLPE insulation, PVC inner sheathed FRLS type, armoured, PVC outer sheathed FRLS type,

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conductor screen, insulation screen and construction as per IS: 7098 (Part 2). HV cables shall be of unearthed type.

Single core HV Power cable shall be of aluminium conductor. The construction of same shall be as per above.

- 10.1.4 All LV power cables shall be with stranded aluminium/copper conductor with XLPE insulation, PVC inner sheathed FRLS type, armoured, PVC outer sheathed FRLS type and construction as per IS: 7098 (Part 1). Power cables with conductor size upto and including 16 sq. mm shall be with copper conductor, conductor size 35 sq. mm and above shall be aluminium conductor.

Single core LV Power cable shall be of aluminium conductor. The construction of same shall be as per above

- 10.1.5 All control cables shall be with 2.5 sq. mm, stranded copper conductor with XLPE insulation, PVC inner sheathed FRLS type, armoured, PVC outer sheathed FRLS type and construction as per IS: 7098 (Part 1). Control cables shall be twisted pair or shielded wherever electro-magnetic/electrostatic interference is anticipated.

- 10.1.6 All control cables shall have 20 % spare cores. All cores shall be identified with numerical core numbers printed on core in addition to colour coding.

- 10.1.7 All cables shall be armoured and shall have extruded inner and outer sheath.

- 10.1.8 Cables connected in parallel shall be of the same type, cross section and terminations.

- 10.1.9 All power and control cables shall be in continuous lengths (except for very long feeders) without any joints. The cables used for lighting and wires in conduits shall have appropriate junction boxes with adequately sized terminals. Cable joints in hazardous areas shall not be permitted.

- 10.1.10 In case of length of any control cables comes out to be more than 400 Meters, FO cable with suitable accessories for proper connectivity shall be provided

- 10.1.11 Cable Reel Drum (Motor operated) shall be provided for Wagon Loader and all other places where the cable travel distance is more than 50 mtrs. .

- 10.1.12 The maximum voltage drops in various sections of the electrical system shall be within limits stated in the following table:

Sl.No.	System Element	Maximum Permissible Voltage Drop
a)	High voltage cables for general distribution	1 %
b)	Bus duct / Cable between transformer secondary and Switchboards	0.5%
c)	Cable between PMCC and MCC or auxiliary switchboard i) MCC / Auxiliary Switchboard near PMCC ii) MCC / Auxiliary Switchboard situated remote from PMCC	0.5% Note-3b 2 to 2.5% Note-3a
d)	Cables between HV Switchboard and HV Motor (during running)	3%
e)	Cable between PMCC and motor (during running)	5%
f)	Cable between MCC (situated near PMCC) and motors	5%
g)	Cable between MCC (situated remote from PMCC) and motors	3%
h)	Cable between Auxiliary Switchboard / MLDB and Lighting Panel / Power Panel	1 to 1.5% (Note-2)

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i)	Circuit between lighting panels and lighting points	4% (Note-2)
j)	DC Supply Circuit (electrical Controls)	5% and/or as per instrumentation requirement
k)	DCDB to Control Room	2% (Note-1)
l)	UPS outgoing circuit	5% (Note-1)

**Note-1**

Minimum voltage available across any instrument in the field / control room / satellite rack room shall be as per instrumentation design basis. Distribution system for instrumentation supplies shall be designed accordingly. In case of any conflict between electrical equipment specification sheet and instrumentation design basis report, the latter shall govern regarding instrumentation power supplies.

**Note-2**

In case of difficulty in achieving specified voltage drops in cables up to lighting panel, 5% drop from Auxiliary Switchboard / MLDB up to lighting points may be permitted.

**Note-3**

- a) Higher voltage drop may be permitted between PMCC and remote mounted MCC / ASB; if overall voltage drop up to motor (from PMCC) is limited within 5.5%.
- b) For large substations 1% drop may be permitted.

The maximum voltage drop at various buses during start-up of large motor and / or motor reacceleration conditions shall be within the limits stated below:-

Sl. No.	System Element	Operating Condition	Maximum Permissible Voltage Drop
a)	At the bus bars of the worst affected Switchboard	Start-up of the large HV motor with other loads on the bus or reacceleration of a group of HV motors (Simultaneous start-up or group reacceleration of HV motors is not envisaged)	10%
b)	At the bus bars of the worst affected MV Switchboard (PMCC / MCC)	Start-up of large MV motor with other loads on the bus, or reacceleration of a group of MV motors.	10%
c)	Cables between HV Switchboard and motor	Motor start-up or reacceleration	5% (Note-a)
d)	Cable between MV Switchboard (PMCC / MCC) and motor	Motor start-up or reacceleration	10% (Note-a)

**Notes:**

- a) Higher voltage drop in motor cables may be permitted, in case the conditions given in Note b), c) and d) are complied.

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- b) The voltage available at the motor terminals during start-up must be sufficient to ensure positive starting or reacceleration of the motor (even with the motor fully loaded, if required), without causing any damage to the motor.
- c) For medium voltage motors, the voltage available at the motor terminals must not be less than 80% of the rated value during start-up or reacceleration.
- d) For high voltage motors, the voltage available at the motor terminals must not be less than 85% of the rated value during start-up or reacceleration.
- e) Soft Starter / VFD Starter shall be considered for starting large HV motors if essential / unavoidable as per system design requirement / equipment design limitation. For cases other than starting limitation, requirement of soft starter / VFD for any drive shall be confirmed by Process Department.
- f) Unless otherwise specified as in clause e), all HV motors and MV motors shall be suitable for Direct on Line (DOL) starting.
- 10.1.13 For breaker control motor circuits the selection of size will be made ensuring that the cable shall withstand a short circuit fault directly for 0.2 sec.

Suitable derating factors based on the site ambient conditions, method of laying and the no. of cables laid together shall also be applied.

- b) Short circuit withstand time (seconds) shall be as follows for Breaker controlled feeders.

Bus duct	1 Sec.
Feeders to motors and transformer	0.25 sec
Feeders from PCC/PMCC to MCC	0.6 sec
Main 11 KV primary distribution feeders	0.7 sec
11 KV cable from transformer to switch board	1 sec
Incomer from other switchboard	0.6 sec

- 10.1.14 The minimum size of power cables shall be 2.5 sq. mm (Cu).
- 10.1.15 The control cables shall be 2.5 sq. mm (Cu). However, wiring in the panel/switch boards may be by means of 1.5 sq. mm (Cu) cables except for CT wiring which shall be 2.5 sq. mm. All the control and power wiring shall be carried by using FRLS wires only.
- 10.1.16 In case of length of any control cables comes out to be more than 400 Meters, FO cable shall be provided.
- 10.1.17 For all other specifications, refer PC183-TS-0815.

## 10.2 Cable Laying

- 10.2.1 The cables shall generally be laid on overhead racks. Pipe racks where available, shall be used to support the cable racks.

HV power cable shall be laid on cable tray in single layer having 1D spacing between the cables. LV power shall be laid on cable tray in touching formation in single layer. Control cable shall be laid on cable tray in touching formation.

HV Power, LV Power and Control shall be on separate trays. Instrument and electrical cable trays shall be separate.

Cables shall be clamped properly on the cable rack in such a way that position and layout of a particular cable shall not change throughout the rack so that it can be easily traced during maintenance jobs.

Walkway of 750 MM to be considered for access to Electrical / Instrument cables on pipe rack.

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From substations to various electrical consumers, cable shall be laid overhead. However, wherever overhead cable routing is not feasible Contractor can go for cable trench / slit (Refer PDS attached with the NIT) as per the site requirement.

Wherever, pipe rack is not available and space for overhead cable laying is possible then dedicated structure for cable shall be made for cable laying and shall be in scope of Contractor

- 10.2.2 The cable racks shall be ladder type, pre-fabricated from suitable hot dip galvanised steel. Maximum cable tray size shall be 600mm wide. Maximum supporting span shall be 2 Mtrs. Cable trays shall be designed considering 25% margin for future use.

All cable racks must be provided with GI flat strip of size 75mm X12 mm as running earth all along the tray.

- 10.2.3 All FO cable shall be laid through HDPE pipe with all accessories( Connecting arrangement ).
- 10.2.4 All cables shall be terminated using suitable cable lugs.
- 10.2.5 All HV terminations and joints shall be of RAYCHEM make only.
- 10.2.6 Bimetallic lugs shall be provided, as required.
- 10.2.7 In Control Room (excluding false ceiling) and Substation, lighting cable shall be laid in concealed conduit.
- 10.2.8 For all other specification of cable racks, refer PC183-TS-0816 & PDS attached.

## 11 ILLUMINATION SYSTEM

### 11.1 General

- 11.1.1 LED type lighting shall be provided. The average illumination levels in the various sections of the plants shall be as indicated in Annexure-I. All the plants and area lighting shall be energy efficient.
- 11.1.2 All Lighting fixtures shall be corrosion proof and weather proof and shall be in scope of Contractor.
- 11.1.3 LED type lighting shall be provided for all areas. The minimum illumination levels in the various sections of the plants shall be as indicated in Annexure-I.

LED shall conform to the following types and standards:-

Product Type	Safety Standard	Performance Standard
Self ballasted LED lamps for general lighting services > 50 V	IEC 62560 Latest Edition	IEC 62612 / PAS Publicly available specification
Control gear for LED modules	IEC 61347-2-13 Latest Edition	IEC 62384 Latest Edition
LED modules for general lighting	IEC 62031 Latest Edition	IEC / PAS 62717 Latest Edition
LED luminaries	IEC 60598-1 Latest Edition	IEC / PAS 62722-2-1 Latest Edition Luminaries performance – Part 2-1: particular requirements for LED
LEDs and LED modules	IEC TS 62504 Terms and Definitions for LEDs and LED modules in general lighting.	

Maintenance factor for indoor lighting shall be considered as 0.7 and for Outdoor lighting 0.6.

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The colour rendering index shall not be less than 90%.

The LED lights shall work satisfactorily at the design temperature of 50 Degree Celsius.

All the LED fittings shall be selected in accordance with Hazardous Area Classification.

The life assessment of LEDs shall include control gears/ driver as well.

11.1.4 The specified illumination level shall be maintained after considering maintenance factor 0.5 for Coal Dust Area , 0.6 for plant & outdoor areas (other than Coal Dust Area) & 0.7 for indoor areas and utilisation factor as per manufacturer catalogues for size of room & type of fixture.

11.1.5 Separate area wise panic lights, fed from 110 V DCDB, shall be provided at strategic locations for safe evacuation of operation personnel. These shall be switched 'ON' automatically on failure of power supply to main lighting board and shall switch 'OFF' automatically on resumption of mains or after 1 hour of power failure to avoid draining of the battery. Location of these lights shall be judiciously decided from safety considerations. The outdoor lighting shall be photocell/timer controlled.

11.1.6 Voltage drop at the fixture from the MLDB bus shall not exceed 3%.

11.1.7 Aviation lights shall be provided on tall structures and all isolated structures. . Aviation Lighting shall be in accordance with International Civil Aviation Organization (ICAO) Publication Annexure 14 and to Indian Standards, together with the approval of local aviation authority..

LED type Low Intensity Aviation Obstruction Light suitable for 240V, 50 Hz supply. It shall be covered under Indian patent act (Govt of India) No. 188995. Degree of protection shall be IP-65.

The illumination intensity of aviation lights and mounting height shall be considered based on vicinity of civilian air terminal within 1 km radius. Aviation lights at each location shall be fed from two separate and distinct DBs (one fed from normal bus and another fed from emergency bus of MLDB). In case aviation lights are not switched ON for any reason, whatsoever, a signal shall be sent to control room which will sound buzzer and also result in flashing of red light. On acknowledgement, buzzer shall stop but flasher will continue unless aviation lights are turned ON.

The fixtures shall have body of corrosion resistant aluminium alloy casting and shall be suitable for outdoor use and mounting on 40 mm NB G.I. pipe. Necessary electrical threading shall be tapped in the fixture for mounting.

11.1.8 Plant lighting circuits shall be single phase (Phase & Neutral) rated 240 V AC. Each circuit shall be rated to 16A but not loaded more than 8A. A minimum of 25% of MCBs of each board shall be left as spares. The load on one lighting sub-circuit of lighting sub-distribution board and junction box shall be limited to 1000W approx.

11.1.9 The lighting sub-distribution board for control of lighting shall be standardized as 18-way, 15-way, 12-way, 9-way and 6-way type.

11.1.10 In plant office rooms, wall mounting boards shall be installed to control the lighting. These boards shall include switches for lights, fans, 15A/5A plug sockets and fan regulators etc.

11.1.11 15A plug sockets shall be fed through separate circuit of lighting sub-distribution boards/junction box having ELCB of 30mA.

11.1.12 16A plug sockets shall be fed through separate circuit of lighting sub-distribution boards/junction box.

11.1.13 Illuminated exit sign shall be provided in substation / Control Room .

11.1.14 Power factor of complete fitting shall be 0.95 min. at 230 V.

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- 11.1.15 Lights from LED's shall be soothing to eye and without any bright spots on the floor/objects illuminated by the luminaries.
- 11.1.16 The driver shall be mounted internally and be replaceable with the aid of commonly available hand tools.
- 11.1.17 The LED module or array shall be designed in such a way that the failure of one LED shall not affect additional LED's.
- 11.1.18 Life expectancy of LED Luminaries shall be minimum of 50000 hrs with greater than 70% of rated lumen output.
- 11.1.19 Min. efficiency of LED driver: The minimum efficiency of LED driver shall be 85% for driver power output rating  $\leq 40W$  and 87% for driver power output rating  $> 40W$ .
- 11.1.20 Short circuit protection /Open load protection shall be required for LED fixtures.
- 11.1.21 Surge Protection for minimum 2kV for indoor and minimum 3kV for Outdoor LED systems shall be provided. However, if a site is prone to lightning and surges 10kV surge protection shall be required. In case of outdoor luminaries, the Surge Protection Device (SPD) should be series type with fail safe.
- 11.1.22 Color temperature of LED Luminaries: 5700K
- 11.1.23 Cover type for outdoor type fittings shall be Toughened glass or UV stabilized polycarbonate whereas, whereas, for indoor and non-weather proof items, UV stabilized Poly Carbonate can be used.
- 11.1.24 For more details, refer PDS attached.
- 11.1.25 For lighting fixtures and 16 Amp plug socket circuits, 3 core 2.5 sq. mm (Cu) cable shall be used.

11.2 LED Tube Lighting Fixtures (inside Substations)

- a) High quality LED fluorescent tube twin batten type complete with 2 X 20W tube eco friendly, no UV radiation as per the specification tabulated below:

Sl. No.	Parameter	Technical Specification
1.	Degree of Protection	IP-20
2.	Lumen output per Lamp	$\geq 2000$
3.	CCT	6500K
4.	Luminous efficacy	$\geq 100$ lm/watt
5.	CRI	$>80$
6.	Guaranteed Life	$\geq 50000$ burning hours
7.	PF	$>0.95$
8.	THD	$<10\%$

11.3 **Street Lighting And Security Lighting**

- 11.3.1 63A TPN outlet from outdoor lighting bus of main lighting board shall be taken direct to the TPN junction box to be mounted on pole through cable and looped from pole to pole.
- 11.3.2 FRP poles of suitable mounting height shall be used for street light and plant lighting (platforms/ structures/ access ways/ walk ways/ pump house/ pump bay etc.) steel tubular poles of suitable mounting height shall be used

The poles shall be subjected to min. following tests:

- Thickness of galvanising
- Drop test as per IS: 2713.

Deflection test as per IS: 2713



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11.3.3 Hot dip galvanized octagonal high mast lighting shall be used for yard and general area lighting. LED type fittings may be used.

11.3.4 LED Street Lighting Fixtures

- a) LED Street Light Fitting with cool white light in Pressure Die Cast Aluminium Housing with UV Stabilized Poly Carbonate Cover with in-built power unit of 3500 lumen suitable for 240V, 50 Hz, System shall be used.
- b) Lighting fixture shall have 50000 hrs. Life Time, CRI>75, IP-65.

**12.0 EARTHING AND LIGHTNING PROTECTION**

**12.1 Earthing**

12.1.1 Complete earthing installation shall be done as per IS: 3043, IEEE-80, IE Rules and IEC recommendations. The earthing system shall be designed to:

- (a) Provide a permanent & continuous path from equipment and conductor enclosures to earth from circuits for flow of fault current.
- (b) Provide sufficient current carrying capacity to conduct safely any current liable to be imposed on it.
- (c) Provide sufficient low resistance to earth to limit the potential between metalwork and earth within safe limits.
- (d) Provide equal distribution of potential and minimum potential difference for safety of personnel.
- (e) Ensure sufficient current in case of fault to facilitate the operation of relays, over current devices, fuses etc. provided in the circuit.

12.1.2 Common underground earthing grid shall be provided covering sub-stations and plants which is further connected to overall Earthing Grid. The overall earth resistance (dry) shall be limited to 1 ohm.

12.1.3 Earthing rings shall be provided around sub-stations and plants which in turn shall be connected to the common earthing grid. Minimum size of main grid shall be 75mm×12mm.

12.1.4 Anti-corrosive bituminous paint shall be provided at each joint of earth flat after necessary finishing and priming treatment .

12.1.5 Earthing grid/ring shall comprise of buried GI earth strips and GI pipes/electrodes.

12.1.6 Separate earth electrodes shall be provided for system neutral earthing. For equipment earthing, minimum two numbers of electrodes shall be provided around each plant/section. However, all these earth electrodes shall be interconnected.

12.1.7 Inter-connecting pits having an earth bus in an enclosed brick chamber without earth electrode shall be provided in the common underground earthing grid for convenience of taking earth conductors inside the plants.

12.1.8 As far as possible, the reinforcement rods inside concrete column shall be connected to the earthing grid/ring to reduce the overall earth resistance.

12.1.9 Individual electrical equipment shall be earthed by GI strip/GI wire/Cu/Al cable. Earth buses shall be provided in plants for earthing groups of electrical/non-electrical equipment to earthing grid/rings.

12.1.10 Size of earthing grid/ring and earth conductors of equipment for generating station and sub-stations shall be as per relevant standards. The fault current magnitude shall be decided based on system fault level. The time duration shall be taken as 1 second for voltage level above 66 kV and 3 seconds for voltage upto 66 kV as per IS -3043.

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- 12.1.11 All equipment rated above 250 V shall have two external earth connections and those rated up to 250 V shall have one external earth connection. However, for lighting fixtures, earthing shall be done through 3rd core of the cable in safe as well as in hazardous area.
- 12.1.12 Flameproof equipment, in addition, shall have one internal earth connection. This means that 4 core cables to be used for all the flameproof equipments and 3.5 core cables to be used for all flameproof motors located at hazardous area.
- 12.1.13 All steel structures, tanks, vessels, pipes, pipe joints, valves etc. shall be earthed against static charge accumulation by 50x6 mm GI strip. The no. of earth connections shall be as follows:
- | Equipment having diameter | Hazardous area | Non hazardous area |
|---------------------------|----------------|--------------------|
| 30 M                      | 2              | 2                  |
| More than 30 M            | 3              | 2                  |
- 12.1.14 Wherever process equipments are mounted on steel structures, the structures shall be earthed instead of earthing the individual equipment.
- 12.1.15 The pipe structures shall be earthed at not more than 25M apart.
- 12.1.16 For all equipment in hazardous area, in addition to external earthing one internal earthing shall be provided.
- 12.1.17 Minimum sizes of earth conductors to be used shall be as given below.

Sl.No.	Equipment	GI conductor size	Al conductor Size
1.	HV/LV switch board, transformers, HV motors	50mm×8mm	150 sq. mm
2.	Motors rated 75 KW and above	50mm×6mm	150 sq. mm
3.	Motors rated 30 KW to less than 75 KW and vessel earthing	35mm×6mm	95 sq. mm
4.	Motors rated 5.5 KW to less than 30 KW	25mm×6mm	25 sq. mm
5.	Motors less than 5.5 KW	8 SWG	6 sq. mm
6.	All minor equipment rated 250V & above.	10 SWG	6 sq. mm
7.	Earth Grid	75mm x 12 mm.	-

Vendor to calculate the actual size. However, higher size of calculated one or above-mentioned size shall be provided.

All GI conductors shall meet the galvanizing requirement as per IS.

- 12.1.18 The main ground grid shall be buried in earth at a minimum depth of 1000 mm below finished grade level unless stated otherwise

## 12.2 Lightning Protection

- 12.2.1 All structure shall be protected against lightning strokes by suitable lightning protection system to be designed and installed as per IS/IEC-62305.
- 12.2.2 The number of down conductors shall be minimum two.
- 12.2.3 Bare metallic structures shall not have any air termination rods at the top. The earth connections shall be welded to the bottom of structure at 300 mm above floor level. However, tall metallic columns with insulation at top shall be provided with air termination rods. Separate earth electrodes shall be provided for each down conductor of lightning protection. However, these shall be inter-connected with the other electrodes in main grid.
- 12.2.4 Air Terminal

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The vertical air terminal rods shall be installed at the roof of buildings to protect these objects from lightning strokes.

The vertical air terminal shall be made of 20 mm dia galvanized steel rod. The projected length of the rod shall be as required to protect the object (on which the rod is fixed) from lightning stroke.

The air terminal rod shall be properly fixed on the top of the building/structure to withstand very high wind pressure. In case the air terminal rod is embedded at the top of roof of building: the portion embedded inside the concrete shall not touch the reinforcement bars and shall be duly insulated from them.

All the vertical air terminal rods shall be electrically connected together by means of horizontal conductors of size 50 x 6 mm galvanized steel flats.

The shielding angle for one vertical air termination shall be 45 degrees. For more than one rod, shielding angle between the rods shall be taken as 60 degrees.

Horizontal air termination (i.e. G.S. Flat conductor) shall be so laid that no part of the rod will be more than nine (9) metres from the nearest roof conductor.

#### 12.2.5 Shielding Masts

The shielding mast for lightning protection shall be installed at the top of steel columns cap plates of power house main building.

The shielding mast shall be made of galvanized steel pipe and the height of the same shall be decided considering the zones to be protected.

Each shielding mast shall be connected to grounding grid by a down conductor 50 x 6 mm. Galvanized steel flat run along the building column. In addition all power house building columns joints shall be electrically bonded.

#### 12.2.6 Down Conductors

The down conductors shall be 50 x 6 mm galvanized steel flats. The connection between each down conductor and earth electrode shall be made via test link located at approximately 1500 mm above ground level.

### 13.0 CABLE TRAYS

13.1 The cable trays and risers shall be of aluminium alloy ladder type.

13.2 Aluminium prefabricated cable racks and accessories such as coupler plates, tees, elbows etc shall be fabricated from 4 mm thick aluminium 19000 H2 alloy sheet extrusion conforming to designation no. 64430 and condition WP as per IS:733.

13.3 For Al fabricated ladder trays, the rung spacing shall be 300 mm.

13.4 In paved areas/near the equipment, if required, the cables shall be laid in buried G.I. pipes. Protection shall be provided for rising cable with G.I. pipe for a minimum height of 300 mm above floor level.

13.5 All cables shall have their run nos. marked close to the termination as well as at intervals for proper identification.

13.6 All cables shall be terminated at the equipment by means of rolled aluminium/stainless steel heavy duty double compression type cable glands and crimping type lugs.

13.7 The cable racks shall be designed to avoid any sharp bends in the cable. The corners of cable racks shall be smooth with radius not exceeding six meters.

13.8 In case provision of inserts, grouting pockets and openings are required in floors, ceiling, and walls, the same shall be indicated by the vendor within four week of the placement of order. But in case it is necessary to cut modify these requirements or to furnish

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requirement beyond the above stipulated time, these shall have to carried out by the vendor at the site without any extra cast.

- 13.9 All the cable shall be properly laid and suitably clamped at regular interval. All cable racks/riser shall have 50% extra space for owner’s future use.
- 13.10 The width of cable trays shall preferably be 150, 300, 450, 600 mm.
- 13.11 The no of tiers may be decided keeping a clear head clearance of 2.5 m inside the rooms, 6 m while crossing the main roads and 3 m while crossing the branch road. For multiplier racks the minimum gap between the two tiers and between top tier and ceiling shall be 300 mm.
- 13.12 The minimum sizes of various structural members used for supporting of cable racks shall be as follows:-

Members	Size of structural member	Maximum separating distance
	Channel angle	
Support 100x50	75X75X8	1.5 m.
Runner	50x50x6/75X75X8	As per requirement

- 13.13 Each straight length and bed shall be supplied with two coupling plates fitted at each side channel at one end. The couplings plates shall be complete with bolts, nuts and washers fitted at other four holes for fixing to adjoining member. Coupling plate shall be designed to permit longitudinal adjustment up to ±10 mm and skew up to 10°.

**14.0 CAPACITOR BANKS (APFC)**

- 14.1 The Contractor shall ensure that the power factor remains minimum 0.95 lag (inductive) in all the Bus of LV Switchboards.

The capacitor bank shall utilize the Automatic Power Factor Controllers to maintain the power factor of individual plant.

- 14.2 For all other specifications, refer PC183-TS-0822.

**15.0 MOUNTING STRUCTURES**

Switch sockets, cable trays, DBs etc shall be mounted / supported on suitable structure fabricated out of standard sections of mild steel, i.e. channels, angels, flats etc conforming to IS: 2066.

**16.0 SPARES**

- 16.1 Commissioning Spares

The commissioning spares shall form an integral part of the scope of supply. Contractor shall be responsible for the quantification of the commissioning spares for the smooth commissioning start up of the package system.

- 16.2 2 years operational spares (Mandatory)

Contractor shall supply Mandatory spares for all equipments as per SOR.

- 16.3 Recommended Spares (Other than Mandatory spare )

Contractor shall provide recommended spares (other than mandatory spare) for all the equipment (item-wise) with recommended quantity.

- 16.4 All spare parts shall be identical to the parts used in the equipments.

- 16.5 Any other spare parts or special tools not specified, but required, shall also be provided.

**17.0 VENDORS’ SERVICES**

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- 17.1 The Contractor shall consider the services of major equipment suppliers during installation, testing and commissioning in their scope as required.
- 17.2 The services of engineers of following equipments' (OEM)manufacturers are envisaged and required during installation, Testing and commissioning. Contractor shall arrange for the same without any additional cost implication:
- AC UPS
  - Variable Speed Drives
  - Numerical relay
  - Power Transformer
  - HV & LV Switchboard
- 17.3 Site Testing, parameterization and commissioning of the Numerical relays shall be done by OEM expert only.
- 18.0 **TESTING & INSPECTION**
- 18.1 Testing of all electrical equipments shall be done in accordance with relevant IEC/BIS codes in presence of owner's representative at manufacturer's works before despatch / at site before installation. All such tests shall be arranged by the contractor and testing charges, if any, shall be borne by the contractor.
- 18.2 The Contractor shall submit the certificates of type tests performed on identical equipment as evidence of the compliance of the equipment with the type tests. All Type Test Certificates shall not be older more than 5 years.
- 18.3 The Contractor shall submit the certificates of routine and acceptance tests conducted on the purchased equipments.
- 18.4 All the routine/acceptance tests shall be performed at the manufacturer's works in the presence of owner's representative.
- 18.5 Stage Inspection of Electrical Equipment shall be considered. The owner or their representative shall be allowed to visit the manufacturing works for stage inspection during manufacturing stage.
- 18.6 The equipment shall be dispatched from works only after receipt of Owner written approval of the test reports.
- 18.7 The Contractor shall intimate the owner 4 weeks in advance of the tests and submit the detailed schedule of tests.
- 18.8 In addition, the equipment shall be inspected at site for final acceptance.
- 18.9 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the Owner.
- 18.10 Electrical installation work shall be subjected to inspection by owner / his authorized representative, statutory bodies like Electrical Inspector, Factory Inspector and where applicable by equipment supplier's engineer. The contractor shall carry out without extra cost to owner rectifications / modifications desired by the above authorities to make the installation conforming to I.E. Rules etc.
- 18.11 The owner may reject any portion of the work considered defective or of poor workmanship and the contractor shall make good these defects without extra cost to owner.
- 19.0 **DOCUMENTATION**
- 19.1 The Contractor shall submit the documents for electrical equipments (MS-word, MS-excel and AutoCAD) as per the drawing and documentation schedule as given in this bid package.

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- 19.2 Sizing of Electrical system and Equipments shall be submitted during detailed engineering stage.
- 19.3 Contractor shall ensure that following shall be mentioned in each sheet of drawings/ documents in the order mentioned below:
- (a) Logo and Name of the client
  - (b) Logo and Name of the consultant
  - (c) Logo and Name of the contractor (Contractor )
  - (d) Logo and Name of the Manufacturer on the drawings prepared by manufacturer, if applicable
  - (e) Name of the Project for which drawings are applicable
  - (f) Title of the drawing (Title shall indicate the details shown in the drawing)
  - (g) Drawing/ document number with sheet number and number of total sheets in the drawing (Drawings having different title shall be assigned different drawing number)
  - (h) All sheets of each drawing shall bear same title, same document number and same revision number
- 19.4 At the time of handing over of the installation, Contractor shall supply as built drawings taking into consideration the actual execution carried out at site.
- 19.5 Erection, testing/ checking (inclusive of calibration check) prior to energisation/ after energisation and commissioning Manuals shall be in bound book format and shall give step by step procedure for:
- (a) Storage, Handling and Erection
  - (b) Checking/ testing after erection and before energisation.
  - (c) Pre-commissioning tests/ checks and cold trials
  - (d) Commissioning
  - (e) Drawings relevant for erection, operation, maintenance and repair of the equipment.
  - (f) List of instruments/ testing kits/ sets, measuring instruments etc. required for testing/ checking with specification, ratings, ranges etc.
- 19.6 Operation & Maintenance Manuals for each of the equipment/ system being shall be in bound book format and shall be supplied alongwith dispatch of equipment and inclusive of following:
- (a) Log sheets indicating daily/ hourly recordings of parameters to be noted down by customer's operating personnel.
  - (b) Procedure for shut down and energisation.
  - (c) Preventive maintenance schedule.
  - (d) Safety procedures for safe operation of equipment and complete system.
  - (e) Specification of equipment installed. Manufacturer's catalogues operation and maintenance manuals for all types of relays/components used.
  - (f) Test procedures for site tests/ checks.
  - (g) Spares list for each equipment/ system for 2 years operation and maintenance.
  - (h) Relevant calculations and protection relay setting table for the equipment/ system being supplied by him
  - (i) Instructions for Diagnostic trouble shooting / fault location charts
  - (j) Tests for checking of proper functioning/ Operation.

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- (k) Storage and re-conservation Manual
- (l) Safety Manual
- (m) Drawings relevant for operation, maintenance and repair of the equipment
- (n) Instructions for Maintenance and Repair
- (o) List of spare parts with ordering specifications and manufacturer's catalogues.
- (p) List of consumables with specifications, brand names and annual consumption figures.
- (q) Manufacturer's catalogues with ordering specification for all items
- (r) List of special tools and tackles
- (s) QAP, Internal Test Certificates and Inspection Certificates
- (t) Procedure for ordering spares.
- (u) All as built drawings.

19.7 Drawings/ documents to be submitted with inspection call of equipment:

- (a) Type test certificate for identical equipment
- (b) Sub-supplier's/ vendor's catalogue/technical literature
- (c) Test reports for internal inspection
- (d) Test certificates of components
- (e) Technical specification & data sheets of equipment
- (f) All drawings as applicable of category 'Approved', 'Approved with comments' and drawings 'For information/ Reference' including comments thereon

19.8 The details of equipment layout and cable routing will be designed by the Contractor during detail engineering stage and these shall be subject to approval by Owner/Consultant. Changes as required to achieve a neat layout with adequate working space all around, for better aesthetics as well as to meet statutory regulation and codes shall be done without any time and cost implication.

## 20.0 TOOLS & TACKLES

The Contractor shall supply at least one set of all special tools for each substation required for maintenance of the equipment supplied by them and price shall be included in the offer. List of tools & tackles with quantities shall be mentioned in the offer.

## 21.0 REVIEW OF DRAWINGS & DOCUMENTS BY OWNER/ CONSULTANT

- 21.1 The successful Bidder (herein after referred as contractor), shall submit within one month of placement of LOI; list of drawings/ documents/ Manuals that would be submitted by them. The list shall mention Serial Number, Title of the drawing/ document/ manual, Category (For Approval, For review, For Reference, etc) and tentative date of submission. The list shall be prepared taking in to account into consideration stipulations in respect of submission of drawings/ documents and scheduled date for completion.
- 21.2 Template for name plate of drawings, documents and drawing/ document numbering system shall also be submitted by contractor and approval obtained.
- 21.3 The Contractor shall ensure that all sheets of the drawings/ documents and top sheet of manual prepared by manufacturer/ vendor/ supplier & submitted by him or by his consortium member or by manufacturer or his consultant, are checked by him/ leader of consortium and vetted by Contractor / Leader of consortium before submission with stamp ensuring correctness, completeness, suitability of document for subject work and compliance with stipulations of order

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- 21.4 The responsibility for delay in approval/ review of drawings/ documents due to
- a. Submission of incomplete drawings/ documents not meeting the requirement of project/ stipulations of order
  - b. Non-compliance of comments made earlier
  - c. Drawings are not submitted in requisite copies; and consequent delay in project shall be that of contractor.
- 21.5 The contractor shall ensure that in case any model number is mentioned in the drawing, detailed technical catalogue, literature, explanatory notes to describe the model and its technical details in full are also submitted along with the drawing. Such drawings/ documents should be assigned Drawing/ Document Number, Number of sheets in the drawing, Rev number etc (Unique Identification). Reference of such drawing/ document number should be mentioned in the drawing.
- 21.6 The drawings/ documents shall be prepared in such sizes that those can be read easily. Size of font in print submitted shall not less than size10 Arial or equivalent.
- 21.7 The drawings/ documents shall be submitted in sizes in which those are prepared. Photocopies in reduced sizes shall not be accepted.
- 21.8 The contractor shall leave space on each sheet for stamping the drawing by Owner/ consultant to avoid stamping on contents of drawing making them unreadable. Submission of drawings in A4 size shall be avoided.
- 21.9 All sheets of a drawing shall be assigned same title and drawing number. Drawings having different title shall be assigned different drawing numbers.
- 21.10 GA drawings, schematic diagrams, single line diagrams, bill of material, data sheets, characteristics curves, cable schedules and cable termination diagrams shall be assigned separate drawing numbers.
- 21.11 Revision shall be clearly marked on all subsequent issue of drawings and documents.
- 21.12 Inability to incorporate some of the comments shall be clearly stated by contractor with reasons and without delay. However, to accept or reject the non-compliance based on the reasons indicated by contractor shall be discretion of Owner/ their consultant.
- 21.13 In case alterations are considered necessary by the contractor in the drawings already approved, such drawings shall be resubmitted for approval again stating the considerations necessitating changes/ alterations. In case, alterations/ changes proposed by contractor are approved by the consultant/ Owner; all other drawings and data affected by such alterations/ changes shall be duly revised and re-submitted for the approval as stated above.
- 21.14 Contractor shall depute their concerned engineers (with the engineers of suppliers, if required) shall visit consultant after submissions of drawings for discussion, modification of drawings and approval so that project is not delayed for want of approval of drawings.
- 21.15 It will be the responsibility of contractor to submit the drawings and obtain approval to meet the project schedule. Delay in approval of drawings due to following shall be the responsibility of contractor:
- a. non-submission of drawings/ documents/ well before those are actually required and/ or
  - b. delay in incorporation of comments and/ or
  - c. non-incorporation of comments by contractor and/ or
  - d. submission of drawings without checking and ensuring requirement stipulated in contract/ order



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- 21.16 Contractor shall note that any approval and/ or clearance accorded by Owner or consultant for manufacture and/ or to proceed further given during discussions or recorded in the minutes of the meetings shall be valid only after the drawings showing relevant details are submitted by contractor and clearance/ approval is accorded by Owner/ Consultant by stamping and signing on the relevant drawings.
- 21.17 Approval of drawings by Owner / his consultant shall not relieve the contractor of his contractual obligations and responsibility for engineering, design, workmanship, materials and performance of the equipment
- 21.18 Contractor shall furnish, if requested, additional drawings, calculations, information to the Owner/ Consultant to enable him to examine/ study the drawings submitted.
- 21.19 Contractor shall note that work shall be carried out exactly as indicated in the approved drawings and no alterations shall be made without the written approval of the Owner/ Consultant.
- 22.0 **Deleted.**
- 23.0 **VENDOR LIST**
- 23.1 Make of all electrical equipment shall be as per Section VI-13.0: Vendor List attached with this bid package.
- 23.2 Any other vendor shall be subject to Owner/Consultant's approval.
- 23.3 Any other item for which vendors are not mentioned in NIT, Contractor shall furnish list of proven suppliers with PTR subject to Owner's/ Consultant's approval during detailed engineering. Document(PTR) shall be in English language only.
- 24.0 **QUALITY ASSURANCE**
- 24.1 All equipment, components, materials to be supplied by Contractor shall be procured, manufactured, erected, commissioned and tested as per a comprehensive Quality Assurance Programme (QAP) to be approved by the Owner/ Consultant.
- 24.2 The Successful Bidder shall submit within 1 Month of from order; Quality Assurance Plan (QAP) for all the equipment/ panels/ cables/ motors/ devices etc. under their scope of supply.
- 24.3 All routine and acceptance tests shall be carried out as per relevant IS / IEC/ Other Standards during inspection at manufacturer's works in presence of Owner or his representative.
- 24.4 The Contractor shall submit type test certificates for similar equipment supplied by him elsewhere. In case type test certificates (not more than 5 years old and conducted at duly accredited laboratory) for similar equipment is not available, the type test shall be conducted in presence of Owner or his representative without any financial implications to Owner.
- 24.5 The inspection procedure shall be finalized and approved by Owner and/ or their consultant/ authorized representative.
- 24.6 Inspection will be carried out as per drawings and quality assurance plan approved by the Owner/ Consultant. Inspection shall be carried out either at manufacturer's shop/ works or any other place where facilities for conducting tests/ checks are available.
- 24.7 Owner reserves the right to witness any of the tests and verify the documents of the Contractor , his supplier/ vendor/ manufacturer.
- 24.8 Manufacture test certificate for bought out components shall be submitted during inspection.
- 24.9 No equipment or part items shall be dispatched without final acceptance certificate and dispatch instructions in writing issued by Owner and/or their authorized representatives.

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- 24.10 The Contractor shall carry out an inspection and testing programme during manufacture in his works and/ or that of his vendor's works to ensure accuracy/ correctness/ completeness of components, compliance with drawings, conformance to functional and / or performance requirements, identify and acceptability of all materials, parts and equipment. The Contractor shall also carry out all tests/ inspections required to establish that the items/ equipment conform to requirements of the specification and the relevant codes/ standards specified in the specification in addition to carrying out tests as per the approved Quality Plan.
- 24.11 Quality audit/ surveillance/ approval of the results of the tests and inspection, approval of drawings will not, however, prejudice the right of the Owner to reject the equipment at any subsequent stage if it does not comply with the specification or does not give complete satisfaction in service and shall in no way limit the liabilities and responsibilities of the Contractor of ensuring complete conformance of the materials/ equipment supplied to relevant specification, standard, data sheets, drawings etc.
- 24.12 The owner or their representative shall be allowed to visit the manufacturing works for stage inspection during manufacturing stage.
- 24.13 The Contractor shall intimate the owner 4 weeks in advance of the tests and submit the detailed schedule of tests.
- 24.14 Contractor shall supply reports of type tests, acceptance tests, all requisite factory tests and site tests in bound volumes.
- 24.15 All the equipment shall be tested at site to know their condition and to prove suitability for energisation and required performance.
- 25.0 **COORDINATION WITH OTHER CONTRACTORS**
- 25.1 Contractor shall coordinate with Owner's other Contractors and shall freely exchange all technical information required for this purpose.

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## SPECIFICATION SHEET

### 11 kV Switchboard

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services		
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>				
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>		
Ref. Stds. : IS <input checked="" type="checkbox"/> IEC <input checked="" type="checkbox"/>	Temp. Max./Min./Design Ref. : 46 / 1 / 50°C			
Encl. Docs. :	Relative Humidity: 100%	Alt. above sea <1000 M		
Make :	<b>ATMOSPHERIC POLLUTION</b>	Dusts : Coal Dust & Urea Dust		
Maker's Ref. No. :		Vapour : Ammonia & Highly Corrosive		
	<b>LOCATION</b>	Indoor <input checked="" type="checkbox"/>	Outdoor <input type="checkbox"/>	
		Gr. Floor <input type="checkbox"/>	1 <sup>st</sup> floor <input type="checkbox"/>	
<b>ADDL. SCOPE</b>	Incoming Bus Duct <input type="checkbox"/>	Tie Bus Duct <input type="checkbox"/>		
	Erection & Comm. <input checked="" type="checkbox"/>	Supervision of Erection & Comm. <input type="checkbox"/>		
TESTS: Routine <input checked="" type="checkbox"/> Type <input type="checkbox"/> Others <input type="checkbox"/>				
<b>BASIC DATA</b>				
	Description	11kV Switchboard		
<b>REFERENCE DRAWINGS</b>	Single Line Diagram			
	Feeder Details			
	P.T. Bus Arrangement	--		
<b>SYSTEM DETAILS</b>	Rated Voltage with variation	11 kV ± 10%		
	Rated Frequency with variation	50Hz ± 5%		
	Highest System Voltage	12 kV		
	Combined V & F Variation	± 10%		
	No. of Phases & Wires	3 Phase, 3 Wire		
	Insulation Level	70 kVp/ 28kV BIL		
	Fault Level	750 MVA for 3 sec.		
Earthing Mode	Non effectively earthed through resistor			
<b>BUS BARS</b>	<b>Rating</b>	Continuous	_____A	
		Short Time for 3 sec.	40KA for 3 sec.	
	Type of Insulation	Insulating heat shrinkable Sleeved		
<b>CIRCUIT BREAKER</b>	Type	Vacuum Circuit Breaker		
	<b>Breaking Capacity</b>	Symmetrical	40 KA for 3 sec.	
		% DC Component	20% (Min.)	
	Making Capacity ( peak )	2.55 times Breaking Capacity		
	Earthing Switch	Integral type		
<b>CONTROL SUPPLY</b>	Closing & Indication	110V DC **		
	Tripping	110V DC **		
	Alarm / Signal	110V DC **		
	Space Heater	240V AC		
<b>MISC. DATA</b>	Cable Entry Top / Bottom	Bottom		
	Dummy Panel Reqd. Yes / No	As required		
	Width of Dummy Panel	--		
	No. of Dummy Panel	--		
	<b>PAINTING</b>	Type	Epoxy Based	
		Shade	631 of IS: 5	
	Spares Parts Reqd. for a Period of	2 Years		

\*\* NOTE:

- 110V DC Power required for closing, tripping and indication of circuit breaker feeder shall be provided from DCDB.
- For metering, protection etc. refer SLD.
- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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**TECHNICAL PARTICULARS**  
**11 KV Switchboard**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
ORDER <input type="checkbox"/>		FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Make / Maker's Type :			
Ref. Standards			
Rated Operational Voltage with $\pm$ %			
Rated Insulation Voltage			
Rated Voltage of Aux. Circuits with $\pm$ %			
Rated Current			
Short Time Rating			
Degree of Protection of Enclosure			
Service Conditions : Indoor / Outdoor			
<b>DRAWOUT FACILITIES</b>	Circuit Breaker's		
	P.T.'s		
	Protective Relays		
	Meters		
<b>SHEET STEEL TYPE &amp; THICKNESS</b>	Base Channel		
	Others		
Material of Gaskets			
Material of External Hardware			
Operating Height : Max. / Min.			
Space Heater Rating of each Panel			
<b>PAINTING</b>	Method of Pre-treatment		
	Thickness of Paint		
	Type & Shade		
Final Temperature			
<b>PROVISIONS / FACILITIES</b>	Safety Shutters		
	Interlocks		
	Earthing Facility		
	Base Channels with Fdn. Bolts		
	Gland Plate with Glands		
Limit of Maximum Nos. of Cables Termination Possible			
Dimensions : L X B X H / Dim. Drg. Ref. No.			
Shipping Dimensions of Largest Package			
Weight : Static / Dynamic			
Heat Dissipation			
<b>BUS - BARS</b>			
Material			
<b>SIZE</b>	HBB		
	VBB		
	Ground		
	Supporting Calculation Attached		
<b>MINIMUM CLEARANCE</b>	Between Phases		
	Between Phase & Earth		
Minimum Creepage Distance			
<b>CURRENT RATING</b>	Continuous		
	Short Time for 3 secs.		
Max. current density for bus-bars			
Temp. Rise for : Cont. Load / Short Ckt. Current			
<b>SUPPORT</b>	Material		
	Voltage Class		
	BIL		
	Arrangement :Separate/Common		
Power Frequency test Voltage for 1 Min. Duration			
Material of Bus-bar Insulation			
Material of Inter Panel / Compartment Barrier			
Shrouding Material for Joints			
Bus Bar Phase Identification Mark			

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No. & Type of Bolts per Joint		
<b>CIRCUIT BREAKERS</b>		
Make / Maker's Type		
Ref. Standards		
Type of Circuit Breaker		
Principle / Collaborator		
Rated Operating Sequence		
Rated Voltage		
Rated Frequency		
No. of Poles		
<b>CURRENT RATING</b>	Continuous in IPH6 Enclosure	
	3 second RMS	
	Momentary ( Peak )	
<b>BREAKING CURRENT</b>	Symmetrical KA	
	Asymmetrical KA	
	% D.C. Component	
Making Current ( Peak )		
Derating Factor, if any for Site Condition		
<b>LIMITATION OF CURRENT RATING FOR</b>	Motor Duty	
	Capacitor Duty	
	Transformer Switching	
	Cable Charging	
Restriking Voltage ( Peak )		
<b>INSULATION LEVEL</b>	1 Min. PF withstand Voltage	
	Impulse withstand Voltage	
No. of Breaks per Pole		
<b>TYPE AND MATERIAL OF</b>	Fixed Contact	
	Moving Contact	
	Arcing Contact	
Type of Closing Mechanism		
Type of Tripping Mechanism		
<b>ARC CONTROL DEVICE</b>	Type	
	Material of Arc Chamber	
Details of Anti – Pumping Feature		
Details of Trip Free Feature		
Total Closing Time		
Total Interrupting Time at 10%, 50%, 100% of rated		
Interrupting Capacity		
<b>SPRING CHARGING MOTOR</b>	Rating	
	Voltage	
	Insulation	
	Duty	
	Type	
Spring Charging Time		
<b>VOLTAGE / CURRENT REQD. FOR</b>	Closing	
	Tripping	
	A.C. Supply	
<b>AUXILIARY CONTACTS</b>	No. of Spare Contacts NO / NC	
	Contact Rating Ac / Dc	
	Convertible Type	
<b>INSULATING OIL</b>	Ref. Standard	
	Volume of Oil Required	
Mounting Arrangement		
Temp. Rise of Different Parts		
<b>DETAILS FOR SF<sub>6</sub></b>	SF <sub>6</sub> Gas Pressure	
	Wt. Of SF <sub>6</sub> Gas per Breaker	

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<b>DETAILS FOR SF<sub>6</sub></b>	Gas Leakage Detector Provided	
	Gas Density Monitor Provided	
<b>DETAILS FOR VCB</b>	Pressure inside the Interrupter	
	Contact Wear Indication Provided	
	Facility for Checking Loss of Vacuum Provided	
<b>RECOMMENDED TIME INTERVAL FOR</b>	Inspection of Drives	
	Inspection of Contacts	
	Quenching Devices	
	Replacement of Oil	
Dimensions : L X B X H / Dim. Drg. Ref. No.		
Type Testing Authority & Test Report Ref. No.		
Net Weight of Breaker		
<b>CURRENT TRANSFORMERS</b>		
Make / Maker's Type		
Ref. Standard		
Type of Primary Winding		
No. of Cores		
Ratio		
Rated Burden		
Accuracy Class		
ALF / ISF		
Thermal Limit		
Dynamic Limit		
Insulation Class / Material		
Basic Insulation Level		
Ref. Magnetisation Curve No.		
<b>POTENTIAL TRANSFORMERS</b>		
Make / Maker's Type		
Ref. Standard		
Winding Connection : Pri. / Sec.		
Ratio		
Rated Burden		
Accuracy Class		
Insulation Class / Material		
Basic Insulation Level		
Weight		
Dimension		
Rated Voltage Factor		
<b>SURGE DIVERTER</b>		
Type & Maker's Type		
Rated Voltage KV		
Nominal Discharge Current ( 8/20 μ sec. wave )		
Residual Voltage at Rated Discharge Current		
Power Frequency Spark Over Voltage		
1.2/50 μ sec. Spark Over Voltage		
<b>RELAYS</b>		
Application		
Make / Maker's Type :		
Ref. Standards		
Operating Principle		
Rated Voltage / Current		
Rated Burden		
Setting Range		
Type of Mounting		
Reset : Hand or Self		
Flag Indication Type		
Ref. Characteristic Curve Type		
Ref. Descriptive catalogue		
<b>INSTRUMENTS AND METERS</b>		
Application		
Make / Maker's Type :		

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Ref. Standards	
Operating Principle	
Rated Burden	
Scale Range	
Accuracy	
Size	
Type of Mounting	
<b>CONTROL SWITCHES</b>	
Application	
Make / Maker's Type :	
Ref. Standards	
Contact Rating	
Utilisation Category	
<b>PUSH BUTTON</b>	
Make / Maker's Type :	
Ref. Standards	
Contact Rating	
Utilisation Category	
<b>SIGNAL LAMPS</b>	
Make / Maker's Type :	
Ref. Standards	
Rated Voltage / Wattage	
Type of Lamp Holder	
Type of Globe	
Accessibility from Front	
<b>MOULDED CASE CIRCUIT BREAKERS</b>	
Make / Maker's Type	
Ref. Standard	
Current Rating	
Breaking Capacity	
Setting Range of Thermal Release	
Setting Range of Magnetic Release	
<b>MINIATURE CIRCUIT BREAKER</b>	
Make / Maker's Type :	
Ref. Standards	
Rated Current	
Breaking Capacity	
<b>CABLE GLANDS</b>	
Material	
Type	
<b>TERMINAL BLOCKS</b>	
Make	
Type	
Current Rating	

NOTE: Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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**SPECIFICATION SHEET**  
**11 / 0.433 KV DISTRIBUTION TRANSFORMERS**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/>		ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Item No. :	Ref. Stds. : IS-1180, IS-2026, IEC-60076		
Quantity :	Encl. Docs. :		
Description : Distribution Transformers	Vendor :		
Code No. :	Vendor's Ref. No. :		
TEST TO BE WITNESSED : Routine : <input checked="" type="checkbox"/> Heat Run : <input type="checkbox"/> Impulse : <input type="checkbox"/> Others : <input type="checkbox"/>			
<b>SERVICE CONDITIONS</b>			
<b>SYSTEM DETAILS (PRI. / SEC.)</b>		<b>AMBIENT CONDITIONS</b>	
Nom. Voltage with $\pm$ % : 11KV $\pm$ 10% / 0.433KV $\pm$ 10%		Temp.- Max./Min./Design Ref. : 46 / 1 / 50°C	
Highest System Voltage : 12 / 0.457 KV		Rel. Humidity : 100 % Alt. above Sea < 1000M	
Number of phases : 3 Ph / 3 W + N		<b>Atmospheric Pollution</b> : Dusts : Coal Dust & Urea Dust	
Rated Frequency with $\pm$ : 50 Hz $\pm$ 5%		Vapour : Ammonia & Highly Corrosive	
Combined V & F Variation : $\pm$ 10 %		<b>Location</b> : Indoor : <input type="checkbox"/> Outdoor : <input checked="" type="checkbox"/>	
Fault MVA : 750 MVA / 36 MVA		<b>AUX. POWER SUPPLY</b>	
Earthing Mode : Solidly Earthed		<b>System Data</b> : A.C. : 415V $\pm$ 10%, 3P & N, 50Hz $\pm$ 5%	
		D.C. : 110 V	
		<b>Instrument Contact Rating</b> : A.C. : 240 V, 5 Amps	
		D.C. : 110 V, 5 Amps	
<b>BASIC DATA</b>			
<b>RATING</b>		<b>TERMINAL CONFIGURATION</b>	
Rated Capacity : 1000 KVA		W	
No Load Voltage Ratio : 11 KV / 0.433 KV		X Z	
Highest Voltage for Eqpt. : 12 KV / 0.457 KV		Y	
Insulation level : Impulse : 75 KV / --		Shall be provided later.	
Pri.-/ Sec : Power Freq. : 28 KV / 3 KV		<b>TERMINAL CONNECTIONS</b>	
Impedance at 75 ° C: As per IS (without negative tolerance)		<b>PRI.</b> Arrangement : O/H bushing : <input type="checkbox"/>	
Vector Group : Dyn 11			
Cooling System : ONAN		Bus Duct : <input type="checkbox"/>	
Motor I Start & T Start : Shall be informed later		Cable : <input checked="" type="checkbox"/>	
<b>TAP CHANGER</b>		Cable cond. : Type : 11 KV XLPE-A-FRLS-PVC (Al) UE	
Type of Taps : On Load : <input type="checkbox"/> Off Ckt. : <input checked="" type="checkbox"/>		No. & Size :	
Range of Taps : -5% TO +5%		<b>SEC.</b> Arrangement : O/H bushing : <input type="checkbox"/>	
No. of Taps : 5 @ 2.5 %			
<b>C.T. REQUIREMENTS</b>		Bus Duct : <input type="checkbox"/>	
Differential Protection : 3 nos. on Trf. : <input type="checkbox"/>		Cable : <input checked="" type="checkbox"/>	
3 nos. Loose : <input type="checkbox"/>		Type :	
Restricted earth fault Protection : 1 no. on Trf. : <input checked="" type="checkbox"/> CI.-PS		No. & Size:	
3 nos. Loose : <input checked="" type="checkbox"/>		<b>Control Cable</b> : Type : 1.1 kv XLPE-A-FRLS PVC (ST2) (Al)	
Standby earth fault Protection : 1 no. on Trf. : <input checked="" type="checkbox"/> CI.-5P10		No. & Size :	
		<b>Earth Conductor</b> : Body :	
		Neutral :	
<b>ADDITIONAL FITTINGS</b>		Cable Gland Type & Material : Primary : } Double	
1. LV Neutral terminal box		Secondary : } compression	
2. Thermometer pocket with cover		Control : } Rolled Al	
3. Tank magnetic oil level gauge		<b>PAINTING</b>	
4. Bi-directional roller		Type : EPOXY BASED	
		Shade : 631 OF IS : 5	
		Reqd. : <input checked="" type="checkbox"/> For a period of 2 Years	

- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.
- Impulse test certificate for similar rating shall be furnished after award of order.
- Losses shall be as per energy efficiency level-2 of latest IS 1180



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### TECHNICAL PARTICULARS TRANSFORMERS

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services		
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>		
		ORDER <input type="checkbox"/>		
		FINAL <input type="checkbox"/>		
<b>GENERAL</b>				
Item no. :		Ref. Stds. :		
Quantity :		Make :		
Description :		Maker's Type :		
Code no. :				
<b>ELECTRICAL DATA</b>				
Rating / Voltage Ratio				
Rated Current - Primary / Secondary				
Rated No Load Current				
Temp. Rise over Ambient - Oil / Winding				
Load Loss at Rated Current at 75° C				
No Load Loss at Rated Voltage / Copper Loss				
Full Load Efficiency at CosΦ - Unity / 0.8 Laq				
Efficiency at 35%, 50% & 100%				
Max. Efficiency & Load at which it occurs				
Full Load Regulation at CosΦ - Unity / 0.8 Laq				
Short Circuit Withstand Capacity				
B max. at Rated V & F ( Tesla )				
Excitation Loss per Kq. at B max.				
X/R Ratio				
<b>INSULATION GRADED / UNIFORM</b>	Primary			
	Secondary			
Induced Over Voltage Withstand Capacity : Pri / Sec.				
OLTC : Rated Voltage / Rated Current				
Total Auxiliary Power Requirement : AC / DC				
<b>CONTROL PANELS</b>	Sheet Metal Thickness			
	Enclosure Type			
	Control Scheme Ref. No.			
Cooling Fans : Qty. / Rating				
Minimum Clearance : H.V. / L.V.	i. Between phases	a. In air mm		
		b. In oil mm		
	ii. Between phase & earth	a. In air mm		
		b. In oil mm		
	Short-circuit Impedance at 75 o C			
	<b>MECHANICAL DATA</b>			
Core : Material & Grade				
Winding Type : Pri. / Sec.				
<b>INSULATING MATERIAL</b>	Between Turns			
	Between Primary & Secondary			
	Between Core & Winding			
<b>RADIATORS</b>	Cooling Tubes / Separate Bank			
	Thickness			
	Vacuum Withstand Capacity			
<b>TANK</b>	Material			
	Thickness : Side / Bottom / Cover			
	Vacuum Withstand Capacity			
	Over Pressure Capacity			
<b>DIMENSIONS</b>	Overall ( LXBXH )			
	Roller C/L			
	Largest Package ( LXBXH )			
Minimum Height required to lift the Core				
<b>WEIGHT</b>	Core & Winding			
	Total			
	Heaviest Package			
Oil Quantity in Litres				
Noise Level				
<b>BUSHING DATA (PRI. / SEC. / NEUTRAL )</b>				
Type & Make				
Ref. Standard				
Rated Voltage				
Rated Current				

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Creepage Distance	
<b>MAKE &amp; TYPE OF BOUGHT OUT ITEMS</b>	
Temperature Indicators : Winding / Oil	
Buchholz Relay / Magnetic Oil Level Gauge	
Cooling Fans / Current Transformers	
OLTC	
Control Panels	
Pressure Release Device	

**NOTE:**

- Completely filled in Technical Particulars Sheet for each type and rating of transformer in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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**SPECIFICATION SHEET**  
**415 V Switchboard**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services		
ISSUED FOR: PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>	
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>		
Ref. Stds. :	IS & IEC	Temp. Max./Min./Design Ref.: 47 / 1.7 / 50°C		
Encl. Docs. :		Relative Humidity	100 %   Alt. above sea : <1000 M	
Vendor :		<b>Atmospheric Pollution</b>	Dusts : Coal Dust & Urea Dust	
Vendor Ref. No. :			Vapour : Ammonia & Highly Corrosive	
		<b>Location</b>	Indoor <input checked="" type="checkbox"/> Outdoor <input type="checkbox"/>	
			Gr. Floor <input type="checkbox"/> 1 <sup>st</sup> floor <input checked="" type="checkbox"/>	
<b>Addl. Scope :</b>	Incoming Bus Duct	<input type="checkbox"/>	Tie Bus Duct <input type="checkbox"/>	
	Erection & Comm.	<input checked="" type="checkbox"/>	Supervision of Erection Comm. <input type="checkbox"/>	
TESTS:	Routine <input checked="" type="checkbox"/>	Type <input type="checkbox"/>	Others <input type="checkbox"/>	
<b>BASIC DATA</b>				
<b>TAG NO.</b>	Item No.			
	Description	415V SWITCHBOARDS		
	Code No.	--		
<b>REFERENCE DRAWINGS</b>	Single Line Diagram			
	Feeder Details			
	Auto Trip Alarm Scheme			
	Non Trip Alarm Scheme			
	Trip Circuit Supervision Scheme			
	Auto C/O Scheme			
	P.T. Bus Arrangement			
<b>SYSTEM DETAILS</b>	Nominal Voltage with Variation	415V ± 10%		
	Rated Frequency with Variation	50Hz ± 5%		
	Combined V & F Variation	± 10%		
	No. of Phases & Wires	3 Ph & 4W		
	Insulation Level	2.5 KV		
	Fault Level	36 MVA		
	Earthing Mode	Solidly Earthed		
<b>BUS BARS</b>	<b>Rating</b>	Continuous	_____ A	
		Short Time for 1 sec.	50 KA	
	Bare / Insulated	Insulated		
	Type of Insulation	Heat Shrinkable PVC sleeved		
<b>EXECUTION</b>	<b>Breaker Feeders</b>	I/C: ST / DT	ST	
		Others: ST / DT	DT	
	<b>Other Feeders</b>	Single front / Double front	Double Front	
		Fixed / Drawout	Drawout	
	Cable Entry : Top / Bottom	Bottom		
	Bus Duct Entry : Top / Bottom	--		
Accessibility : Front / Back	Front / Back			
<b>CONTROL SUPPLY</b>	<b>Breaker Feeders</b>	Closing & Indication	110V DC **	
		Tripping	110V DC **	
	Contactors	240V AC		
	Space Heater	240V AC		
<b>MISC. DATA</b>	<b>Painting</b>	Type	Epoxy	
		Shade	631 of IS: 5	
	Period for which Spares required	2 Years		

ST- SINGLE TIER  
DT- DOUBLE TIER

**\*\* NOTE:**

- 110V DC Power required for closing, tripping and indication of circuit breaker feeder shall be provided from DCDB.
- For metering, protection etc. refer SLD.
- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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### TECHNICAL PARTICULARS 415V SWITCHBOARDS

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR: PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>
<b>GENERAL</b>			
Manufacturer's Type			
Ref. Standards			
Rated Operational Voltage with $\pm$ %			
Rated Insulation Voltage			
Rated Voltage of Aux. Circuits with $\pm$ %			
Rated Current			
Short Circuit Rating			
Degree of Protection of Enclosure			
Service Conditions : Indoor / Outdoor			
<b>DRAWOUT FACILITIES</b>	Circuit Breakers		
	P.Ts.		
	Motor Starters		
	Protective Relays		
<b>SINGLE FRONT / DOUBLE FRONT</b>	C.B. Feeders		
	Other Feeders		
Cable Entry :	Top / Bottom		
Accessibility :	Front / Back		
<b>MAXIMUM NOS. OF FEEDERS IN ONE PANEL</b>	Circuit Breakers		
	Motor Starters		
	Switch Fuse		
<b>SHEET STEEL TYPE &amp; THICKNESS</b>	Load Bearing member		
	Non Load Bearing member		
	Base Channel		
Material of Gaskets			
Material of External Hardware			
Operating Height : Max. / Min.			
Space Heater Rating of each Panel			
<b>PAINTING</b>	Method of Pre-treatment		
	Type		
	Thickness of Paint		
	Finishing Shade		
Dimensions : L X B X H / Dim. Drg. Ref. No.			
Shipping Dimensions of Largest Package			
Weight : Static / Dynamic			
<b>BUS - BARS</b>			
Material			
<b>SIZE</b>	HBB : Phase / Neutral		
	VBB : Phase / Neutral		
	Ground		
	Supporting Calculations Attached		
<b>MINIMUM CLEARANCE</b>	Between Phases		
	Between Phase & Earth		
Minimum Creepage Distance			
Current Rating : Continuous / Short Time			
Temp. Rise for : Cont. Load / Short Time Current			
<b>SUPPORT</b>	Material		
	BIL		
	Arrangement : Separate/Common		
Material of Bus-bar Insulation			
Shrouding Material for Joints			
No. & Type of Bolts			
<b>CIRCUIT BREAKERS</b>			

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Make	
Maker's Type	
Ref. Standards	
Type of Circuit Breaker	
Short Circuit Category	
Maximum Operating Voltage	
No. of Poles	
<b>CURRENT RATING</b>	Continuous
	1 second RMS
	Momentary ( kA Peak )
<b>BREAKING CURRENT</b>	Symmetrical KA
	Asymmetrical KA
	Sym. MVA at Rated Voltage
Making Current ( Peak )	
<b>INSULATION LEVEL</b>	1 Min. PF withstand Voltage
	Impulse withstand Voltage
No. of Breaks per Pole	
<b>TYPE AND MATERIAL OF</b>	Main Contacts
	Arcing Contacts
Contact Pressure	
Type of Closing Mechanism	
Type of Tripping Mechanism	
Type of Arc Control Device	
Arc Pumping Features with Details	
Trip Free Features with Details	
Total Closing Time	
Interrupting Time at 10%, 50%, 100% of rated Interrupting Capacity	Total
	Arcing Time
<b>SPRING CHARGING MOTOR</b>	Rating
	Voltage
	Insulation
	Duty
Spring Charging Time	
<b>CONTROL VOLTAGE WITH RANGE</b>	Closing
	Tripping
	Alarm and Indication
<b>POWER/ CURRENT REQUIRED FOR</b>	Closing
	Tripping
<b>AUXILIARY CONTACTS</b>	No. of Spare Contacts : NO / NC
	Contact Rating : AC / DC
	Convertible : Yes / No
Net Weight of Breaker	
Type Testing Authority & Test Report Ref. No.	
<b>CURRENT TRANSFORMERS</b>	
Make / Maker's Type	
Ref. Standard	
Type of Primary Winding	
Ratio	
Rated Burden	
Accuracy Class	
ALF / ISF	
Insulation Class & Material	
Ref. Magnetisation Curve No.	
<b>POTENTIAL TRANSFORMERS</b>	
Make / Maker's Type	
Ref. Standard	
Winding Connection	
Ratio	
Rated Burden	



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Accuracy Class		
Insulation Class & Material		
<b>SWITCHES</b>		
Make / Maker's Type		
Ref. Standard		
Type of Switch		
Rated Operational Voltage		
Utilisation Category		
Rated Operational Current		
Short Time Withstand Current		
No. of Poles / Break		
Type Test Certificate Ref. No.		
<b>FUSES</b>		
Make / Maker's Type		
Ref. Standard		
Type of HRC Fuse		
Rated Voltage / Current		
Category of Duty		
Prospective Breaking Current		
<b>CURRENT TIME CURVE SHOWING PRE-ARCING AND TOTAL I<sup>2</sup>T VALUES</b>	Ref. No.	
	Attached	
<b>CONTACTORS</b>		
Make / Maker's Type		
Ref. Standard		
Rated Operational Voltage		
Utilisation Category		
Rated Duty		
Rated Thermal Current		
<b>OPERATING VOLTAGE OF COIL</b>	Pick up Max./Min.	
	Drop off Max./Min.	
Coil Consumption Pick up / Hold on		
<b>RELAYS</b>		
Make / Maker's Type		
Ref. Standard		
Operating Principle		
Setting Range		
Type of Mounting		
Burden		
Reset : Hand or Self		
Flag Indication Type		
Ref. Characteristic Curve Type		
Ref. Descriptive catalogue		
<b>INSTRUMENTS AND METERS</b>		
Make / Maker's Type		
Ref. Standard		
Operating Principle		
Scale Range		
Accuracy		
Size		
Type of Mounting		
<b>CONTROL SWITCHES</b>		
Make / Maker's Type		
Ref. Standard		
Contact Rating		
Utilisation Category		
<b>PUSH BUTTONS</b>		
Make / Maker's Type		
Ref. Standard		
Contact Rating		
Utilisation Category		
<b>SIGNAL LAMPS</b>		

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Make / Maker's Type	
Ref. Standard	
Rated Voltage / Watts	
Type of Lamp Holder	
Type of Globe	
<b>MINIATURE CIRCUIT BREAKER</b>	
Make / Maker's Type :	
Ref. Standards	
Rated Current	
Breaking Capacity	
<b>MOULDED CASE CIRCUIT BREAKERS</b>	
Make / Maker's Type	
Ref. Standard	
Current Rating	
Breaking Capacity	
Setting Range of Thermal Release	
Setting Range of Magnetic Release	
<b>CABLE GLANDS</b>	
Material	
Type	
<b>TERMINAL BLOCKS</b>	
Make	
Type	
Current Rating	

**NOTE:**

- Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.
- Inter-tripping of primary and secondary of transformer shall be provided for all faults through lockout relays.

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### SPECIFICATION SHEET INDUCTION MOTOR

PROJECT: Coal Based Fertilizer Plant		PLANT : Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
		ORDER <input type="checkbox"/>	
		FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Item No. :	Ref. Stds. :	IS <input checked="" type="checkbox"/>	IEC <input checked="" type="checkbox"/>
Quantity :	Encl. Docs. :		
Description : 3 Phase Induction Motor	Make : As per enclosed vendor list		
Code No. :	Maker's Type. :		
TESTS: Routine <input checked="" type="checkbox"/>	Type <input type="checkbox"/>	Others <input type="checkbox"/>	
<b>SERVICE CONDITIONS</b>			
<b>SYSTEM DETAILS</b>		<b>AMBIENT CONDITION</b>	
Rated Voltage with $\pm$ % :	415V $\pm$ 10%	Temp. Max./Min./Design Ref. 46 / 1 / 50°C	
No. of phases :	3	Relative Humidity 100%	Alt. above sea : <1000 M
Rated Frequency With $\pm$ % :	50 Hz $\pm$ 5%	<b>ATMOSPHERIC POLLUTION</b>	Dusts : Coal Dust & Urea Dust
Combined V & F variation :	$\pm$ 10%		Vapour : Ammonia & Highly Corrosive
Fault Level :	As per System Fault level	<b>Area</b>	Safe <input type="checkbox"/>
Space Heater Supply :	240 V AC	Hazardous <input type="checkbox"/>	
Low Voltage Heating Supply :		Haz. Area class: Zone: Temp. class : Encl. Gr.	
		Location : Indoor <input type="checkbox"/>	
		Outdoor <input type="checkbox"/>	
<b>INSTRUMENT CONTACT RATING</b>	A.C. :	<b>COOLING WATER</b>	
	D.C. :	Inlet Press. :	Kg/sq.m. Inlet Temp. °C
Aux. Motor Supply :		Fauling Factor :	Outlet Temp. °C
<b>BASIC DATA</b>			
<b>RATING &amp; DUTY</b>		<b>DRIVEN M/C DATA</b>	
Rated Output :		Type :	
Syn. Speed :		Make :	
Duty :		Absorbed Power :	
Rotor Type :	Squirrel Cage	Coupling :	
Starting Method :	DOL	Torque-Starting / Max. :	
Max I Start/I Rated :	Refer Technical Specification	GD <sup>2</sup> at Motor Speed :	
Min. V Start at Terms :	80% of rated voltage	Thrust - Radial / Axial :	
Min. Starting Torque at V <sub>R</sub> :		Addl. Data :	
<b>EXECUTION</b>		<b>ACCESSORIES</b>	
Degree of Protection :		Foundation Bolt <input checked="" type="checkbox"/>	Space Heater <input checked="" type="checkbox"/>
Addl. Degree of Protection :		Lifting Eye Bolt <input checked="" type="checkbox"/>	Drain Plug <input checked="" type="checkbox"/>
Mounting Arrangement :		Cable Glands <input checked="" type="checkbox"/>	Cable Lugs <input checked="" type="checkbox"/>
Direction of Rotation :	Bi-directional	Diff. C.T.s <input type="checkbox"/>	C.W. Flow Indicator <input type="checkbox"/>
Insulation Class:	'F' with temp. rise limited to 'B'	RTDs for HT Motor <input checked="" type="checkbox"/>	Wdgs. <input checked="" type="checkbox"/>
Cooling Method :		Hot Air <input type="checkbox"/>	Bearings <input checked="" type="checkbox"/>
Stator Connection :	Delta	Thermometer For HT Motor <input type="checkbox"/>	Hot Air <input type="checkbox"/>
		Bearings <input checked="" type="checkbox"/>	
		Earthing Terminals	On Body <input checked="" type="checkbox"/>
			In T.B. <input checked="" type="checkbox"/>
<b>CABLING DATA</b>		Name Plate : <input checked="" type="checkbox"/>	Addl. name plate : <input checked="" type="checkbox"/>
Power cable :		Rain Protecting Hood : <input checked="" type="checkbox"/>	Thermistor <input type="checkbox"/>
Heater cable :3x2.5 Sq.mm (Cu) subject to Cl.no.7.1 of ES: 8102.		<b>SPARE PARTS</b>	
C.T. cable :		Required <input checked="" type="checkbox"/>	For Period of 2 Years
R.T.D. cable :		Bearings (DE & NDE) : <input checked="" type="checkbox"/>	Cooling Fan <input checked="" type="checkbox"/>
Alarm cable :		Grease Nipple & Plug : <input checked="" type="checkbox"/>	Fan cover <input checked="" type="checkbox"/>
<b>CABLE GLAND</b>	Type : Double Compression	RTD for: winding and bearing <input checked="" type="checkbox"/>	
	Material :	Terminal Plate complete with stud & shorting link : <input checked="" type="checkbox"/>	
		Inner & Outer covers for DE & NDE bearing: <input checked="" type="checkbox"/>	
<b>PAINTING</b>	Type : Epoxy	Terminal Block <input checked="" type="checkbox"/>	
	Shade : 631 of IS : 5		

- **Note:** 1) All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.
- 2) Space heater shall be provided for all motors rated 30KW & Above.
- 3) Power cables shall be of 1.1KV grade XLPE-A-FRLS and space heater cables shall be of 1.1 KV grade XLPE-A-FRLS PVC.



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### TECHNICAL PARTICULARS INDUCTION MOTOR

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR :	PROPOSAL <input type="checkbox"/>	ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>
<b>GENERAL</b>			
Item No.			
Quantity			
Description			
Code No.			
Ref. Standard			
Make			
Maker's Type			
<b>ELECTRICAL DATA</b>			
Rated Output			
Rated Voltage			
No. of Starts - Hot / Cold			
Torque - Starting / Pull Up / Pull Out			
Starting Time at min. V Start (Hot / Cold)			
Safe Stall Time at $V_R / 1.1V_R$			
Stator Time Constant			
Temp. Rise at Full Load - Wdg. / Hot Air / Brq.			
<b>TEMP. RISE OF STATOR</b>	3 Starts From Cold		
<b>/ ROTOR AFTER</b>	2 Starts From Hot		
Current at FL / 0.85 FL			
Efficiency at FL / 0.85 FL			
Speed at FL / 0.85 FL			
Power Factor at FL / 0.85 FL / Start			
Push Pull Voltage withstand Capacity			
Max. V dip for 1 sec. / 10 sec. / 60 sec.			
Losses - Fixed / Copper / Total			
Space Heater Rating			
Suitable for Low Voltage Heating			
C.T. Ratio & Accuracy Class			
C.T. $V_k$ & $I_{mag}$ . at $V_k / 2$			
Heating Time Constant			
Cooling Time Constant			
<b>MECHANICAL DATA</b>			
Frame Size / Ref. Dimensional Drq.			
Weight - Stator / Rotor / Total			
Heaviest Weight to be Lifted			
Rotor $GD^2$ in $Kgm^2$			
<b>REACTION AT SUPPORTS FOR</b>	S/C Condition		
	Starting Condition		
	Running Condition		
	Push Pull Condition		
Max. Vibration Limit			
Max. Noise Level			
Suitable for Outdoor Use	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Suitable for Bi-directional Rotation	Yes <input type="checkbox"/>	No <input type="checkbox"/>	
Material of Insulation			
Treatment of Insulation			
Winding Coils Replaceable at Site			
Type & Material of Fan			
Material & Thickness of Cooler Tube			
Cooling Water Required in $M^3 / hr$			
Lubrication Type			
Lubricant Specn.			
Interval of Lubrication			
<b>BEARING NOS. &amp; TYPE</b>	DE		
	NDE		
	GUIDE		
On Line Lubrication			
Type & Rating of Main Cable Box			
No. of Cable Glands in Control Cable Box			

- Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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### SPECIFICATION SHEET LOCAL CONTROL STATION

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services				
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>						
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>				
Ref. Stds. : IS / IEC		Temp. Max./Min./Design Ref. 46 / 1 / 50°C				
Encl. Docs. :		Relative Humidity: 100%   Alt. above Sea : Less than 1000 m				
Vendor :		Atmospheric Pollution				
Vendor Ref. No. :		Dusts : Coal Dust & Urea Dust Vapour : Ammonia & Highly Corrosive				
		<b>Area</b>				
		Safe : <input type="checkbox"/> Hazardous : <input type="checkbox"/>				
Sample : Reqd. : <input type="checkbox"/> Not Reqd. : <input checked="" type="checkbox"/>		<b>Hazardous Area Class</b>				
Tests : Routine : <input checked="" type="checkbox"/> Type : <input type="checkbox"/>						
Others:		Zone : Encl. Gr. : Temp. Cl.				
		Location : Indoor <input checked="" type="checkbox"/> / Outdoor <input checked="" type="checkbox"/>				
<b>BASIC DATA</b>						
Item No.	1		2		3	
	LCS FOR HV/LV MOTORS (Breaker controlled)		LCS FOR LT MOTORS (above 22KW to 55KW)		LCS FOR LT MOTORS (up to 22KW )	
	TYPE - 1		TYPE - 2		TYPE - 3	
Quantity						
Rated Control Voltage with + %	110V DC ±5%		240V±10%		240V±10%	
Rated Frequency with +	50Hz±5%		50Hz±5%		50Hz±5%	
Enclosure for Hazardous Area						
<b>Provisions required in LCS</b>						
<b>PUSH BUTTON</b>	Start		Required		Required	
	Stop		Required		Required	
	Reverse					
	Forward					
<b>CONTROL SWITCH</b>	TNC	Required				
	Lock / Service					
	OFF / AUTO / ON					
<b>INDICATION LAMP</b>	Local/Remote	Required		Required		
	ON	Required		Required		
	OFF	Required		Required		
	Ready for Service	Required				
	Space Heater ON	Required		Required		
<b>METERS</b>	C.B. tripped	Required				
	Ammeter	Required		Required*		
	Range					
<b>RAIN HOOD</b>	C.T. Sec. Current	1 Amp.		1 Amp.		
	Reqd.	Required		Required		
	Not Regd.					
Control Cable Size PVCAPVC (Cu)						
Painting Type & Shade	Epoxy Shade631of IS 5		Epoxy Shade631of IS 5		Epoxy Shade631of IS 5	
Period For which Spares Reqd.	2Years		2Years		2Years	
<b>MAKE OF COMPONENTS</b>						
Push Buttons	L & T / Siemens / Alstom / Teknic / Vaishnav					
TNC Switches	L & T / Siemens / Alstom / Teknic					
Ammeter	AEP / IMP / Mecro / Universal					
Indication Lamp	L & T / Teknic / Vaishnav					
Cable Gland	Baliga / Flexpro / CEAG FCGPL / FEPL					
Terminal Box	Elemex / Siemens/ L & T					
- Note 1) All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order						
*2) From process point of view, ammeter shall be provided for motors below 5.5 KW .						

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**TECHNICAL PARTICULARS**  
**LOCAL CONTROL STATIONS**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
ORDER <input type="checkbox"/>		FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Maker's Type			
<b>CONSTRUCTIONAL FEATURES</b>			
Material of Construction			
Thickness of Enclosure			
IP Class of Enclosure			
Mounting Arrangement			
Door hinged or not			
Gasketing Material			
External Hardwares			
Rainhood reqd. or not			
<b>Mounting Component</b>		On Door	
		On Base Plate	
Provision of Padlocking provided with			
Dimensions LxBxH / Dimensional Drg. Ref. No.			
Type Test Certificate No.			
<b>WIRING</b>			
Wiring Material & Size			
External Cable Size			
<b>TERMINATION ARRANGEMENT</b>			
Termination Arrangement			
Cable Glands		Material Types	
Terminal		Make	
		Type	
		Rating	
<b>PUSH BUTTONS</b>			
Make & Maker's Type			
Ref. Standards			
Rated Voltage			
No. of Contacts N.O. / N.C.			
Contact Rating ( V / A )			
<b>AMMETER</b>			
Make & Maker's Type			
Ref. Standards			
Rated Current / VA			
Accuracy Class			
Scale Band			
Size			
<b>CONTROL SWITCHES</b>			
Make & Maker's Type			
Ref. Standards			
Rated Voltage			
No. of Contacts N.O. / N.C.			
Contact Rating ( V / A )			
Utilization Category			
<b>SIGNAL LAMPS</b>			
Make & Maker's Type			
Ref. Standards			
Rated Voltage / Watts			
Type of Holder			
Safety Resistor			

- Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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- SPECIFICATION SHEET  
LIGHTING SUB DISTRIBUTION BOARD

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services		
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/>		ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>		
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>		
Ref. Stds. : IS/IEC		Temp. - Max / Min / Design ref.: 46 / 1 / 50°C		
Encl. Docs. :		Relative Humidity: ≤ 100%; Alt. above sea : <1000 M		
Vendor :		Atmospheric Pollution		
Vendor Ref. No. :		Dusts : Coal Dust & Urea Dust		
<b>SYSTEM DETAILS</b>		Vapour : Ammonia & Highly		
Nominal Voltage with + % : 415V+ 10%,		Area		
Rated Frequency with + % : 50 Hz± 5%,		Safe <input type="checkbox"/> Hazardous <input type="checkbox"/>		
Combined V & F Variation : ± 10%,		Hazardous Area Class		
No. of Phases & Wires : 3-Phase, 4-wire		Zone : Encl. Gr. :		
TESTS TO BE WITNESSED: Routine <input checked="" type="checkbox"/>		Temp. Class : T3		
		Location Indoor <input type="checkbox"/> Outdoor <input checked="" type="checkbox"/>		
		Type <input type="checkbox"/> Others <input type="checkbox"/>		
<b>BASIC DATA</b>				
Item No. :				
Quantity :				
Description :		LSDB		
Code No.		LSDB		
Incoming & Outgoing feeders		DC LSDB		
Refer SLD		Refer SLD		
Degree of Protection :		Refer SLD		
Min IP55		Min IP55		
Addl. Degree of Protection :		Min IP55		
--		--		
Cable Type & size		--		
Incoming				
Outgoing				
1.1 KV, 3x2.5 sq. mm. (Cu)		1.1 KV, 3x2.5 sq. mm. (Cu)		
XLPE-A-FRLS PVC		XLPE-A-FRLS PVC		
1.1 KV, 3x2.5 sq. mm. (Cu)		1.1 KV, 3x2.5 sq. mm. (Cu)		
XLPE-A-FRLS PVC		XLPE-A-FRLS PVC		
Painting Type & Shade :		Epoxy based, RAL 7032		
Epoxy based, RAL 7032		Epoxy based, RAL 7032		
Epoxy based, RAL 7032		Epoxy based, RAL 7032		
Period for which Spares required :		2 years		
2 years		2 years		
2 years		2 years		
- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.				
<b>TECHNICAL PARTICULARS</b>				
Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/ Consultant approval, before commencement of manufacturing.				
General	Item No. :			
	Make & Maker's Type			
	Material & Thickness of Enclosure			
	Gasketing Material			
	COVER TYPE	Internal :		
		External :		
	PAINTING	Pre treatment		
		Shade		
	Material of Ext. Hardware < 8mm / > 8mm			
	Dimensional Drawing Reference No. :			
Weight :				
M.C.B.	Make & Maker's Type			
	Reference Standards			
	Category of Duty :			
	Rated Current :			
	No. of Poles :			
Terminal Block	Type of Neutral :			
	Make & Type			
Cable Gland	Rated Current			
	Type :			
Material :				

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### SPECIFICATION SHEET SWITCH SOCKET & PLUG

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services		
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/>		ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>		
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>		
Ref. Stds. : IS / IEC	Temp.- Max / Min / Design ref.: 46 / 1 / 50°C			
Encl. Docs. :	Max Relative Humidity ≤ 100% Alt. above sea : <1000 M			
Vendor :	Atmospheric Pollution	Dusts : Coal Dust & Urea Dust		
Vendor Ref. No. :	Vapour : Ammonia & Highly Corrosive			
Sample Req. :	Area	Safe <input type="checkbox"/>	Hazardous - <input type="checkbox"/>	
	Hazardous Area Class	Zone :	Encl. Gr. :	
		Temp. Class :		
	Location :	Indoor <input checked="" type="checkbox"/>	Outdoor <input checked="" type="checkbox"/>	
<b>TESTS TO BE WITNESSED :</b> Routine <input checked="" type="checkbox"/>		Type <input type="checkbox"/>	Others <input type="checkbox"/>	
<b>BASIC DATA</b>				
Item No.				
Quantity				
Rated Voltage & Frequency	415V/240V+ 10%, 50 Hz± 5%.			
Rated Current	63A/15 Amp			
No. of Phases & Pins	3ph/1 Ph, 3 Pin			
Degree of Protection	IP65			
Addl. Degree of Protection	--			
Cable Size	Supply			
	Plug	--		
Period for which Spares required	2 Years			
- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.				
<b>TECHNICAL PARTICULARS</b>				
Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.				
<b>General</b>	Make & Maker's Type			
	Material & Thickness of Enclosure			
	Gasketing Materials			
	Material of Ext. Hardwares < 8mm / > 8mm			
	Cable glands Type & Material			
	Painting	Pre treatment		
		Shade		
	Dimensional Drawing Reference No.			
Weight of Switch Socket / Plug				
<b>Switch</b>	Make & Maker's Type			
	Reference Standards			
	Rated Current			
	Utilisation Category			
<b>Fuse</b>	Make & Maker's Type			
	Reference Standards			
	Rated Current			
<b>Socket</b>	Make & Maker's Type			
	Reference Standards			
	Rated Current			
<b>Plug</b>	Make & Maker's Type			
	Reference Standards			
	Rated Current			

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### SPECIFICATION SHEETS JUNCTION BOX

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>
<b>GENERAL</b>			
Ref. Stds.		IS / IEC	
Encl. Docs.			
Make			
Maker's type			
Sample Required		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
<b>AMBIENT CONDITIONS</b>			
Temp. Max. / Min. / Design Ref.		46 / 1 / 50°C	
Rel. Humidity		100%	
Alt. Above Sea Level		<1000M	
<b>ATMOSPHERIC POLLUTION</b>	Dusts	Dusts : Coal Dust & Urea Dust	
	Vapours	Vapour : Ammonia & Highly Corrosive	
Area		Safe <input checked="" type="checkbox"/>	Hazardous <input type="checkbox"/>
Hazardous area classification		Zone:	Encl. Gr.: Temp. Class:
Location		Indoor <input checked="" type="checkbox"/>	Outdoor <input checked="" type="checkbox"/>
<b>TESTS</b>		Routine <input checked="" type="checkbox"/>	Type <input type="checkbox"/> Others <input type="checkbox"/>
<b>BASIC DATA</b>			
Item No.			
Quantity			
Rated Voltage		240V±10%	
Rated Frequency		50Hz±5%	
Rated Current		16A	
No. of Phases & Wires		1Phase / 3wires (PNE)	
Application		For looping of cable	
Material of Enclosure			
Shape of Enclosure		Round	
Degree of Protection		IP-55	
Addl. Degree of Protection		--	
Type of Cover		Dome	
No. of Outlets		3 nos. + one plug	
<b>PAINTING</b>		Type: Epoxy based	
		Shade: 631 as per IS: 5	
<b>SPARE</b>		Required: Yes	
		Duration: 2 Years operation and maintenance	
No. of Terminals: As required			
Cable gland: 4 nos.			
Stopping Plug: 1 no.			
<b>CABLE SIZE</b>		Incoming -- 3Cx2.5 mm <sup>2</sup> (Cu) 1.1 KV XLPE ARMoured FRLS PVC	
		Outgoing -- 3Cx2.5 mm <sup>2</sup> (Cu) 1.1 KV XLPE ARMoured FRLS PVC	

Note:

- Double compression rolled aluminium cable glands, lugs and plugs shall be provided
- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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**TECHNICAL PARTICULARS**  
**JUNCTION BOX**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
ORDER <input type="checkbox"/>		FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Item No.			
Ref. Std.			
Type of Junction Box			
Make			
Maker's type			
<b>CONSTRUCTIONAL FEATURES</b>			
Material of Construction			
Thickness of Enclosure			
Enclosure Protection Class			
Mounting Arrangement			
Cover Fixing Arrangement			
Gasketing Material			
External Cable Sizes			
Dimensions LX B X H / Dimensional Drg. Ref. No.			
Weight			
Painting			
Type Test Certificate No.			
<b>CABLE GLAND</b>			
Type			
Material of Construction			
Make			
<b>TERMINAL BLOCK</b>			
Nos. of Terminals			
Material			
Type			
Current Rating			
Fixing Arrangement			
Make			

NOTE: Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing..

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### SPECIFICATION SHEET BATTERY CHARGER

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>			
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>	
Ref. Stds. : IS/IEC		Temp.- Max / Min / Design ref.: 46 / 1 / 50°C	
Encl. Docs : <input type="checkbox"/>		Relative Humidity 100% Max. Alt. above Sea Level < 1000M	
Make : As per vendor list enclosed		<b>ATMOSPHERIC POLLUTION</b>	Dusts : Coal Dust & Urea Dust
Maker's Type :			Vapour : Ammonia & Highly Corrosive
		<b>LOCATION</b>	A/C Room <input type="checkbox"/> Ventilated Room <input checked="" type="checkbox"/>
			Non Ventilated Room <input type="checkbox"/>
TESTS: Routine <input checked="" type="checkbox"/> Type <input type="checkbox"/> Others <input type="checkbox"/>			
<b>BASIC DATA</b>			
<b>TAG NO. &amp; QUANTITY</b>	Item No.		
	Code No.		
	Description		Battery Charger
	Quantity		
<b>A.C. SUPPLY SYSTEM DETAILS</b>	Nominal Voltage with $\pm\%$		415 V $\pm$ 10 %
	Rated Frequency with $\pm\%$		50 Hz $\pm$ 5 %
	No. of Phases & Wires :		3 Phase, 4 Wire
	Earthing Mode		Solidly Earthed
	Fault Level		36 MVA
<b>LOAD DETAILS</b>	Continuous Current		_ A
	Rated D.C. Voltage		110V
<b>ASSOCIATED BATTERY DETAILS</b>	Make & Type		Ni-Cd
	No. of Cells		
	Nominal Voltage		110 V ,DC, $\pm$ 10%
	Float Charging Current in Amp.		
	Float Charging Voltage		1.1
	Boost Charging Current Starting/ Finishing		Ni-Cd - 1.3-1.45
	Charging Final Voltage		
	Tapping provided at Cell No.		Ni-Cd - 1.42-1.7
	Boost Charging Time		10 Hrs
Internal Resistance per Cell ( <input type="checkbox"/> <input type="checkbox"/> $\Omega$ )			
<b>CABLING DETAILS</b>	A.C. Power Supply		
	Battery		<b>XLPE insulated FRLS-PVC sheathed</b>
	Load		<b>XLPE insulated FRLS-PVC sheathed</b>
	Control		
<b>PAINTING</b>	Type & Shade		
<b>SPARE PARTS</b>	Required for a Period of 2 Years operation and maintenance		

- Note: All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.





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**TECHNICAL PARTICULARS  
BATTERY CHARGER**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR :		PROPOSAL <input type="checkbox"/>	ENQUIRY <input checked="" type="checkbox"/>
		ORDER <input type="checkbox"/>	FINAL <input type="checkbox"/>
<b>GENERAL</b>	Item No.		
	Make		
	Maker's Type		
<b>CONSTRUCTIONAL DETAILS</b>	Degree of Protection for Enclosure		
	Type of Sheet Steel		
	Thickness of Sheet Steel		
	Gasket Material		
	External Hardware <8 mm / >8 mm		
	Dimensions (L x B x H)		
	Total Weight		
	<b>Painting</b>		Type
		Shade	
<b>FLOAT / STAND BY FLOAT CHARGER</b>	Type of Charger.		
	DC Output Voltage		
	DC Output Current		
	Manual range of Output Voltage Variation		
	Output Voltage Regulation		
	Ripple Content		
	Voltage Drop Across Dropper Diodes at FL		
	Over Load Capacity		
<b>BOOST CHARGER</b>	Type of Charger		
	Output Current : Starting / Finishing		
	Output Voltage Range		
	Ripple Content		
	Float Current for Automatic Switching		
	Charge Termination Device		
	Type of Cooling		
<b>FLOAT/ STAND BY FLOAT / BOOST CHARGER</b>	<b>CHANGE-OVER ARRANGEMENT FROM</b>	Float to Standby Float	
		Standby Float to Float	
		Float / Standby Float to Boost	
		Boost to Float / Standby Float	
	Short Circuit current		
Heat Dissipation			
		<b>Float / Standby float</b>	<b>Boost</b>
<b>RECTIFIER TRANSFORMER</b>	Make		
	Type		
	Class of Insulation		
	Vacuum Impregnated		
	KVA Rating ( Design / Load)		
Temp. Rise Over Ambient			
<b>THYRISTORS</b>	Make		
	Type		
	VRRM		
	Iav		
<b>DIODES</b>			<b>Rectifier – Float / Boost</b>
	Make		
	Type		
	VRRM		
Iav			<b>Dropper Diodes</b>
<b>PCBS</b>	Make		
	Type		
	Self Diagnostic feature		
<b>FILTER CAPACITOR</b>	Make		
	Type		
	Capacity		
	Rated Voltage		
<b>D.C. CHOKE</b>	Make & Type		
	Insulation Class		



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<b>BATTERY E/F RELAY</b>	Rating : Current / Inductance				
	Make				
	Type				
	Setting Range				
<b>DC U/V RELAY</b>	Make				
	Type				
	Setting Range				
		<b>Float / Standby float</b>		<b>Boost</b>	
<b>THERMAL RELAY</b>	Make				
	Type				
	Setting Range				
	<b>AUX. RELAY</b>	Make			
Type					
		<b>Float / Standby Float</b>		<b>Battery</b>	
<b>SWITCHES</b>		Input	Output	Input	Output
	Make				
	Type				
	Rated Voltage/Current				
	Utilisation Category				
<b>CONTACTORS</b>		<b>Float/Standby Float I/P</b>		<b>Boost I/P</b>	<b>D.C. Contactor</b>
	Make				
	Type				
	Rated Voltage/Current				
	Utilisation Category				
	Operating Voltage of Coil				
<b>FUSES</b>		<b>Float/Standby Float</b>		<b>Boost</b>	
		Input/Output/SCR/Diodes		Input/Output/SCR/Diodes	
	Make				
	Type				
	Rated Voltage/Current				
<b>PUSH BUTTONS</b>	Prospective Breaking Current				
	Make				
	Type				
	Current / Voltage Rating				
	Utilisation Category				
<b>CONTACTORS &amp; SELECTOR SWITCHES</b>	Make				
	Type				
	Current / Voltage Rating				
	Utilisation Category				
<b>TIMER</b>	Make				
	Type				
	Timer Range				
<b>INSTRUMENTS &amp; METERS</b>	Make				
	Type				
	Operation				
	Accuracy				
	Size				
<b>SIGNAL LAMPS</b>	Make				
	Type				
	Rated Voltage / Wattage				
	Rating of Safety Resistor				
<b>CABLE GLAND</b>	Make				
	Type				
	Material				
<b>TERMINAL BLOCK</b>	Make				
	Type				
	Current Rating				

**NOTE:**

- Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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### SPECIFICATION SHEET BATTERY

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
<b>ISSUED FOR :</b> PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>			
<b>GENERAL</b>		<b>AMBIENT CONDITIONS</b>	
Ref. Stds. : IS/IEC		Temp.- Max / Min / Design ref.: 46 / 1 / 50°C	
Encl. Docs. : <input type="checkbox"/>		Relative Humidity: 100% Max.	Alt. above Sea Level <1000M
Make : As per enclosed vendor list		<b>Atmospheric Pollution</b>	Dusts : Coal Dust & Urea Dust
Maker's Type :			Vapour : Ammonia & Highly Corrosive
		<b>Location</b>	A/C Room <input type="checkbox"/> Ventilated Room <input checked="" type="checkbox"/>
			Non Ventilated Room <input type="checkbox"/>
<b>TESTS:</b> Type <input type="checkbox"/> Routine <input checked="" type="checkbox"/> Acceptance <input type="checkbox"/> Others <input type="checkbox"/>			
<b>BASIC DATA</b>			
<b>TAG NO. &amp; QUANTITY</b>	Item No.		
	Code No.		
	Description	Ni- Cd Battery	
	Quantity		
<b>BATTERY DETAILS</b>	Rated Nominal Voltage of battery bank	110 V DC	
	Capacity in AH at 2 hrs rate		
	No. of Cells		
	Nominal Voltage per cell		
	Cell Designation		
	Intermediate Tapping point		
	Earthing mode		
<b>CABLE DETAILS</b>	No.		
	Size		
	Type		
<b>ROOM DIMENSION</b>	Length		
	Breadth		
	Height		
<b>SPARE PARTS</b>	Required <input checked="" type="checkbox"/> for a Period of 2 Years operation and maintenance		

- Note: All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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### TECHNICAL PARTICULARS BATTERY

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
<b>ISSUED FOR :</b> PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/>
		FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Item No.			
Make			
Maker's Type			
No. of Cells Per Battery			
Capacity at 10 Hr Rate			
<b>CONSTRUCTIONAL DETAILS</b>			
<b>POSITIVE PLATES</b>	Type		
	Size		
	Number Per Cell		
<b>NEGATIVE PLATES</b>	Type		
	Size		
<b>SEPARATORS</b>	Type		
	Material		
	Thickness		
<b>CONTAINERS</b>	Thickness		
	Material		
<b>CONNECTORS BETWEEN CELLS</b>	Size		
	Material		
	Method of Connection		
Clearance Between Bottom of Plates & Containers			
Overall Dimensions of each Cell			
Weight of Complete Cell			
<b>ELECTRICAL DATA</b>			
<b>RECOMMENDED RATES OF CHARGE</b>	Starting (A)		
	Finishing (A)		
	Float (A)		
	First Charge (A)		
<b>RECOMMENDED VOLTAGE PER CELL</b>	Float Charging		
	<b>Boost Charging</b>	Start	
		Finish	
Open Circuit Voltage On Full Charge			
<b>GUARANTEED <math>\gamma</math> AT 10 Hr. RATE</b>	Amp. Hr. %		
	Watt Hr. %		
Internal Resistance Per Cell			
<b>DISCHARGE CAPACITY IN Amp.</b>	5 Hr. Rate to V Per Cell		
	3 Hr. Rate to V Per Cell		
	1 Hr. Rate to V Per Cell		
	30 Min. Rate to V Per Cell		
	15 Min. Rate to V Per Cell		
	5 Min. Rate to V Per Cell		
	1 Min. Rate to V Per Cell		
	30 Sec. Rate to V Per Cell		
	15 Sec. Rate to V Per Cell		
	5 Sec. Rate to V Per Cell		
1 Sec. Rate to V Per Cell			
<b>MISCELLANEOUS DATA</b>			
<b>Electrolyte Details</b>	Qty. Per Cell for First Filling		
	Sp. Gr. for First Filling		
	Sp. Gr. at the end of Full Charge		
	Sp. Gr. at the end of Discharge		
Recom. Max. Period of Storage before 1 <sup>st</sup> Charge			
Battery Supporting Rack Dimensions			

- NOTE: Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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**SPECIFICATION SHEET  
DCDB**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services		
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/>		ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>		
<b>GENERAL</b>		<b>AMBIENT CONDITIONS</b>		
Ref. Stds. : IS/IEC		Temp.- Max / Min / Design ref.: 46 / 1 / 50°C		
Encl. Docs. : <input type="checkbox"/>		Relative Humidity: 100% Max.	Alt. above Sea Level <1000M	
Make : As per enclosed vendor list		<b>Atmospheric Pollution</b>	Dusts : Coal Dust & Urea Dust	
Maker's Type :			Vapour : Ammonia & Highly Corrosive	
		<b>Location</b>	A/C Room <input type="checkbox"/> Ventilated Room <input checked="" type="checkbox"/>	
			Non Ventilated Room <input type="checkbox"/>	
TESTS: Type <input type="checkbox"/> Routine <input checked="" type="checkbox"/> Acceptance <input type="checkbox"/> Others <input type="checkbox"/>				
<b>BASIC DATA</b>				
<b>TAG NO.</b>	Item No.	DCDB		
	Description	DC DISTRIBUTION BOARD		
	Code No.			
<b>REFERENCE DRAWINGS</b>	Single Line Diagram	--		
<b>SYSTEM DETAILS</b>	Nominal Voltage with Variation	110V DC		
	Rated Frequency with Variation	--		
	Combined V & F Variation	--		
	No. of Phases & Wires	1 Phase 2 wire		
	Insulation Level	1.1 KV		
	Fault Level			
<b>BUS BARS</b>	<b>Rating</b>	Continuous		
		Short Time for 1 sec.	16 kA	
	Material of Construction	Al		
	Bare / Insulated	Insulated		
<b>EXECUTION</b>	Type of Insulation	Heat Shrinkable Raychem Sleeves		
	Single Front / Double Front	Single Front		
	Drawout / Non Drawout	Non Drawout		
<b>CABLE ENTRY</b>	Top	--		
	Bottom	Yes		
<b>MISC. DATA</b>	Dummy Panel Reqd. ( Yes / No )	No		
	Width of Dummy Panel	--		
	No. of Dummy Panel	--		
	<b>PAINTING</b>	Type	Epoxy Based	
		Shade	RAL 7035	
Spares Parts Reqd. For a Period of				

- Note : All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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**SPECIFICATION SHEET  
LIGHTING TRANSFORMER**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
<b>ISSUED FOR :</b>	PROPOSAL <input type="checkbox"/>	ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>
<b>GENERAL</b>			
Item No. :		Ref. Stds. :	IS/IEC
Quantity :	As Required	Encl. Docs. :	
Description :	Auxiliary Service Transformer	Make :	As per enclosed vendor list
Code No. :		Maker's Type :	
<b>TESTS :</b>	Routine <input checked="" type="checkbox"/>	Heat Run <input checked="" type="checkbox"/>	Others : <input checked="" type="checkbox"/> Impulse <input checked="" type="checkbox"/>
<b>SERVICE CONDITIONS</b>			
<b>SYSTEM DETAILS ( PRI. / SEC. )</b>		<b>AMBIENT CONDITIONS</b>	
Nom. Voltage with $\pm$ % :	415 $\pm$ 10 % V	Temp.- Max./Min./Design Ref. :	46 / 1 / 50°C
Highest System Voltage :	457 KV	Rel. Humidity: 100% Max.	Alt. above Sea < 1000M
Number of phases :	3 Ph + N	<b>Atmospheric</b>	Dusts : Coal Dust & Urea Dust
Rated Frequency with $\pm$ :	50 $\pm$ 5 % Hz	<b>Pollution</b>	Vapour : Ammonia & Highly Corrosive
Combined V & F Variation :	$\pm$ 10 %	<b>Location</b>	Indoor : <input checked="" type="checkbox"/> Outdoor : <input type="checkbox"/>
Fault MVA :			
Earthing Mode :	Solidly Earthing		
<b>BASIC DATA</b>			
<b>RATING</b>		<b>TERMINAL CONNECTIONS</b>	
Rated Capacity :		<b>PRI.</b>	Cable / Cond.
No Load Voltage Ratio : 415/433 V			Type :
Highest Voltage for Eqpt. 457 V		<b>SEC.</b>	Cable / Cond.
<b>Connection</b>	Primary : Delta Secondary : Star		Type :
% Impedance :		<b>Earth Conductor</b>	
Cooling System :			
		No. & Size :	
		Body :	
		Neutral :	
<b>PAINTING</b>		<b>SPARE PARTS</b>	
Type :	Epoxy based	Reqd. :	<input checked="" type="checkbox"/> For a period of 2 Years operation and maintenance
Shade :			
<b>ADDITIONAL FITTINGS</b>			
Refer Technical Specification			

- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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**SPECIFICATION SHEET**  
**ELECTRICAL EQUIPMENT FOR CRANES & HOISTS**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
ORDER <input type="checkbox"/>		FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Item No. :		Ref. Stds. : IS/IEC	
Quantity :		Encl. Docs.	
Description :		Make : As per vendor list enclosed	
Code No. :		Maker's Type. :	
TESTS: Routine <input checked="" type="checkbox"/>		Type <input checked="" type="checkbox"/>	
		Others <input checked="" type="checkbox"/>	
<b>SERVICE CONDITIONS</b>			
<b>SYSTEM DETAILS</b>		<b>AMBIENT CONDITION</b>	
Rated Voltage with + % : 415 V ± 10 %		Temp: - 46 / 1 / 50°C	
No. of phases : 3 Ph, 4 Wire		Relative Humidity: 100% Max.   Alt. above sea : <1000 M	
Rated Frequency With + % : 50 Hz ± 5 %		<b>ATMOSPHERIC POLLUTION</b> Dusts : Coal Dust & Urea Dust Vapour : Ammonia & Highly Corrosive	
Combined V & F variation : ± 10 %			
Fault Level :		<b>AREA *</b> Safe <input type="checkbox"/>   Hazardous <input type="checkbox"/>	
Earthing Mode : Solidly Earthed		<b>HAZ. AREA CLASS. *</b> Zone :   Encl. Gr. :	
Control Supply Voltage : 240 V AC, 1 Ph.		Temp. Cl.	
Lighting & Fan Supply Voltage : 415 V (3 Ph)/ 240 V (1Ph) AC		<b>Location :</b> Indoor <input type="checkbox"/>   Outdoor <input type="checkbox"/>	
Hand Lamp Supply Voltage:- 24 V AC			
<b>MISCELLANEOUS DATA</b>			
<b>POWER FEED METHOD</b>		<b>PAINTING</b>	
Flexible Cable :		Type :	
Overhead Bar Conductor :		Shade : of IS : 5	
<b>Incoming Cable</b> Type : size :		<b>SPARE PARTS</b>	
		Required <input checked="" type="checkbox"/>   For Period of 2Years operation & maintenance	
<b>CONTROLS</b>			
Pendant Control Station :			
Operator's Cabin :			
<b>MAKE OF EQUIPMENT AND COMPONENTS</b>			
Motors :			
Switch :			
Contactor :			
Fuse :			
Push Button :			
Limit Switch :			
Brake :			
Cable :			
Control Transformer :			
Lighting fixture :			
Junction Box :			
Terminal Block :			
Control Panel :			

- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.





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**TECHNICAL PARTICULARS  
ELECTRICAL EQUIPMENT FOR CRANES & HOISTS**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
		ORDER <input type="checkbox"/>	
		FINAL <input type="checkbox"/>	
POWER CONTROL PANEL			
<b>GENERAL</b>	Make & Maker's Type		
	Ref. Standard		
	Service		
	Degree Of Protection		
	Matl. Of Construction & Thickness		
	Gasket Material		
	External Hardwares		
	Clearance Available on all sides		
<b>BUS BAR</b>	Material Of Construction		
	Size & Rating		
	Minimum Clearances / Creepage Distance		
	Insulation & Temp. Rise		
	Support Details		
<b>SWITCHES</b>	Make & Maker's Type		
	Ref. Standard		
	Duty Category		
	Rated Voltage & Current		
	Making / Breaking Speed		
	Making / Breaking Capacity		
<b>FUSES</b>	Make & Maker's Type		
	Ref. Standard		
	Duty Category		
	Rated Voltage		
	Rated Current		
	Prospective Current		
	Fuse Puller : Included		
	Distance of Gland Plate from Bottom		
<b>CONTACTORS</b>	Make & Maker's Type		
	Ref. Standard		
	Utilization Category		
	Rated Voltage & Thermal Current		
	Making / Breaking Capacity		
	Coil Voltage		
<b>PUSH BUTTON</b>	Make & Maker's Type		
	Ref. Standard		
	Rated Voltage & Current		
	<b>No. of Aux. Contacts</b>	NO	
	NC		
<b>CONTROL TRANSFORMER</b>	Make & Maker's Type		
	Ref. Standard		
	Rating		
	Class Of Insulation		
<b>SIGNAL LAMPS</b>	Make & Maker's Type		
	Ref. Standard		
	Rated Voltage / Wattage		
	Type Of Lamp & Lamp Holder		
<b>LIMIT SWITCH</b>	Make & Maker's Type		
	Ref. Standard		
	Duty Category		

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MOTORS					
Description					
Code No.					
Make					
Maker's Type					
Rating					
Rated Output					
Synchronous Speed					
Duty					
Rotot Type					
Starting Method					
Max I Start / I Rated					
Min. V Start at Terms					
Min. M Start at VR					
<b>EXECUTION</b>	Degree of Protection	<b>IP</b>	<b>IP</b>	<b>IP</b>	<b>IP</b>
	Addl. Degree of Protection				
	Insulation				
	Cooling Method	<b>IC</b>	<b>IC</b>	<b>IC</b>	<b>IC</b>
	Stator Connection				
<b>ELECTRICAL DATA</b>	No. of Starts / Stop per Hour				
	Torque-Starting / Pull Up / Pull Out				
	Safe Stall Time at $V_R / 1.1 V_R$				
	Stator Time Constant				
	Max. Temp. Rise				
	Current at FL / 0.85 FL				
	Push Pull with Stand Capacity				
	Max. V Deep for 1 Sec. / 10 Sec.				
	Space Heater Rating				
<b>ACCESSORIES</b>	Lifting Eye Bolt				
	<b>Earthing Terminals</b>	On Body			
		In T.B.			
	Name Plate				
Addl. Name Plate					
<b>CABLING DATA</b>	Power Cable				
	Heater Cable				
	Cable Gland Type				
	Cable Gland Material				
<b>MECHANICAL DATA</b>	Frame Size / Weight				
	Ref. Dimensional Drg.				
	Material of Insulation				
	Size of Wdg. Wire				
	Type & Material of Fan				
	Lubrication Specification				
	Interval of Lubrication				
	Bearing Type with No. DE / NDE				

NOTE: Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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### SPECIFICATION SHEET HT CABLES

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>	
Encl. Docs. :		Temp. Max./Min./Design Ref. 46 / 1 / 50°C	
Vendor :		Relative Humidity: 100 %	Alt. above Sea Level < 1000M
Vendor Ref. No. :		<b>Atmospheric Pollution</b>	Dusts : Coal Dust & Urea Dust
			Vapour : Ammonia & Highly Corrosive
<b>TESTS TO BE WITNESSED:</b> Routine <input checked="" type="checkbox"/> Type <input type="checkbox"/> Acceptance <input checked="" type="checkbox"/> Others <input type="checkbox"/>			
Type Tests Certificate of Similar Cable : Required <input checked="" type="checkbox"/> Not required <input type="checkbox"/>			
<b>BASIC DATA</b>			
Item No.	1		2
Ref. Stds.	IS:7098 (PART-2)		IS:7098 (PART-2)
Voltage Grade	11 KV POWER CABLE		11 KV EARTHING CABLE
System Earthing	UE		E
Type of Cable	POWER		EARTHING
<b>CONDUCTOR</b>	ALUMINIUM/ COPPER	ALUMINIUM	
	STRANDED	STRANDED	
Insulation Type	XLPE EXTRUDED		XLPE EXTRUDED
Inner Sheath Type	EXTRUDED PVC (ST2)		--
<b>CONDUCTOR SCREEN</b>	Required	--	
	Not Required	--	
Material of Conductor Screen	AS PER IS		
<b>ARMOURING</b>	Required	YES	
	Material	GALVANISED STEEL STRIP / WIRE	
	No. of Layer		
Outer Sheath Type	EXTRUDED FRLS PVC TYPE-ST2		EXTRUDED FRLS PVC TYPE-ST2
Special Requirements	INSULATION SCREEN REQUIRED		--
Drum Material	STEEL		WOOD

- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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**SPECIFICATION SHEET  
LT POWER & CONTROL CABLES**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
<b>ISSUED FOR :</b> PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>			
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>	
Encl. Docs. :		Temp. Max./Min./Design Ref.: 46 / 1 / 50°C	
Vendor :		Relative Humidity: 100 %	Alt. above Sea Level < 1000M
Vendor Ref. No. :		<b>Atmospheric Pollution</b>	Dusts : Coal Dust & Urea Dust Vapour : Ammonia & Highly Corrosive
<b>TESTS TO BE WITNESSED:</b> Routine <input checked="" type="checkbox"/> Type <input type="checkbox"/> Acceptance <input checked="" type="checkbox"/> Others <input type="checkbox"/>			
<b>Type Tests Certificate of Similar Cable :</b> Required <input checked="" type="checkbox"/> Not required <input type="checkbox"/>			
<b>BASIC DATA</b>			
Item No.			
Ref. Stds.	IS:7098 (PART-1)	IS:7098 (PART-1)	IS:7098 (PART-1)
Voltage Grade	1.1 KV POWER CABLE	1.1 KV CONTROL CABLE	1.1 KV EARTHING CABLE
System Earthing	NEUTRAL SOLIDLY EARTHED	NEUTRAL SOLIDLY EARTHED	NEUTRAL SOLIDLY EARTHED
Type of Cable	POWER	CONTROL	EARTHING
<b>CONDUCTOR</b>	ALUMINIUM/ COPPER	ALUMINIUM / COPPER	COPPER
	STRANDED	STRANDED	STRANDED
Insulation Type	XLPE EXTRUDED	XLPE EXTRUDED	XLPE EXTRUDED
Inner Sheath Type	EXTRUDED PVC (ST2)	EXTRUDED PVC (ST2)	--
<b>CONDUCTOR SCREEN</b>	Required	--	--
	Not Required	--	--
Material of Conductor Screen	--	--	--
<b>ARMOURING</b>	Required	YES	YES
	Material	GALVANISED STEEL STRIP / WIRE	GALVANISED STEEL WIRE
	No. of Layer	SINGLE	SINGLE
Outer Sheath Type	EXTRUDED FRLS PVC TYPE-ST2	EXTRUDED FRLS PVC TYPE-ST2	EXTRUDED FRLS PVC TYPE-ST2
Special Requirements	--	--	--
Drum Material	WOOD	WOOD	WOOD

- All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.

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### TECHNICAL PARTICULARS CABLES

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
<b>ISSUED FOR :</b> PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/>
		FINAL <input type="checkbox"/>	
<b>GENERAL</b>			
Make			
Ref. Standard			
Item No.			
Voltage Grade			
Suitable For Earthed / Unearthed System			
No. of Cores & Size of Conductor			
<b>CONSTRUCTIONAL DETAILS</b>			
<b>CONDUCTOR</b>	Material		
	Construction		
	No. & Dia of wires per Core		
<b>CONDUCTOR SCREEN</b>	Material		
	Thickness		
<b>INSULATION</b>	Material		
	Thickness		
	Core Identification Method		
<b>INSULATION SCREEN</b>	Material		
	Thickness		
<b>INNER SHEATH</b>	Type & Material		
	Thickness		
<b>ARMOURING</b>	Type & Material		
	Dia of Wire / Strip Thickness		
<b>OUTER SHEATH</b>	Material		
	Thickness		
<b>ELECTRICAL DATA</b>			
<b>CONTINUOUS CURRENT RATING WHEN LAID IN</b>	Ground At 30 <sup>o</sup> C		
	Air At 40 <sup>o</sup> C		
Short Circuit Current For 1 sec.			
<b>CONDUCTOR TEMP.</b>	Continuous		
	Short Time		
Resistance At Operating Temp. (Ohm / KM)			
Reactance At 50 C/S (Ohm/KM)			
Capacitance (F/Km)			
Insulation Resistance			
Polarisation Index			
<b>DERATING FACTOR CHART ATTACHED FOR</b>	Temperature		
	Grouping		
	Exposure to Sun		
<b>MECHANICAL DATA</b>			
<b>DIAMETER WITH TOLERANCE</b>	Over Inner Sheath		
	Over Armour		
	Overall		
Weight Of Cables Per KM			
Minimum Bending Radius			
Maximum Pulling Tension			
Standard Drum Length			
Tolerance On Drum Length			

NOTE: Completely filled in Technical Particulars Sheet for each type & size of cable in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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**TECHNICAL PARTICULARS  
LIGHTING FIXTURES AND ACCESSORIES**

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
		ORDER <input type="checkbox"/>	
		FINAL <input type="checkbox"/>	
<b>FIXTURE</b>			
Item No			
Make			
Type			
Ref. Standard			
<b>Suitable For</b>	Type Of Lamp		
	Wattage Of Lamp		
Suitable For Outdoor Use			
Control Gear Integral / Separate			
<b>Degree of Protection</b>	Fixture		
	Control Gear Box		
<b>Additional Degree of Protection</b>	Fixture		
	Control Gear Box		
<b>Material &amp; Finish</b>	Housing		
	Reflector		
	Control Gear Box		
	Diffuser / Louvre		
	Gasket		
	Ext. Hardwares <8mm/>8mm		
<b>Pre - treatment</b>	Housing		
	Reflector		
	Control Gear Box		
<b>Thickness of material</b>	Housing		
	Reflector		
	Control Gear Box		
Minimum Mounting Height			
Spacing / Height Ratio			
Light Output Ratio - Up / Down			
Surface Temp. Rise Range ( For FLP Fxt )			
<b>Cable Gland</b>	Type		
	Material		
	Qty. Fittings / Control Gear Box		
<b>Threaded Plug Provided</b>	Fixture		
	Control Gear Box		
<b>Looping Facility Available</b>	Fixture		
	Control Gear Box		
Mounting Bracket Provided			
Weight Of Fixture			
<b>Catalogue attached indicating</b>	General Arrangement		
	Light Distribution		
	Utilisation Factors		
	I FL / I Starting		
<b>ACCESSORIES</b>			
<b>Ballast</b>	Make & Maker's Type		
	Ref. Standard		
	Rating		
	Winding Wire Material		
	Insulation Class		
<b>Capacitor</b>	Power Loss in Ballast		
	Make & Maker's Type		
	Ref. Standard		
<b>Lamp Holder</b>	Rating		
	Make & Maker's Type		
	Ref. Standard		
<b>Starters</b>	Rating		
	Make & Maker's Type		
	Ref. Standard		

NOTE: Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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## SPECIFICATION SHEET INTERLOCKING SWITCH SOCKET & PLUG

PROJECT: Coal Based Fertilizer Plant		PLANT: Ash Pond and Allied Services	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
		ORDER <input type="checkbox"/>	
		FINAL <input type="checkbox"/>	
<b>GENERAL</b>		<b>AMBIENT CONDITION</b>	
Ref. Stds. :	IS / IEC	Temp.- Max / Min / Design ref.: 46 / 1 / 50°C	
Encl. Docs. :		Max Relative Humidity ≤100% Alt. above sea : <1000 M	
Vendor :		Atmospheric	Dusts : Coal Dust & Urea Dust
Vendor Ref. No. :		Pollution	Vapour : Ammonia & Highly Corrosive
Sample Regd. :		Area	Safe <input type="checkbox"/> Hazardous - <input type="checkbox"/>
		Hazardous	Zone : Encl. Gr. :
		Area Class	Temp. Class :
		Location :	Indoor <input checked="" type="checkbox"/> Outdoor <input checked="" type="checkbox"/>
<b>TESTS TO BE WITNESSED :</b>		Type Others	
Routine <input checked="" type="checkbox"/>			
<b>BASIC DATA</b>			
Item No.			
Quantity			
Rated Voltage & Frequency		415V ± 10 %, 50Hz ± 3%	240V+ 10%, 50 Hz± 5%.
Rated Current		63 Amp	16 Amp
No. of Phases & Pins		3 Ph, 5 Pin	1 Ph, 3 Pin
Degree of Protection		IPW55	IP65
Addl. Degree of Protection			
Cable Size	Supply		
	Plug		
Period for which Spares required			
<b>MAKE OF COMPONENTS</b>			
SWITCH :			
FUSE:			
SOCKETS :			
PLUG :			
CABLE GLANDS :			
TERMINAL BLOCKS :			
<b>TECHNICAL PARTICULARS</b>			
<b>General</b>	Make & Maker's Type		
	Material & Thickness of Enclosure		
	Gasketing Materials		
	Material of Ext. Hardwares < 8mm / > 8mm		
	Cable glands Type & Material		
	Painting	Pre treatment	
		Shade	
	Dimensional Drawing Reference No.		
Weight of Switch Socket / Plug			
<b>Switch</b>	Make & Maker's Type		
	Reference Standards		
	Rated Current		
	Utilisation Category		
<b>Fuse</b>	Make & Maker's Type		
	Reference Standards		
	Rated Current		
<b>Socket</b>	Make & Maker's Type		
	Reference Standards		
	Rated Current		
<b>Plug</b>	Make & Maker's Type		
	Reference Standards		
	Rated Current		

NOTE: Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

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## ELECTRICAL ERECTION, TESTING & COMMISSIONING SPECIFICATION



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## 1.1. SCOPE OF WORK

1.1.1 The scope of work shall include storage, handling, transportation, unpacking, checking, reporting of damages/defects, assembling, erection, installation, including fabrication, alignment, leveling, grouting, welding, bolting, painting (wherever specified), etc., testing and commissioning of various electrical equipment either supplied by the contractor or supplied by owner as free issue items, earthing system, fabrication & installation of steel structural etc. as per drawings & documents, specifications, standards & codes, prevalent rules & regulations and best engineering practices.

1.1.2 The scope shall also include obtaining approval from statutory authorities, as required.

## 1.2 SCOPE OF ERECTION

1.2.1 The scope comprises of erection/installation, testing and commissioning of electrical equipment/items as indicated in SOR.

1.2.2 Laying of cables in excavated/ RCC trenches and on cable trays as required.

1.2.3 Installation of Cable Trays on MS structure along with supply of Tray Clamps, jointing/Reducing Plates and other hardware. Laying of cables in excavated/RCC trenches and on cable trays as required along with cables clamping including supply of clamping material.

1.2.4 Supply of double compression/FLP rolled aluminium cable glands and crimping type tinned copper cable lugs.

1.2.5 Excavation and back filling of cable trenches.

1.2.6 Termination of power, control and lighting cables.

1.2.7 Fabrication with supply of MS material, consumable and hardware of frames, supports, cable racks etc. as required.

1.2.8 Supply, laying & connection of the complete earthing system including supply of GI earth electrode as per sketch given, GI earthing strips, Earth Bus-Bars, flexible earthing conductors etc.

1.2.9 Minor civil works such as digging of earth and refilling for directly buried cables, earth strips, cable protection pipes, earth electrode pits, ground mounted lighting pole foundations, civil works such as making earth pit inspection chambers with covers, grouting of base plate, channels, supports and foundation bolts, including chipping of concrete or in brick work for earth strips, pipes and other minor chipping for foundation preparation, if required, cutting holes in walls for racks, risers, light fitting brackets, sealing of cable entries and making good the same after installation of the equipment and leveling and other minor similar jobs shall be in contractor's scope.

1.2.10 Hydra/cranes/forklift etc. for shifting/lifting of material shall be in contractor's scope.

1.2.11 Straight - through jointing of cables (wherever required)

1.2.12 Making/providing canopies/rain hoods.

1.2.13 All hardware required for successful commissioning, whether specifically mentioned or not in the specification shall be supplied by the Contractor.

1.2.14 Concrete foundations for pedestals, lighting poles, grouting of equipments etc., including supply of grouting materials.

1.2.15 Removal of materials/scrap to the scrap yard and stores etc. as per instructions of Owner/Consultant.

1.2.16 Supply and installation of any other item not specifically mentioned but found necessary by the engineer-in-charge for satisfactory completion of job.

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- 1.2.17 All letter writing on switchboards, transformer, danger boards, sign etc shall be done by the contractor.
- 1.2.18 Any work not included in this tender but may be required, as decided by engineer-in-chief, such as site modification of panel wiring, mounting of additional equipment etc. for which extra payment shall be made as per the man-day-rates to be quoted for various categories of workmen.
- 1.2.19 “AS BUILT” drawings with all site modifications shall be prepared by making the changes on owner’s drawings.

### 1.3 EXCLUSIONS

### 1.4 CODES AND STANDARDS

- 1.4.1 The design, manufacture, testing, installation of the equipment shall comply with the latest issue of all relevant Indian Standards and codes of practices and all applicable Statutory Acts & Regulations.
- 1.4.2 The contractor shall have acquainted with local safety standards pertaining to electrical installation, testing & commissioning
- 1.4.3 The contractor shall have valid “A” class license from the Director of Electrical Safety to the Govt. of Gujarat. The contractor shall have to submit the copy of their license. The contractor must have PF & ESI codes covering all persons hired by him for carrying out the job.
- 1.4.4 The contractor shall observe safety rules and take all necessary safety precautions to carry out the work in the plant.

### 1.5 GENERAL PROCEDURE FOR ERECTION

- 1.5.1 The general procedure governing "Transfer of equipment and materials to Contractor", erection and final acceptance of owner/consultant are given below:

#### 1.5.1.1 Storage of equipment at site

- a) All equipment and materials shall be properly stored by the contractor at site in the designated storage area provided by the owner. Contractor shall arrange to draw the necessary equipment/materials in the sequence required for erection and transport the same from contractor's store to erection point.
- b) The contractor shall keep proper record of the materials supplied by him/owner.
- c) The contractor shall ensure that all the materials drawn by him are stored indoor/under shade/outdoor as per package storage instruction. However, if a package is temporarily stocked outdoor due to unavoidable reasons, this shall be ensured that the storage area is dry, hard and well-drained.
- d) Goods must not be placed directly on the floor/ground but shall be kept on blocks, 60 mm to 120 mm above the floor level such that the bottom is well ventilated.
- e) In case of outdoor storage, the contractor at his own cost shall provide waterproof PVC sheets/tarpaulin to cover all goods so as to protect them from rain etc. These sheets/tarpaulin shall be removed for inspection once in a week and if found moist or mouldy, shall be dried in direct sunlight.
- f) In addition to the above, the equipment manufacturer's storage instructions, if any, shall be strictly followed.

#### 1.5.1.2 Contractor's inspection at site

- a) On receipt of any material (supplied by the contractor) at site, contractor shall fully unpack and inspect all equipment received for completeness, signs of damages, defect etc. in the presence for owner’s representative. Any damage/short supply detected shall be recorded

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immediately. The contractor shall be required to make good/replace/repair the defective/damaged items at no extra cost to the owner.

#### 1.5.1.3 Handling and cleaning

- a) The contractor shall be responsible for proper handling and cleaning of all materials/equipment drawn/ supplied by him until owner/consultant finally accepts the erected equipment.
- b) Equipment shall be handled with care by experienced riggers under guidance of competent supervisors and as per rigging marks given on cases. Dragging on floor shall be avoided and crane/suitable rollers shall be used for moving the equipment at any times.
- c) The contractor shall be fully responsible for the safe keeping of equipment issued to him till these are erected, tested, commissioned by him and accepted by owner/consultant.

#### 1.5.1.4 Transportation

This involves transportation of various electrical equipments/materials from HWB stores to contractor's store/erection site and from contractor's store to erection site. When transporting the equipment, it shall be loaded on suitable trailer/ trucks as per capacity and size of equipment, and shall be properly supported on the trailers/ trucks by means of ropes/stoppers to avoid damage or tilting due to heavy jerks and vibration.

Precautions, if any, displayed on equipment shall be strictly observed. Transportation equipment without safe load certified capacity shall not be used in any case.

#### 1.5.1.5 Erection Requirements

- a) All work shall be carried out as per drawings supplied. Placing on foundation, aligning, grouting, connecting, fixing danger notice plate / board on equipment as specified, meggering, labeling and painting shall form part of erection requirements.
- b) Fixing of supporting frames/pedestals, grouting, cutting and dressing holes in walls/ceiling and any other minor civil work necessary for installation and leveling of electrical equipment are included in electrical erection scope.
- c) The scope of erection also includes cable dressing using steel tie/aluminium clamps fabricated from Al strip 25mm (width)X3mm (thick)/clamping/minor rerouting, minor relocation of fittings, internal cleaning of equipment, overhauling and minor repairs.
- d) Fabrication of clamps from the materials specified and clamping of cables on racks, trays etc. fixing of single core cables in tri-foil formation in aluminium clamps, earthing of cable armour and lead sheath, wherever necessary (and as per the details given by Consultant) fall under erection scope of work.
- e) Marking of cables by fixing/grouting the cable marks/number tags at every 25 metres along entire route of cables are included in the scope of work. The tags shall be made of Aluminium Strips.
- f) The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged/scratched during handling, erection or repair. The paint used shall match exactly the painted surface of the equipment on which touch-up is done, and shall be epoxy based.
- g) The descriptions given above are only to give a preliminary idea about the scope of work and they do not limit the entire scope to these descriptions only. Hence all other parts of the tender document shall be read in conjunction with the referred standards, associated drawings, specification sheets and schedule of materials & services to assess actual scope of work.
- h) The contractor shall undertake erection of all equipment specified herein in accordance with good engineering practices in conformity with statutory regulations and Code of Practice and to the entire satisfaction of the purchaser/ owner.

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- i) The contractor shall arrange all the necessary erection tools, tackles, testing and measuring instruments and shall supply all erection materials as required.

## 1.6 SPECIFICATION FOR ELECTRICAL ERECTION

### 1.6.1 General

1.6.1.1 These specifications lay down the erection procedures to be followed for each type of equipment, over and above the general "Erection Requirements".

1.6.1.2 The contractor shall also follow manufacturer's instructions and any other instructions of consultant/Principal/Statutory bodies during erection.

1.6.1.3 Suggestive Erection Drawings shall be supplied to the successful bidder for Lighting, Earthing, Cable Tray Routing, etc. These drawings may be suitably modified, if required, to suit site requirement with the approval of owner/consultant.

1.6.1.4 As-Built Drawings shall be prepared by the bidder and supplied to owner/consultant.

### 1.6.2 Switch Boards

(HT SwitchBoard, PMCC/EPMCC/MCC, Capacitor Panel, MLDB, UPS ACDB, LSDB, ASPB, Feeder Pillar Box, etc.)

#### 1.6.2.1 Handling

- a) As far as possible lifting of switchboards shall be done by making use of eyebolts provided. It shall be ensured that before lifting, all eyebolts are fully tightened and that panel supports, nuts and bolts are intact and tight.
- b) If lifting arrangement is not provided/ not feasible and final positioning by sliding is unavoidable, packing base shall be retained as long as possible and rolled on suitable pipes. Dragging of panel directly on floor by crowbars shall be avoided.
- c) Maximum care shall be taken to avoid any damage to insulator, bushings, meters and protective equipment.

#### 1.6.2.2 Erection

- a) Check the foundation according to the drawings. Ensure that all pockets have been rightly made. Fix the datum level, and level the foundation by chipping in such a way that the prescribed point of cubicle base plate is flushed with finished floor.
- b) Check the individual cubicle for any deformity and ensure that all faces are straight. Any dent on sheet steel frame shall be rectified before placing on foundation.
- c) For Installation of base frame supplied with equipment or site fabricated, level the foundations in both directions (lateral and transverse) and ensure that these have been correctly leveled throughout. In case of runner rails, check the rails for level in both the directions and ensure that they are parallel to each other. Wherever base frame is fixed to cubicle, place the cubicle on foundation ensuring that holding down bolts are directly over the foundation pockets.
- d) Obtain correct level of panel with respect to floor/ existing bus-bar by putting shims below base frame, shims are to be supplied by the contractor. Measure the level of each frame with reference to datum and ensure that level difference between the two ends of the switchboard base frame is within  $\pm 2$  mm.
- e) Cubicle shall be so adjusted that front face of all the panels are in one plane, all sides are plumb and corresponding horizontals on all panel faces (e.g. minimum lines, door edges, inter cubicle joints) line up in the same horizontal line (s). Match the cubicles and adjust properly. Provide gasket between edges, if required; so that no inter-panel gaps are seen.
- f) Bolt adjacent cubicles and base frame together by drilling new holes, wherever necessary to match holes.

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- g) Grout the foundation bolts with mortar, run grouting mixture under base of the cubicle frame, ram to ensure solidity. After grout has set properly, tighten the foundation bolts.

#### 1.6.2.3 Bus Connections and Installation of Loose items

- a) Fix bus bar links and inter panel bus-bar connections with coupling bolts/ supporting insulators. Clean the contact surface of bus bars and links and smear with contact grease before bolting.
- b) Wherever recommended, fix shroud on the joints and fill compound, or compound may be put on joint to form smooth homogenous & spherical shaped mass and then wrapped with tape. Simple taping of joints may also be done. Recommendation of manufacturer/ consultant/ Principal shall be followed in this respect.
- c) In case of misalignment of bus bars, adjustments may be necessary. The connecting pieces may have to be re-drilled or re-fabricated.
- d) Check tightness of bus bars bolts connections with torque wrench. Follow vendor's recommendations in this regard. Bus tightens shall be confirmed by contractor by Micro ohm testing equipment.
- e) Install all loose relays, instruments, cable boxes, metering and protective CTs, PTs etc. Before fixing the relays, make sure that they are cleaned and all packing materials have been removed from them and proper operation. Clean the contacts.
- f) Connect all inter-panel bus wiring. Connections of relays and instruments shall be done as per drawings. Check the wiring according to wiring diagram.
- g) Connect all earthing bus bar between the cubicles and it shall be connected at two points by Al/ GI strip or cable to the main earthing ring. Fix all glands for incoming and outgoing and control cable connections on the holes provided for the purpose, as per drawings.
- h) Drill holes for fixing cable glands/ cable boxes as per drawings, if such holes are not provided. All spare holes, gaps etc. shall be blanked as per instructions of Principal/ Consultant.

#### 1.6.2.4 Cleaning

After erection is complete all cubicles, switches, starters, CTs, PT Chambers, Bus bar Chambers etc. should be cleaned by blowing air (preferably hot air). Surface of the insulation shall be cleaned with cloth soaked in CTC/ Benzene.

#### 1.6.2.5 Circuit breakers installation (Air Circuit Breaker)

- a) Clean the contacts properly with cloth soaked in CTC/ Benzene etc. Clean and lubricate the operating mechanism, check and rectify the main insulating contacts and bushings and also secondary contact for any damage/ misalignment. Check the locking mechanism.
- b) Manually close and trip the breaker several times and check contact alignment and pressure. Adjustment, if required, shall be done according to the manufacturer's instruction. The arc chute if dispatched separately should be fixed properly, only after checking of contact alignment etc. After fixing the Arc Chute, operate manually the breaker and check the contacts make properly. Measure contact resistance with conductor. Check the operation of OFF-ON indicator.

#### 1.6.2.6 Vacuum Circuit Breaker

- a) Check the breaker frame for any damage. In case of vertical isolation type, raise and lower the breaker several times and ensure that breaker moves freely on guide, lubricate the mechanism.
- b) Check the operation of locking mechanism. Check the secondary isolating contacts for any deformity. Check HT bushings for any damage and repair if it is minor.
- c) Manually close and trip the breaker several times. Adjust the mechanism as per manufacturer's instruction. Measure the contact resistance with ductor. Check the oil

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level in the chamber. If level is low, due to leakages, rectify and fill up as per manufacturer's instruction. Check the operation of ON/OFF Indicator.

- d) Check that safety shutter open and close smoothly. Remove the lock if provided before racking in the circuit breakers. Put the circuit breaker inside the cubicles. If cubicle is aligned properly, the circuit breaker shall go smoothly inside the cubicle.
- e) In case of horizontal isolation type circuit breaker, engage the racking mechanism and put the interlock mechanism operates smoothly and adjustment if required shall be done. Slowly rack in the breaker to service position. While racking in, ensure that safety shutters open smoothly. Check the mechanical interlock mechanism. Also check that the main and secondary isolating contacts mesh properly. Conduct this operation a few times to ensure proper functioning and alignment of all mechanism.
- f) For vertical isolation type circuit breaker, put it first at the test position and check interlock mechanism and also the secondary isolating contacts engaged properly. Put it at service position, and slowly raise it to fully raised position. Ensure that main isolating contact bushings enter bush bars spouts smoothly and contacts mesh properly. Conduct the raising/ lowering operation several times to ensure a smooth functioning of all mechanism. Any other allied work thought necessary for completion of the erection will have to be done by the Contractor.

#### 1.6.2.7 General Checks

- a) Ensure that all gaskets are in position, replace the same if found damaged.
- b) All opening covers and rear doors shall be bolted with required number of bolts. Take care that no bolt/nut/washer gets lost during handling and erection.
- c) Check inter-changeability of breakers of same rating.

### 1.7 ECS I/O RACK & NGR

#### 1.7.1.1 Handling

- a) As far as possible lifting of I/O Racks / Panels & NGR shall be done by making use of eyebolts provided. It shall be ensured that before lifting, all eyebolts are fully tightened and that panel supports, nuts and bolts are intact and tight.
- b) If lifting arrangement is not provided/ not feasible and final positioning by sliding is unavoidable, packing base shall be retained as long as possible and rolled on suitable pipes. Dragging of panel directly on floor by crowbars shall be avoided.
- c) Maximum care shall be taken to avoid any damage to insulator, bushings, meters and protective equipment.

#### 1.7.1.2 Erection

- a) Check the foundation according to the drawings. Ensure that all pockets have been rightly made. Fix the datum level, and level the foundation by chipping in such a way that the prescribed point of cubicle base plate is flushed with finished floor.
- b) Check the individual cubicle for any deformity and ensure that all faces are straight. Any dent on sheet steel frame shall be rectified before placing on foundation.
- c) Take prior approval for Fabrication of the base frame if required.
- d) For Installation of base frame supplied with equipment or site fabricated, level the foundations in both directions (lateral and transverse) and ensure that these have been correctly leveled throughout. In case of runner rails, check the rails for level in both the directions and ensure that they are parallel to each other. Wherever base frame is fixed to cubicle, place the cubicle on foundation ensuring that holding down bolts are directly over the foundation pockets.

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- e) Obtain correct level of panel with respect to floor/existing bus-bar by putting shims below base frame; shims are to be supplied by the contractor. Measure the level of each frame with reference to datum and ensure that level difference between the two ends of the switchboard base frame is within  $\pm 2$  mm.
- f) Cubicle shall be so adjusted that front face of all the panels are in one plane, all sides are plumb and corresponding horizontals on all panel faces (e.g. minimum lines, door edges, inter cubicle joints) line up in the same horizontal line (s). Match the cubicles and adjust properly. Provide gasket between edges, if required; so that no inter-panel gaps are seen.
- g) Bolt adjacent cubicles and base frame together by drilling new holes, wherever necessary to match holes.
- h) Grout the foundation bolts with mortar, run grouting mixture under base of the cubicle frame, ram to ensure solidity. After grout has set properly, tighten the foundation bolts
- i) Mounting in place loose items supplied with the equipment.
- j) In addition to the procedure laid above, any other instruction given by the manufacturer shall also be followed.

## **1.7.2 Transformer**

### **1.7.2.1 Handling**

- a) Transformers shall be lifted by lugs or shackles provided for the purpose to avoid unbalance while lifting.
- b) It shall be ensured that Lifting chains/slings do not interfere with any part of the transformer.
- c) Cover bolts shall be checked for tightness. If found loose, it shall be tightened fully before handling. Care shall be taken that the bolt does not rotate to avoid damage of the gasket.
- d) Jacks shall be used, if required, only on jacking pads provided for the purpose (jacks shall never be used under valves or radiators tubes).
- e) Transformer shall never be left without putting stoppers of the wheels.

### **1.7.2.2 Erection**

- a) Foundation of the transformer shall be prepared and checked for its level as per Drg. before shifting/transferring the transformers from the stores.
- b) Proper time shall be given for curing the level of rails.
- c) Wheels shall be fixed before placing of the transformer in position. Wheels of the transformers shall be checked for its proper movement. Greasing shall also be done on the shaft of wheel before placing the wheels in position. Split pins must be used/placed in position before its rolling.
- d) Transformer shall be placed on the prepared foundation only.
- e) Transformer's wheels shall be checked for its free movement on the rails/plates. It shall be then leveled & aligned with the bus ducts, which shall be connected on the LT side of the transformer.
- f) Stoppers to the transformer wheels shall be provided immediately after alignment to prevent any movement.
- g) Cleaning of all the accessories like radiators, cooling fans, valves, conservator tank, explosion vent pipe, bushings and other accessories shall be done.
- h) Radiators shall be flushed with hot oil before assembly.
- i) Cloth only shall be used for cleaning purposes.

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**CAUTION:** While working on the transformers with hand-holes or bushing holes, take care that no tools or any other foreign matters are dropped into the tanks. All the loose tools shall be properly tied and secured.

- j) All accessories such as radiators, conservator, valves, explosion vent pipe, Buchholz relay, HV and LV bushings, cable end termination boxes, marshalling box, instruments, capillary tubes, silica gel breather with dried silica gel, fans etc. shall be assembled as per vendor's drawings and instructions.
- k) Operation of shut off valves and tightness of all gasket joints shall be checked before topping up of oil. Thermometers shall also be fixed.
- l) Oil samples from each drum for dielectric strength shall be tested. Oil with standing 40 KV for 1 minute shall only be filled.
- m) Oil shall be filtered with filtering machine by using metallic hose.
- n) Bottom drain valve shall be used to fill oil in the transformer tank to prevent aeration in oil.
- o) It shall be ensured during oil filling operation that no air pockets are left in the tank and no dust or moisture enters the oil. All air vents shall be opened. Oil flow rate shall be reduced when oil level is almost up to the bottom of the main cover to prevent internal pressure from rupturing the diaphragm of pressure relief pipe. Sufficient time shall be allowed to escape all air bubbles. Air bubble accumulated in Buchholz relay shall be released by opening air release cock provided on the top. Vent plugs shall be closed.
- p) Cables shall be connected to HV and LV terminals of transformer.
- q) Control cables/ power cables shall be connected to Marshalling Box. Stop push button mounted on the wall of transformer room shall be connected to trip the transformer.
- r) Transformer body shall be earthed at two separate points to main earthing strip.
- s) Transformer neutral shall be earthed to a separate and distinct neutral earth pit (through NER, wherever applicable) as per design and drawings.
- t) Danger notice board conforming to IS: 2551 and IE Rules 1956 shall be provided on enclosure or door of the enclosure.
- u) Transformer Room's door/enclosures shall be earthed as per IE Rules, 1956.

Safety items i.e. fire extinguishers, shock treatment chart, fire buckets with screened sand, danger board etc. shall be provided

### 1.7.3 **Storage Batteries**

- a) Installation work for storage battery cells on steel / wooden racks shall be done strictly as per supplier's drawings and instructions.
- b) Steel / wooden racks shall be installed in the battery room on support insulators. The racks shall be plumbed and aligned properly.
- c) Each cell shall be inspected for any damage of its positive, negative plates, containers etc. Cell shall be cleaned properly and all packing materials removed as per manufacturer's instructions.
- d) The cells after assembling the plates, indicators etc. shall be placed on cell insulators over racks and interconnected to each other so as to avoid strain on cell-terminals.
- e) The electrolyte shall be prepared in large glass/ PVC or special jars as per manufacturer's instructions. The jars shall be cleaned with distilled water. The concentrated sulphuric acid shall be added to the distilled water slowly (never add water to sulphuric acid) and electrolyte stirred constantly with PVC rod. Temperature and specific gravity of electrolyte shall be as per manufacturer's instruction.



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- f) All necessary safety precautions shall be taken while preparing the electrolyte i.e. goggles, rubber apron, and gloves etc. shall be used.
- g) No foreign materials, dust or dirt etc. shall be allowed to fall in the electrolyte and it shall be kept duly covered.
- h) Connection to the battery charger shall be made.
- i) Prepared electrolyte shall be filled in cells up to mark level of at least 10 mm above upper edge of the plates in a manner approved by manufacturer. Electrolyte shall be allowed to cool down.
- j) While giving initial charges to the cells, instructions of the manufacturer's regarding rate of charging shall be strictly followed and care taken that charging unit is not over loaded more than the rated capacity. During the period of charging, the cells must be topped up as often as necessary to prevent the electrolyte falling below the required level. Distilled water to be used for topping purposes and quantity of distilled water used for topping up of the cells shall be noted.
- k) After initial charging battery shall be discharged at specified rate. Thereafter battery shall be recharged.
- l) Record all battery voltage of each cell, specific gravity, temperature, charging current during charging/ discharging and shall be kept in Performa supplied by the supplier or in a form approved by the consultant/ Owner Discharging and recharging operations shall be done as recommended. After final charging the battery shall be put on float charge.
- m) No naked flame or sunlight shall be permitted in battery room and smoking shall be strictly prohibited.
- n) During initial charging and discharging battery shall not be left unattended. It is to be assured that battery room is properly ventilated with an exhaust fan / blower.
- o) It is to be assured that battery room is properly ventilated with an exhaust fan.

#### **1.7.4 Cable Installation**

##### **1.7.4.1 General**

- a) All fabrication, cutting, laying, spacing, fixing etc. of cables, trays, supports, hangers etc. shall be as per drawings and instructions of Owner/Engineer-in-Charge.
- b) The contractor shall keep accurate record of cable drums supplied by owner, the drum nos. and actual length of cable taken out of each drum. Each cable length shall be cut from a specific drum as per approved schedule of cable. Lengths of cable runs shown in the cable schedule are calculated lengths only, hence the actual lengths shall be measured at site before laying and cutting the cable. The contractor shall take extreme care to adjust cable runs from drums so that joints in the cable are avoided and wastage reduced to minimum.
- c) For purpose of measurement of cable run for payment the length of cable between and terminations only shall be considered.
- d) Factory made cable tray, bend elbow, etc. also shall be used. Whereas standard supply could not be used/available. Fabrication as per site requirement shall be in contractor's scope including cold galvanization on site.
- e) Dismantling of cables rolling in cable drums, disposal at designated place as required by owner / engineer in charge shall be carried out by the contractor.

##### **1.7.4.2 Laying**

- a) The cable drums should be properly mounted on jack/ cable wheel. Make sure that the spindle is suitable for carrying weight of the drum without bending. Check that spindle is

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laying horizontal on the bearing so as to prevent the drum creeping to one side or to the other while rotating.

- b) Unroll the cables from the drum in correct direction. Rotate drum only as per arrow mark given in the cable drum. Ensure that the end protection box attached to the flange of the drum is removed and securing rope cut to allow cable and move freely. Rotate the cable drum and simultaneously pull cable steadily and with even pulls and not with unnecessary jerk or strain. In no case the cable shall be allowed to twist or kink since this is likely to spring the armour and fracture the insulation and outer serving of the cable.
- c) Do not drag the cable on floor or hard surface. Use only wooden/steel cable rollers for this purpose.
- d) Cable should not be bent sharply to a small radius. The cable bending radius shall be as large as possible and will not be less than 15 times the outside diameter for XLPE cables and 12 times for PVC cables. At joint termination the individual core of cable shall not be bent with bending radius of less than 15 times the diameter over the insulation.
- e) Where cables are laid on the MS racks, trays etc. ensure that trays/racks/supports are fixed properly in an approved manner or according to the drawings. Check from drawings that for horizontal runs of cable, bracket, risers, supports, angles are grouted or fixed in formation as required.
- f) In sub-station where large no. of cables rise to panels/switchboards, it shall be ensured that these risers do not interfere with cables on racks and rising cables do not interfere with cables on racks and rising cables do not cross the other cables in horizontal runs. Risers are to be properly supported so that weight of cable does not fall on terminations. All cable crossings shall be avoided.
- g) Cable laid in trenches should be sealed at the entry to hazardous area/non-hazardous area as per direction of owner/engineer-in-charge.
- h) Openings in substation basement and floors for entry of cables shall be sealed after the cables are laid.
- i) Cables shall be clamped by taking care to be taken to space clamps at such intervals as to prevent buckling of cables.
- j) The laying of the cable on the racks shall be done in an approved manner and according to the drawings supplied.
- k) Where cables are laid in cable slits, the slits after laying of cables shall be filled with sand & lean cement mixture and plastered so that surface flushes with top of slit.
- l) Cable cutting shall be done as per cable cutting schedule.

#### 1.7.4.3 Directly Buried Cables

- a) Laying of underground directly buried cables shall include excavation of earth along the cable route, laying of Hume/GI pipes for road crossing, back filling, ramming, removing of extra earth including supply of bricks, sand etc. as per drawing and instruction of Owner/Engineer-in-Charge.
- b) Where cables are directly laid into ground, trenches should be dug up to such a depth as to ensure that the depth of the top of the entire cable below the ground level is min. 900 mm for medium and low voltage cables, and min. 1200 mm for high voltage cables. Before laying of cables at these trenches, bottom of the trench should be properly leveled up and all odd and sharp materials removed. Trench bottom then should be bedded with a 75 mm thick layer of sand. Approval of Owner/Engineer-in-Charge shall be taken for preparation of this bed before laying of cables. Cables shall be laid in the trenches in straight runs. Care shall be taken so that any kinks or bends are not formed.

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After laying of the cables, bricks shall be placed length wise on both the sides of the cables along the entire length to form trough.

- c) Fill up space between bricks with sand up to height of the bricks. Then place bricks closely width wise on top of the sand layer throughout the length. Fill up loose earth in trench, ram properly to compact, remove extra earth from site. Broken bricks shall not be use for brick working. Only Class-I bricks shall be used.
- d) If new cables are laid to cross existing cables, the new cable shall be laid under existing cables at depth of not less than 200 mm from the existing cable. It shall be ensured that the approach of new cable to the crossing is uniform and gradually sloped.
- e) Fix cable markers at 100 Mtrs. apart and at joints on the entire cable route length of the cables. The cable markers shall be made of pre-cast concrete blocks of 300 mm x 350 mm x 350 mm size with markings of “HT CABLE”, “LT CABLE”, “Depth of Cable”, “Arrow Marks” etc. inscribed. These shall be supplied by the contractor at no extra cost and fixed as per directions of the Owner / Engineer-in-Charge. The top of the above concrete slabs shall have a smooth finish with cement only.
- f) Laying of cables under road crossings etc. shall be done in pipes, and pipe ends shall be sealed with bitumen compound and sand as required after cables are laid. Backfilled soil shall be rammed thoroughly to prevent road surface cracking due to settlement of loose soil.

#### 1.7.4.4 Laying in Readymade Trenches

- a) RCC slabs / chequered plates lifted from trenches for laying cables shall be put back in position at close of work every day to avoid accident & damage to cables in the trench.
- b) When cables pass through pipes, pipe ends shall be sealed with bitumen compound and sand as required.
- c) Protection pipes shall be provided, whenever cables enter from the floor, trench etc. in the equipment and sealing in and around these pipes shall be done.

#### 1.7.5 Cable Jointing and Termination

##### 1.7.5.1 General

The scope of work shall include but not limited to the followings:

- a) Soldering/crimping of sockets/ferrules and connections at all joints/terminations as per specifications. Sockets shall be provided at all terminations except where pressure clamp type terminals are provided.
- b) Glanding of cable and fixing of cable boxes.
- c) Scrap generated from cable termination shall be disposed in scrap yard as per instruction of site engineer in charge.
- d) Tagging of cables at its both ends e.g. MCC/DB & equipment end.

##### 1.7.5.2 Specifications

- a) HT XLPE cables shall be terminated by use of heat shrink type termination kits.
- b) All LT XLPE power and control cables shall be terminated through double compression type gland.
- c) In case of LT XLPE cables, armours shall be suitably earthed in compression type glands. For HT XLPE cables, this shall be done either in glands or by any other suitable means like bonding the armour with suitable wire and connecting same to the earth terminals inside cable box.
- d) In explosion proof equipment, sealing accessories, where provided in cable box, shall be used for sealing the cable entry to the box and termination.

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- e) All lighting and control cables shall be provided with crimped Al/Cu Sockets before termination in junction boxes.

#### 1.7.5.3 Crimping

- a) For all power cables, crimping type Al lugs for Al cables and tinned Cu lugs for Cu cables shall be provided. These lugs shall be crimped on the cable conductors by means of special hand/hydraulic crimping tools. Before crimping the socket inhibiting grease shall be smeared over the conductor. Conductor shall be shaped properly before sliding the socket over it. Crimping shall be done in an approved manner.
- b) All the control cables, which shall be of copper conductor, shall be terminated without any additional lugs in screwed type terminals provided in various equipments.

#### 1.7.5.4 Jointing

- a) The jointing shall be done in an approved manner. Care shall be taken not to damage the insulation when opening the cable for jointing.
- b) Before commencing soldering of the socket, conductor shall be thoroughly cleaned and insulation protected. The ferrules shall be thoroughly cleaned. Ferrule and each strand of the cable shall be thoroughly sweated with solder to tin them and fill the conductor gaps to remove all air pockets. Soldering materials of approved quality as per ISS practice shall be used. Taping of the conductors shall be done in an approved manner after crimping/soldering.

1.7.5.5 Filling up compound and sealing the cable box shall never be done in one operation. After the first pouring of compound, it should be topped up again with compound and then sealed.

1.7.5.6 Sealing of GI pipe end shall be done after cable termination.

#### 1.7.5.7 **STRAIGHT THROUGH JOINTS**

- a) Jointing of XLPE & HRPVC cables shall be done with extreme care and manufacturer's instructions shall be strictly followed. Soldering of sockets shall also be done with extreme care as indicated above.

Earth continuity wire shall be plumbed and/or clamped. Compound shall be filled according to the instructions of manufacturers of terminating kit/cable. Joints made inside trench or on rack shall be properly supported. Wherever joints are made inside ground, brick masonry work shall be done around the joint box and filled with sand, and there after covered with earth at no extra cost.

- b) A tent shall be used in all circumstances where jointing work is being done outdoor, for protection against rain and to prevent dust from being blown in to exposed joints and jointing materials. Extreme care shall be taken to maintain proper phase sequence while terminating at equipment ends. Records of connection details shall be maintained. Conductors shall be shaped properly while terminating and no sharp bends shall be given. Where numbers of cables are to be connected in parallel, proper tests shall be done before connection, so that no cross connection shall be made. No phase crossings shall be allowed for making the connections.
- c) Cables shall be supported adequately at the entry to cable box/equipment so that load of cable does not come on cable glands.
- d) All cables shall be meggered before and after jointing and insulation values recorded.
- e) While terminating at equipment end, each core shall be properly tagged with numbering ferrules as per nomenclature given in the drawings. Wires should be dressed and clamped neatly, bolting shall be done properly.

#### 1.7.6 **Earthing**

##### 1.7.6.1 General

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- a) Painting of all earth strip joints with anti-corrosive paints shall be carried out as per details given in drawings and instruction of Owner/Engineer-in-Charge.
- b) All electrical equipment rated 415 V and above shall be connected to earth bus by two separate and distinct earth connections. All equipment rated 240 V and below shall be earthed with single earth conductor.

#### 1.7.6.2 Specifications

- a) Types and sizes of earthing conductors shall be as indicated in the SOR attached. All earthing installations shall conform to IS-3043.
- b) Underground conductors shall run at a depth of 600 mm below ground level. Where these conductors run along with cables, they shall be laid at the same depth as cables. Where conductors run on wall, ceilings, they shall be laid on clamps or brackets made out of Al/GI strips.
- c) Wherever, earthing conductor is passing through floor, walls etc. the conductor shall be taken through PVC/GI pipes.
- d) All paints, enamel etc. shall be removed from point of contact before making connections.
- e) Connections between G.I. strips shall be done by welding. For connecting Al conductor/G.I. wire, Al socket shall be crimped on the conductor/wire. At the equipment end, connections shall be done by bolting.
- f) Connection between Al & GI shall be done by bolting. Graphite grease shall be applied on contact surfaces.
- g) Epoxy resin paint or bitumen shall be applied on welded or bolted joints to prevent corrosion and taping done as indicated in the drawing. Connections between Al wires shall be done by crimping back to back Al ferrule.
- h) Earth electrodes - Earth electrodes shall be provided as per drawings/specification. Work includes excavation of earth, installation of electrodes and test links etc., supply and filling of charcoal and common salt, back filling of earth and removal of extra earth as specified earlier. It also includes making brick wall around the electrode and cover as per drawings/specifications. The testing links shall be grouted on brick wall and connections with earth electrode and conductors shall be made. Distance between two electrodes shall not be less than 10 meters and may be located 4 M away from building foundation.
- i) Earth pits for equipment earthing, neutral earthing and lightning protection shall be separate. However, these pits shall be inter-connected.

#### 1.7.7 Plant Lighting

1.7.7.1 The electrical installation covered by this specification shall conform to relevant Indian Standards & codes of practices.

1.7.7.2 Erection of light fittings, plug sockets etc.

1.7.7.3 Fabrication of supports for lighting fittings, sockets, junction boxes shall be done as per the relevant drawings/instructions given by the owner/consultant/engineer-in-charge. These shall be grouted to walls, ceiling or welded to insert plates, steel structures etc. Insert plates on ceilings shall normally be provided. However, if required, the contractor shall weld such supports to the reinforcement rods after exposing by chipping off concrete at no extra cost. Installation of lighting fittings includes control boxes, where supplied separately and shall be done as per drawings. Before installation, checking of internal parts, assembly of accessories shall be done as per manufacturer's instruction.

1.7.7.4 The explosion-proof fittings shall be earthed through third core of the cable used for wiring. The third pin and body of 15 amps/25A switch socket shall be earthed similarly.

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1.7.7.5 Installation of explosion proof equipment shall be done strictly following manufacturer's instruction or relevant Standards. Cable termination shall be done as per relevant drawings. No drilling of holes or any change in construction of equipment or part thereof shall be done.

1.7.7.6 Wiring for normal AC supply light points and plugs shall be taken on the same brackets but wiring for emergency DC supply lights shall be taken separately. Drawings for lighting layout give only tentative location of fittings and wiring route shall be decided in consultation with owner/engineer-in-charge. Wiring shall follow shortest possible route and no. of circuit shall be bunched together to the extent possible in the same route. For wiring and laying of cables, "CABLE INSTALLATION PROCEDURE" described above shall be referred.

1.7.7.7 Cable for wiring light points and socket outlets shall normally be laid along wall, ceilings, structures, on suitable brackets made out of M.S./Al sheets or strips. Connections to the points with fluorescent fixtures in one circuit shall be taken through junction boxes. Junction boxes shall be suitably located for branching off from the circuit to the individual point. Wherever indicated, cables may be laid directly on walls, ceilings etc. by clamping on saddles.

1.7.7.8 Terminations shall be done in a manner as detailed in Cl. 3.6.6. Wherever indicated, the wire can be drawn through PVC bushings provided in the fittings. Relevant drawings may also be referred to.

1.7.7.9 Lamps shall be installed after installation of fittings and wirings.

1.7.7.10 All light fittings and corresponding control switches shall be numbered in a permanent way as instructed by owner/engineer-in-charge.

## 1.7.8 ERECTION OF STRUCTURES

### 1.7.8.1 Specification

The fabrication work shall be done as per drawings/specifications/sketches in an approved manner and to the entire satisfaction of owner/engineer-in-charge. The contractor shall take adequate measures to avoid wastage. Scrap quantity shall not exceed 2% of total quantity used for erection.

### 1.7.8.2 Erection of racks, risers, supports etc.

- a) Erection of racks and risers for cable supports shall be done along the cable routes as indicated in the drawings. Where no such drawing exist contractor shall prepare site execution drawings get approval prior to actual site execution. The contractor before erection shall check the route for any obstruction like process pipe lines, structures, equipment etc. In case of obstructions, the matter shall be brought to the notice of owner/engineer-in-charge in writing and racks shall be re-routed as per his instructions.
- b) As and where indicated in the drawings, supports for racks, risers etc. shall be welded on the steel structure, such as MS beams, pipe trestles, insert plates provided in the RCC column etc. for erection of racks.
- c) Wherever indicated, supports for racks, risers, shall be grouted on walls. The racks, risers etc. shall be installed on such supports and those properly welded.
- d) Opening on walls/floors shall be provided where racks/risers are crossing floors/walls.
- e) Heavy channels, risers may also be grouted on the floors in addition to supports provided from walls, ceilings, steel structures etc.
- f) As indicated in the drawings, racks and risers shall be erected either in single tier/ multi tier formation.

### 1.7.8.3 Erection of supports in trench

- a) Supports and Hangers shall be grouted with rag bolts on the walls of readymade concrete trench.

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- b) In existing trench wall, contractor may be required to provide pockets for grouting cable supports at some points. This shall be done without any extra cost to the owner.
- c) In case of requirement of insert plates for support of cable rack, the contractor shall weld such plates to the reinforcement MS rods. This shall be done by chipping the concrete for exposing the reinforcement MS rods and thereafter welding the plates and making good the concrete chipping by plastering.

1.7.8.4 The pipes will have to be bent (wherever required) and fixed/embedded in floor, wall and ground for laying the cables. Neoprene bushes shall have to be fixed at the end of such pipes.

1.7.8.5 GI trays of different sizes shall be cut in size and fixed on racks and risers. Fixing of trays shall only be done after erection/welding/painting of the supports as required.

1.7.8.6 Erection of support frames for miscellaneous equipments, base channels for transformers and switchboards etc. shall be carried out at no extra cost.

1.7.8.7 Dismantling of steel fabrication, disposal at designated place and re-erecting as required by owner/engineer-in-charge shall have to be carried out by the contractor.

1.7.8.8 Dismantling of cable racks, disposal at designated place and re-erecting as required by owner/engineer in charge shall be carried out by the contractor.

## 1.8 **GENERAL PROCEDURE FOR TESTING & COMMISSIONING**

1.8.1 Before proceeding with the work, contractor shall fully inspect all installed Electrical Equipment for completeness, signs of damages, defects etc. and record all discrepancies noticed. The contractor shall be required to make good/repair/replace the damaged components at no extra cost.

### 1.8.2 Testing and Commissioning Requirements

- a) All works shall be carried out in accordance with the drawings, supplier's instructions/ manuals for equipment and as per relevant ISS & Code of Practices.
- b) Before conducting test on any equipment, the contractor shall obtain permission from owner/ engineer-in-charge and all tests shall be conducted in their presence.
- c) Results of each test shall be recorded by the contractor immediately after the test on approved Performa and counter signed by the owner's authorized representative. The test results shall be furnished in four copies in the form of 'Test Certificates'. Performa of which shall be provided during testing.
- d) Copies of the record shall be handed over to owner/engineer-in-charge.
- e) The Contractor shall commission all electrical equipment and carry out all pre-commissioning/commissioning tests inclusive of no-load and on-load tests on motors, and shall be responsible for final adjustments of relays, motors, instruments, starters, breakers etc. as per operational data supplied and as per directions of Engineer-in-Charge.
- f) All terminals, cable joints, earth terminals which are opened for testing purposes shall be re-terminated and re-insulated by the Contractor to restore their original state.
- g) Painting
- h) The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged/scratched during testing and commissioning work. The paint used shall match exactly painted surface of the equipment on which touch up is done.

### 1.8.3 Cleaning and Regular Maintenance

Till the commissioned equipment is finally accepted by owner/engineer-in-charge, Contractor shall be responsible for regular cleaning and maintenance of all electrical

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equipment. The maintenance job is to be done in consultation with or on advice from the Owner/Consultant.

## 1.9 **TESTING & COMMISSIONING SPECIFICATIONS**

1.9.1 These specifications lay down the testing and commissioning procedures to be followed for each type of equipment, over and above the general requirements laid down in specifications for erection.

Manufacturer's instructions and any other instructions of owner/consultant/engineer-in-charge/statutory bodies shall also be followed by the contractor during testing and commissioning.

The contractor shall maintain and furnish the records of all equipments i.e. HT/LT panels, motors, transformers, CT, PT, relays etc. including any special test as per manufacturer's manual.

### 1.9.2 **Switch Boards**

#### 1.9.2.1 General Checks

- a) Check all auxiliary contacts of breakers for proper make/break operation.
- b) If necessary, make minor adjustments to circuit breakers mechanism, auxiliary contacts etc. for proper operation of circuit breakers. Proper greasing and lubrication or mechanism shall also be done before final commissioning.
- c) Check for termination of control circuit wiring as per drawing and ensure that the terminals at equipment and panel are mechanically sound.
- d) Ensure proper operation of all test operation switches and push button.
- e) Check wiring of all space heaters, indication lamps bells, buzzers etc.

#### 1.9.2.2 Insulation resistance test

- a) Measure the insulation resistance of main bus-bars (Phase to phase & Phase to earth) and circuit breaker with 5000V/2500V/1000V Megger (IR values shall generally be not less than 100MΩ for 11KV, 50MΩ for 3.3KV, 10MΩ for 415V).
- b) Control wiring shall be tested with 500 V Megger (IR values shall not be less than 2 MΩ).

#### 1.9.2.3 High Voltage Test

The test shall be conducted on switch Gear rated 3.3 KV and above. Test shall be as per relevant Indian Standard. However, for AC high voltage test the value shall be twice the working voltage of the switchgear plus 1000V. This voltage shall be maintained for 1 minute. Each phase shall be tested in turn with remaining phases earthed. After high voltage test, a further megger test shall be made to make sure that insulation resistance to earth has not altered appreciably. The reading of second megger test should be consistent with that of the first. (AC test voltage for 1 min. duration shall be 24KV for 11 KV panel and 8 KV for 3.3 KV panel).

#### 1.9.2.4 Testing of Current Transformer

- a) Insulation resistance to earth of Primary Winding and Between Primary and secondary winding shall be tested with 500 V megger (remove earth connection before test).
- b) Check the polarity of C.T:- Connect zero centre voltmeter in the secondary winding, connect 6V battery with switch in the primary, close the switch and from the kick of the voltmeter, ascertain the polarity.
- c) CT Primary Injection shall be performed using CT primary injection KIT.

#### 1.9.2.5 Testing of P.T. Insulation

Testing of H.T. & LT side of P.T. shall be done with 1000 Volts and 500 Volts megger respectively (the value shall not be less than 100 MΩ and 2 MΩ respectively).

#### 1.9.2.6 Testing of Relays



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- a) Checking of wiring shall be done according to Manufacturer's drawings. Check relay continuity at all taps and also ensure plug bridge contact satisfactory.
- b) Secondary injection test  
 Use secondary injection test set incorporating timer. Testing of all protective relays such as but not limited to over current, earth fault, differential, motor protection, under voltage relays, generator protection relay etc. shall be done as per the procedure set by the manufacturers of the relays. All time delay relays shall be tested to verify their characteristics for IDMT and instantaneous relay pick up and drop off values shall be noted at various taps. Relays shall be tested at all taps. Errors shall be calculated and compared with permissible limits specified by manufacturers. Adjustment, such as in establishing circuit, shall be done as recommended by manufacturer. After testing, relays shall be set at values given by Consultant.
- c) Timer relay shall be tested and calibrated and set properly.
- d) All auxiliary relays shall be tested for proper operation.

#### 1.9.2.7 Testing of Instruments

All indicating and recording instruments like Ammeter, Voltage meter, KWh meter etc. shall be calibrated. Zero error of each instrument shall be corrected.

#### 1.9.2.8 Operational Test

Conduct the following operational tests after putting the circuit breaker at test and service position. Check that the fuses of proper rating are put in control circuit as per wiring diagram.

- a) Close and trip the circuit breaker several times with power or manually. In case of motor operated spring charged closing mechanism, check the operation of charging motor. Ensure that it cuts in/off properly.
- b) Check the indication scheme ON, OFF, trip circuit healthy, auto-trip etc.
- c) Trip the breaker by operating the protective relays (operate contact manually).
- d) Check the trip free feature
- e) Check the anti-pumping feature
- f) Check operation of voltage selector relay scheme for supply.
- g) Check annunciation scheme for AC/DC power supply failure.
- h) Each motor starter shall be tested for correct operation. All operational tests to verify sequence of operation, inter-locking, alarm indication schemes (by simulating the connection) shall be done.
- i) Bi-metallic type thermal over load relay shall be tested at different settings. Current shall be injected through the thermal elements (three elements can be connected in series) at twice and thrice the set value and tripping time shall be noted. The values shall be compared with the data supplied by manufacturer.
- j) Single phase prevention relays shall be tested for proper operation.
- k) Check that fuses of specified ratings are put in various outlets.

#### 1.9.3 Testing of Distribution board (ASPB, DCDB, LSDB, UPS ACDB etc.)

- a) **Wiring check for completeness for all equipment of the Panel.**
- b) **IR value with 500V Insulation Tester.**
- c) **Operational check of the Panel by simulation.**
- d) **Meters and indication lamp to be checked.**

#### 1.9.4 Transformer

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1.9.4.1 Final testing before commissioning shall be done in cold condition after drying out the transformer and disconnecting H.V. and L.V. side cables by removing link in disconnecting chamber, cables and also earth connections to neutral.

1.9.4.2 At least 5000/2500/1000 V Volt megger shall be used for 11/3.3/0.415 KV winding and manufacturer's test certificates shall be compared for the purpose. 500 Volt megger shall be used for auxiliary power cables and control cable and values shall be preferably more than 2 MΩ.

Polarization Index shall be recorded as below to determine whether drying is necessary or not:-

$$PI = \frac{IR\ 10\ Min}{IR\ 1\ Min}$$

	Evaluation of insulation condition based	Base on PI	Drying on PI
Hazardous	< 1	Mandatory	
Bad	1-1.5	Mandatory	
Doubtful	1.5 - 2	Recommended	
Adequate	2 - 3	No	
Good	3 - 4	No	
Excellent	> 4	No	

#### 1.9.4.3 Oil Tests

- Crackle Test: Cleaned Iron piece shall be heated red hot and put in the oil taken in a pot. In case of crackle sound, presence of moisture is indicated.
- Dielectric Strength Test: It shall be done as prescribed in Appendix 'C' of IS: 335. The oil should withstand minimum of 40 KV for 1 minute.

Even oil conditions are found satisfactory in testing after final topping. It is advisable that as an additional precaution, the transformers shall be dried out.

#### 1.9.4.4 Drying out Procedure

- Drying out of the transformers shall be carried out in accordance with IS: 10028.

Before drying out following points shall be checked:-

- Any oil leakage through bushings and radiators
- Transformer tank is connected to the earth
- Temperature indicators are suitably calibrated and connected

- Precautions when drying :-

Maximum sustained temperature shall not be more than 80°C. Do not leave the transformer unattended during drying out period. Watch the transformer during drying out process and record carefully all observations viz. Oil temperature, winding temperature and insulation resistance of H.V. and L.V. windings. Drying out shall be continued till the insulation resistance value is steady prescribed in Standard Code of practice and IS: 10028 Part-II and steady value remains constant for 12 hours. Within the above period, several samples of oil are to be tested to ascertain dielectric strength. All readings shall be recorded (hourly/half hourly) for insulation resistance and temperature of oil and winding. Sample of transformer oil shall be collected from bottom only. The oil shall be allowed to settle for at least 24 hrs.

In case the insulation value does not improve by the above method, low voltage equal to impedance voltage shall be supplied to HV side for few hours after short-circuiting the LV side. During the process, regular readings of insulation resistance of winding to earth, winding to winding and temperature against time shall be recorded.

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If necessary/depending upon the manufacturer's recommendations, a vacuum pressure of 635 mm of mercury shall be applied for removal of air bubble. Hot air shall be released after drying out is done. Vent cocks and screws after release of air shall be closed.

#### 1.9.4.5 Ratio Test :

3 phase, 415 volt shall be supplied on HV side for every tap position and reading shall be taken on other side. For every tap changing, supply shall be switched off for off-load changer.

#### 1.9.4.6 Polarity Test

3 phase, 415 volts shall be applied to HV side. One terminal of HV side shall be joined to corresponding terminal of LV side, say A-a. The voltage across A-a, A-b, B-a, B-b, B-c, C-a, C-b, C-c, N-a, N-b, N-c shall be recorded and vector group shall be ascertained.

#### 1.9.4.7 Phasing for Paralleling Operations

Two transformers shall be connected on primary side. Terminal 'a' of secondary side shall be connected to bus-bar which corresponds to the equivalent terminal of second transformer. Both transformers shall be at same tap. Then 415 volt, 3 phase supply shall be connected to primary side. Circuit breaker of second transformer shall be closed. The corresponding secondary terminal voltage of two transformers, a1-a2, b1-b2, c1-c2 shall be measured. These voltages shall be zero in case both transformers are of same polarity and phase displacement. Voltmeter of the double reading of voltage of the secondary shall be used for measuring their condition. In case of star connected secondary winding having star joint earthed, secondary terminals need not be connected as stated earlier.

#### 1.9.4.8 Buchholz Relay Testing

Air pressure shall be inserted through petcock gently till alarm contacts make. Pressure shall further be increased till trip contact makes. For low oil pressure also check shall be done.

#### 1.9.4.9 Temperature Indicators

Temperature indicator shall be calibrated for the alarm contact properly.

#### 1.9.4.10 Following points shall be checked before commissioning the transformer:-

##### a) General Inspections

- i) Assembly of accessories and mounting shall be checked with reference to Drgs.
- ii) Tightness of all cover bolts, flange etc. shall be checked.
- iii) Oil leakage through bushings, valve, radiator valve etc. shall be checked.

##### b) Oil Level

- i) Correct level in conservator shall be checked.
- ii) Oil level in disconnecting chamber and in thermometer pocket shall be checked.

##### c) Buchholz Relay

It shall be checked that floats are at normal position and shut off valve between relay & conservator is open.

##### d) Breather

- i) It shall be checked that the protective cover on air passage is removed.
- ii) Oil level in seal chamber and condition of silica gel shall be checked.

##### e) Explosion Vent

- i) It shall be checked that the diaphragm is intact and no oil visible in gauge glass.
- ii) Equalizer pipe valve between vent and conservator shall be opened.

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- f) Radiator  
All the valves between radiator bands and main tank shall be opened.
- g) Thermometer  
The connection of C.T. and Heater element for winding temperature indicator shall be checked.
- h) Wiring  
Wiring from instruments to marshalling box and to switch board/ control panel shall be checked.
- i) HV and LV Bushing and connections.
- a. Bushings shall be cleaned and connections shall be checked for outgoing and incoming lines.
- b. Gap of arcing horn (HV bushing) shall be checked.
- c. High pot test of transformer shall be completed.
- j) After all checking found O.K., the breaker for incoming of transformer shall be made ON for charging the transformer. It shall be watched for at 24 hrs. without load. Then it can be loaded after finding everything O.K.

#### **1.9.5 DC Distribution Board/UPS/VFD**

- a) est insulation resistance with 500 V megger. T
- b) All operational tests to verify function of each component like relays, switches etc. and sequence of operation, interlock, as per circuit diagram.
- c) Above panels shall be tested as per the instructions of manufacturer A

#### **1.9.6 Cables**

- a) All HT & LT cables shall be tested for insulation resistance with 5000/2500/415 V megger as applicable after termination. IR shall be measured between phases and between phase & earth. The voltage shall be applied for 1 minute.
- b) IR test of HT cables shall be done before and after of High Voltage test in accordance with IS: 1255.
- c) Tan Delta testing of all the new cables shall be performed at site.

#### **1.9.7 Neutral Grounding Resistor**

Before taking any NER in line, the IR values shall be recorded for entire installation. The testing shall be done with 500 V megger. Resistance of the NER shall also be measured and recorded.

#### **1.9.8 Lighting**

Before energizing any lighting circuit, the IR values (phase to phase and phase to earth) shall be recorded for entire wiring installation. The testing shall be done with 500 V megger. After switching on the power supply, load of each circuit shall be measured.

#### **1.9.9 Earthing**

- a) The continuity of earthing and resistance of each earth pit and grid shall be measured with earth megger.
- b) Checking earth grids for size, continuity and connections
- c) Checking size and continuity of earth connections from grid to each equipment

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- d) Measurement of connections to earth at equipment which are likely to have highest earth resistance
- e) Measurement of earth loop impedance for checking the operation of protective devices in case of earth fault.

#### **1.9.10 Miscellaneous Equipment**

Under this are included, exhaust fans, blowers, limit switches, vibrators, electro-magnets, air pressurization unit etc. The following tests shall be conducted.

- a) Measurement of insulation resistance
- b) Check up the direction of rotation.
- c) Operational test

#### **1.9.11 Motors**

##### **1.9.11.1 General Checks**

- a) Check the alignment of motor with the driven equipment.
  - b) Check and calibrate meters, safety switches, bearings/air temperature indicators, winding temperature indicators, lubricating oil pump motors etc. as applicable.
  - c) Check operation of space heaters.
  - d) For motor standing idle for a long time, carry out overhauling, re-greasing and drying.
- 1.9.11.2 Check the condition of grease in bearings and if required, replace completely with fresh grease after proper cleaning of bearings. This work shall preferably be taken up before final alignment of motor with driven equipment.
- 1.9.11.3 In case of oil lubricated bearings, the bearing housing shall be flushed with oil and then filled up to the specified level. Check that oil ring rotates freely along with rotor. In case of pedestal type journal bearing, it shall be necessary to open the top cover, and check the bearings.
- 1.9.11.4 Fix up all accessories like tacho-generators, water pressure relay, temperature detectors and any other safety switches after calibration.
- 1.9.11.5 Check that the shaft rotates freely. This shall be done after decoupling the motor from driven equipment.
- 1.9.11.6 Check air gap between rotor and stator (wherever possible) at three places at 120° apart on both sides of drive and verify with the figures furnished by the manufacturers. The variation shall not exceed 10% of average value.
- 1.9.11.7 Check the tightness of foundation bolts. Ensure pins are fitted before commissioning of motor.
- 1.9.11.8 Check that power and control cables are properly connected and tightened. All earth connections of the machine shall be checked.
- 1.9.11.9 In case of forced ventilated motor, clean the ventilation duct. Ensure that recommended flow and pressure of air is available to produce the required cooling effect. If the motor is provided with air to water heat exchanger, check for the adequate flow of water. If necessary, clean the exchanger to remove any obstruction to water flow. Check that there is no leakage from water cooler, pipe connections.
- 1.9.11.10 Check the space heater circuit. Space heaters shall be provided on all HT motors and LT motors rated 30KW & above. Switch on space heater supply at least one week before the commissioning of motor. Wherever drain plugs are provided in motor body, open and check for water accumulation inside motor.
- 1.9.11.11 Testing

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- a) Insulation resistance test - The insulation resistance of LT motors shall be measured between the winding of the machine and its frame by means of 500/1000V megger. A minimum value of 1 MΩ for 415 V motors shall be considered a safe value.
- b) However, it is desirable that before commissioning the motors, the insulation resistance shall be improved substantially above the lower limits. The contractor shall carry out heating of winding as per the advice of the owner/engineer-in-charge.

#### 1.9.11.12 Drying

- a) Blowing hot air
- b) Placing heater or lamps around and inside, in case of small motors after making suitable guarding and covering arrangement so as to conserve the heat.
- c) Heating by injecting low voltage in the winding (low voltage output of welding set may be used). The winding shall be inter-connected so that current flows through each phase, and particular care shall be exercised to prevent local overheating. The voltage applied shall be suitably adjusted. The maximum temperature of winding, while drying, shall be 70° to 80°C by thermometer or 90° to 95°C by resistance method. Heating shall be done slowly, first till steady temperature of winding is reached (may be within 4 to 8 hours depending upon size of motor). Once the steady temperature is reached, maintain it for some time.
- d) Check the insulation resistance which will drop first and then become steady. Hourly reading of IR shall be taken and temperature shall be recorded 1/2 hourly. If IR is reasonably steady, supply can be switched off. Measure the IR under cold condition. Never keep the motor unattended during drying process.
- e) For checking polarization index of HT motor, note IR value after 1 minute & 10 minute, the ratio shall be compared with data supplied by manufacturer, these shall not be less than 2.5.

#### 1.9.11.13 Operational Test

- a) Check control gear and set the protective relays as per settings supplied by Consultant. It is preferable that before first no-load run, the settings may be kept lower than 100%. However, during load running, settings shall be restored to Normal. Simulation test shall be conducted on motor starter, circuit breaker (main fuses removed on CB at test position). All interlock shall be incorporated in the control system. Testing shall be done from local and remote control station and shall be ensured that the control system works satisfactorily. In case of any defect in the integrated control wiring the contractor shall locate and rectify such defects.
- b) Any other tests recommended by the manufacturer for special type equipment like variable speed motors etc. shall be done.

#### 1.9.11.14 No-load Test

Finally the motor shall be started on no load after decoupling. Check the direction of rotation and change if required. The motor shall be run for 8 to 10 hours. Voltage, starting current, and starting time shall be noted. Hourly reading of current, winding and bearing temperature, (for small motors body temperature to be measured by thermometer) shall be noted. Note vibration, excessive noise if any. In case of variable speed motor, variation of speed shall be checked and regulation of speed noted.

- 1.9.11.15 After switching off the motor, the insulation resistance shall be measured under hot and cold condition.

- 1.9.11.16 If the no-load trial run is found satisfactory, the motor shall be run on load after adjusting the protective relay setting to 100% value. Note the starting time, load current, winding temperature etc. The temperature rise should not be more than the specified value. Check for any excessive vibration or noise.

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### **1.9.12 Installation of Battery bank**

- 1.9.12.1 Installation, Testing & commissioning of Ni-Cd Battery bank in two tier/ multi-tier arrangement complete with stands, stand insulators, connectors etc., excluding cable termination but including handling, transportation from owner's stores / storage yard to erection site, unpacking, inspection, levelling, aligning, fixing of stands in position, placing of cells / groups of cells in position on stands in proper sequence and order, aligning, making intercell, inter-row, inter tier connections, charging, discharging and recharging for capacity test, all work, labour and materials complete as drawings and documents, specifications codes and standards and direction of consultant / owner / OEM guidelines.
- 1.9.12.2 Installation of new battery bank shall be in party's scope: This includes but not limited to assembly of stands, placing it on insulators, Installing and arranging new cells in Double Row Double Tier configuration, Fixing Inter Row Inter Tier connectors, Filling of Electrolyte, Applying jelly on terminals etc. This should be done as per the OEM standard procedure.
- 1.9.12.3 Commissioning of new Battery Bank: Commissioning should be done as per standard procedure of OEM. The required battery charger and resistance bank for battery discharging shall be in party's scope. The necessary manpower required for the commissioning of battery bank shall be in party's scope.
- 1.9.12.4 The vendor shall ensure min. 3 Charge and 2 Discharge cycles (Capacity verification) for the new battery bank and shall follow the instructions of the OEM and Engineer in charge.
- 1.9.12.5 Party shall arrange the necessary tools such as Hydrometer, multimeter, reading sheets and all kind of spanners and safety equipments etc. at site.
- 1.9.12.6 Acceptance of battery bank: When parameters of all cells are in acceptable range the battery bank shall be taken in to service as per the battery OEM guidelines.

### **1.9.13 Installation Battery Charger**

- 1.9.13.1 The installation of the battery charger shall be carried out as per the guidelines and under the supervision of the OEM representative and Engineer in charge.
- 1.9.13.2 The job includes but not limited to Installation, Testing & Commissioning of sheet steel enclosed, free standing, floor mounting, cubicle type, including transportation from the owner's store to the site of erection, assembly, mounting, and inter panel wiring as necessary at site.
- 1.9.13.3 All inter bus bar joining and panel earthing at two points shall be carried out at site.
- 1.9.13.4 Installation on foundation including leveling and aligning, supply of foundation nuts and bolts, drilling of gland plates with requisite holes, fixing of cable glands supplied loose, plugging of all unused cable entries and other holes found in boards for making the same dust and vermin proof with all labour and materials to make the installation complete as per approved drawings technical specifications and direction of engineer-in-charge shall be in vendors scope
- 1.9.13.5** Job shall also include rigidly fixing the frame including grouting, with minor civil work if necessary.

### **1.10 DOCUMENTATION**

- 1.10.1 For the purpose of completion certificate, the following documents will be deemed to form completion document:
- a) The technical documents according to which the work was carried out.
  - b) Final check-list and completion report.
  - c) Commissioning Reports of all Equipment along with Testing Reports

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- 1.10.2 Three sets of construction drawings showing therein the modifications and correction made during the course of execution signed by Owner/Engineer-in-charge.
- 1.10.3 Test certificates for the materials purchased by Contractor.
- 1.10.4 Material appropriation statement for the materials issued by Owner for the works and list of surplus materials returned to Owner's stores duly supported by necessary documents.
- 1.10.5 No claim certificate by the Contractor certifying that the entire work done by him under the contract has been measured & accepted for the final bill to his satisfaction and that he will have no claim(s) concerning any work(s) or part thereof performed by him under the Contract, to Owner except otherwise indicated in the final bill.
- 1.10.6 The completion certification shall be issued by Owner within 30 days of the Contractor furnishing documents listed in this clause jointly certified by Owner/Engineer-in-charge and Contractor's Site Engineer.

### 1.11 HANDING OVER TO OWNER

- 1.11.1 The contractor shall hand over the complete installation as a whole. Minor works not specified or mentioned in the scope or SOR but required to complete the job as a whole will have to be done by the contractor without extra cost. Any equipment/installation shall not be deemed as handed over to Owner until the same is complete in all respect and is accepted in writing by the Owner/Engineer-in-charge.
- 1.11.2 The final acceptance of the work shall be after the demonstration of guarantees by the Contractor. Owner shall issue the final acceptance/taking over certificate upon fulfillment of the guarantees.
- 1.11.3 The complete Installation shall be guaranteed by the Contractor for minimum one year against any bad workmanship or defective material supplied by them.

### 1.12 OBLIGATIONS & RESPONSIBILITIES OF CONTRACTOR

The contractor's obligations and responsibilities shall include but not limited to the following:

- 1.12.1 To deploy skilled, semi skilled and unskilled personnel in requisite numbers and as per scheduled programme so as to complete the WORK as per overall project schedule.
- 1.12.2 To deploy suitably qualified site manager, engineers and supervisors in requisite numbers to assure execution of good quality job as per best engineering practices and to the full satisfaction of Owner/Consultants.
- 1.12.3 Contractor shall submit method statement/work procedure and take approval of same by owner/consultant/engineer in charge prior to execution of work.
- 1.12.4 Safety supervisor shall be deployed at site that monitors safety aspect during the site construction work. Contractor to note that all workers shall use PPE (helmet, safety shoes, hand gloves, goggles, double lanyard safety belt etc. and they shall be medically tested before putting into the job.
- 1.12.5 To prepare detailed planning and execution schedule considering the availability of fronts and materials. This shall be reviewed by Owner/Engineer-in-charge and Contractor shall be required to keep updating the same (as per the instructions of Owner/Engineer-in-charge) to take care of any changes in the availability of fronts and materials and to complete all jobs as per the overall project schedule. Owner/Engineer-in-charge shall in no way be held responsible for such changes.
- 1.12.6 To check for quantity compliance between bill of materials and drawings for cable, structural, earthing materials etc. and intimate Owner/Engineer-in-charge sufficiently in advance regarding discrepancies, if any.
- 1.12.7 Construction power shall be made available at one point. Arrangement for distributing the same to various area for construction shall be the contractor's responsibility.



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- 1.12.8 To arrange all required tools and tackles, consumables, instruments, erection materials & machineries etc. for handling erection, testing & commissioning of complete electrical installation.
- 1.12.9 To arrange and supply storage tanks for drinking water so as to avoid any inconvenience that may be caused due to interruption in water supply at times.
- 1.12.10 To provide proper storage and security arrangements for his tools, tackles, equipments, materials etc. as well as equipment and materials issued by Owner/Engineer-in-charge to Contractor. Owner/Engineer-in-charge shall not be responsible for any loss or damage to items in the custody of Contractor at site for any reason whatsoever.
- 1.12.11 Completion of all repairs arising out of defective work done by Contractor, Owner/Engineer-in-charge may at his discretion require the Contractor to rectify certain defects in materials caused due to bad workmanship of supplier and/or during transportation.
- 1.12.12 The contractor shall be fully responsible for any accident to their personnel. Required insurance of workmen shall be as per the norms and rules.
- 1.12.13 To maintain all the records for men, materials and execution of job as required by law as well as Owner/Engineer-in-charge.
- 1.12.14 To get his work inspected by Owner/Engineer-in-charge and get approved from statutory agencies such as but not limited to Electrical Inspector, Factory Inspector etc.  
All co-ordination with Statutory Authorities shall be contractor's responsibility. Only statutory fee required for approval shall be paid by the owner.
- 1.12.15 To make arrangements for services such as transport, medical, lighting, canteen etc. for working round the clock.
- 1.12.16 In addition to safety regulations indicated in this enquiry, Owner/Engineer-in-charge may issue certain safety directives, which shall have to be followed meticulously without any reservation.
- 1.12.17 To undertake and execute work and supply as per scope of work, scope of supply and follow Technical Conditions including specification for electrical erection, specification for electrical testing and commissioning and as per schedule of rates
- 1.12.18 Reconciliation of all materials issued by owner/supplied by contractor.
- 1.12.19 Handing over of the completed works to owner/engineer-in-charge as per procedure laid down by Consultant.
- 1.12.20 To submit documentation forming part of request for issue of completion certificate.
- 1.12.21 Clearing the site after cleaning the areas where the Contractor executed the job, stored the materials and built his office, fabrication shop etc.
- 1.12.22 Contractor shall be responsible for good Housekeeping of his area of scope of work.
- 1.12.23 The contractor shall be responsible for shifting of the defective material to scrap yard or any other place which will be shown by owner for clearing the sites.
- 1.12.24 Disposal of packing material after unpacking of equipment/material in contractor's scope of work at designated location.
- 1.12.25 The contractor shall make their own arrangement of Lodging and boarding and transportation of their manpower for working at site during installation and commissioning of all the Equipment.
- 1.12.26 Contractor shall submit site organization chart with mobilization plan.

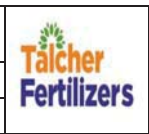
### 1.13 SAFETY MEASURES

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- 1.13.1 Contractor shall not undertake any work within the Battery Limits of the plants, unless proper and valid safety permit is obtained.
- 1.13.2 Contractor shall have to observe all the safety practices as required and shall provide safety wear for his workmen. Contractor and his employees should observe all safety regulations within factory area as directed by owner's safety department from time to time.
- 1.13.3 Supervisor appointed at site must be experienced and qualified for the jobs to be carried by the contractor as per the scope mentioned above.
- 1.13.4 Workman's experience, age, address, character and medical fitness certificate need to be certified by the contractor before starting the job.
- 1.13.5 All persons must take safety training from safety dept. before starting the job.
- 1.13.6 All the jobs are to be performed / carried out in the running plant. The bidder shall take at most care and follow the safety guidelines issued by the engineer in charge.
- 1.13.7 Party must make following min. safety appliances available to their workman at job site.
- a) **Helmet**
  - b) **Safety Shoes**
  - c) **Ear plugs**
  - d) **Hand gloves**
  - e) **Safety Goggles**
  - f) **positive air mask with life line (if required)**
  - g) **Boiler/Fire protection suit.**
- 1.14 INSURANCE OF STAFF**
- 1.14.1 The Contractor will be responsible for the insurance of his supervisory, skilled and unskilled staff under the workmen's compensation Act 1923, 1933 and subsequent amendment if any, thereon. The Contractor should produce copies of insurance of his staff for verification.
- 1.14.2 The Owner assumes no responsibility for any damages due to accidents or any other cause to the erection of equipment or persons employed by the Contractor.
- 1.14.3 The Contractor shall ensure that the person or person appointed by them for service in the company's premises do not suffer any legal disqualification for service by reason of his age or any law and statute in force from time to time of any other reason whatsoever.
- 1.14.4 The employee of the contractor shall be liable to search by company's security forces.
- 1.14.5 If the Engineer-In-Charge is not satisfied with the service or conduct of any of the employee of the contractor for any reason whatsoever, the contractor shall remove such employees from the company's premises.
- 1.14.6 No. employee of the contractor shall be allowed to stay on the premises of the company beyond authorized working hours.



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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and despatch in well-packed condition of Power Transformers.
- 1.2 This standard shall be applicable for 3 phase, core type, separate winding power transformers of rating 315 KVA and above.
- 1.3 This standard shall be read in conjunction with the relevant part of Design Philosophy – Electrical.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of IS 2026, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 The design and operational features of the equipment offered shall comply with the provisions of the latest issue of the Indian Electricity Rules and other relevant Statutory Acts and Regulations. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy – Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy – Electrical.

## 4.0 OPERATING REQUIREMENTS


- 4.1 The transformer shall be suitable for operating at the rated capacity continuously at any of the taps, under the ambient conditions and with the voltage and frequency variations without exceeding the permissible temperature rise and without any detrimental effect on any part.
- 4.2 The transformer shall also be capable of delivering rated current at a voltage equal to 105 % of the rated voltage.
- 4.3 The maximum flux density in any part of the core and yoke at the rated MVA, voltage and frequency shall be such that under 10 per cent continuous over voltage condition it does not exceed 1.9 Tesla at any tap position.
- 4.4 The transformer shall be capable of allowing at least three consecutive starts of the largest Squirrel Cage Induction Motor, while delivering 85% of its rated power without any harmful effect on its insulation. It shall be possible to repeat the starting cycle once in eight hours.
- 4.5 The transformer shall be designed to be loaded as per IS 6600.
- 4.6 The transformer shall be so designed as to operate in parallel satisfactorily with similar transformers.

## 5.0 GENERAL DESIGN FEATURES

- 5.1 Transformers shall be built under strict quality assurance procedures to comply with IEC 60076 and or IEC 60726.
- 5.2 Transformers shall be suitable for continuous operation at full load for at least 30,000 hours without maintenance requiring the transformer to be de-energized
- 5.3 The design of the transformers shall be in accordance with the latest practice.

### 5.4 Rated Voltage, Frequency and Phase Connection

These shall be as indicated in Design Philosophy – Electrical.

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- 5.5 The transformer shall be so designed that it is capable of operation at 125% rated voltage for a period of one minute and 140% rated voltage for a period of five seconds due to sudden load throw off.
- 5.6 Transformer shall be capable of withstanding thermal and mechanical stresses caused by symmetrical or asymmetrical faults on any winding.
- 5.7 Transformers shall withstand, without injurious heating, combined voltage and frequency fluctuations which produce the following over fluxing conditions:
- 110% for continuous operation
  - 125% for 1 - minute
  - 140% for 5 – seconds
- 5.8 **Tap Changing Gear**
- 5.8.1 Each transformer shall be provided with on-load/ off-circuit tap changing equipment on the high voltage winding with taps. It shall be mounted on one side, in an easily accessible position.
- 5.8.2 The range of tap changer shall be as indicated and arranged in steps of 2.5%.
- 5.8.3 The off-circuit tap changing shall be affected by an externally operated handle capable of being padlocked in any position and provided with tap position indicator and mechanical stops at the extreme positions.
- 5.8.4 For transformer specified with on-load tap changer, tap changing gear shall be complete with tap position indicator, limit switch, lock and key and necessary control panel. Provision shall be made for auto-manual operation. The manual operation shall be possible both from the panel as well as from field. In case the tap changer is located in a separate housing, the housing shall be connected with the conservator for oil connection. A separate buchholz relay shall be provided in such a case. Emergency mechanical manual device shall also be provided. A minimum of 2 lakh trouble-free operations shall be considered.
- 5.9 **On-Load Tap-Changing Mechanism (O.L.T.C.)**
- 5.9.1 For transformer specified with on-load tap changer, high speed tap changing gear shall be complete with tap position indicator, limit switch, lock and key and necessary control panel. Provision shall be made for auto-manual operation. In case the tap changer is located in a separate housing, the housing shall be connected with the conservator for oil connection. A separate buchholz relay shall be provided in such a case. Emergency mechanical manual device shall also be provided. A minimum of 2 lakh trouble-free operations shall be considered. The OLTC gear shall have diverter resistance and the current diverting contacts shall be housed in a separate oil chamber segregated from the main tank of the transformer.
- 5.9.2 Transformer shall be provided with an on-load tap changing mechanism, as required. This shall be designed suitable for remote control operation from switch boards in the control room in addition to being capable of local manual as well as local electrical operation.
- 5.9.3 It shall not be possible to use the electric drive when manual gear is in use and it shall be possible to use only one electrical control at a time. Operation of the local or remote control switches shall cause one tap movement only until the control switch is returned to the off position for the next operation.
- 5.9.4 The local electrical control switches shall be mounted in the outdoor cubicle.
- 5.9.5 The equipment shall be so arranged as to ensure that when a tap change operation has been commenced it shall be completed independently of the operation of the control relays and switches. If a failure of the auxiliary supply during a tap change or any other contingency result in that movement not being completed, adequate means shall be provided to safeguard the transformer and its auxiliary equipment from damage. Supervisory indication shall be provided to indicate “The change incomplete” foul.



- 5.9.6 Limit switches may be connected in the control circuit of the operation motor provided that a mechanical de-clutching mechanism is incorporated. Otherwise it shall be directly connected to the operating motor circuit and mechanical stop provided.
- 5.9.7 Thermal devices or other means shall be provided to protect the motor and control circuits. All relays switches, fuses etc. shall be mounted in the marshalling box and shall be clearly marked to indicate their purpose.
- 5.9.8 The whole of the apparatus shall be of robust design and capable of giving satisfactory service without undue maintenance under the conditions to be met in service, including frequent operation.
- 5.9.9 A five-digit counter shall be fitted to the tap changing mechanism to indicate the number of operations completed by the equipment.
- 5.9.10 A permanently legible lubrication chart shall be fitted within the driving mechanism chamber.
- 5.9.11 The On-Load Tap Changer shall include the following :-
- a) An oil immersed tap selector and arcing switch or arc-suppressing tap selector, provided with resistor for reduction of make and break arcing voltage, overload and short circuits.
  - b) Motor driven mechanism.
  - c) Control and Protection devices.
  - d) Local and remote tap-changer position indicator.
  - e) Manual operating device.
- 5.9.12 The on-load tap changer shall be designed so that the contacts shall not interrupt arc within the main tank of the transformer. The tap selector and arcing switch or arc suppressing tap selector switch shall be located in one oil filled compartment. The compartment shall be provided with a means of releasing the gas produced by the arcing. It shall be designed so as to prevent the oil in the tap selector compartment from mixing with the oil in the transformer tank.
- 5.9.13 The oil in those compartments of the main tap-changing apparatus which do not contain contacts used for making or breaking current shall be maintained under conservator head by means of an adequate diameter pipe corresponding dia of OLTC oil surge relays connection from the highest point of the chamber connection corresponding to the dia. of OLTC oil surge relay from the highest point of the chamber to the conservator. This connection shall be controlled by a suitable valve and shall be arranged so that any gas leaving the chamber will pass into the gas and oil actuated relay.
- 5.9.14 The tap changer shall be capable of permitting parallel operation with other transformers for which necessary wiring and accessories, if any, shall be provided.
- 5.9.15 The centre of manual operating device shall be located at a height of 1500 mm from rail top so that it can be operated by a person standing at the ground level. The arrangement shall be strong and robust in construction. The transformer shall give full load output on all tap positions.
- The mechanism shall be complete with normal accessories including at least the following:-
- A mechanical tap position indicator (Rated tap voltages shall be marked on the diagram plate).
  - A mechanical operation counter.
  - Mechanical stops to prevent over cranking of the mechanism beyond extreme tap positions.
- 5.9.16 The control scheme for the tap changer shall be provided for independent control of the tap changers when the transformers are in independent service. In addition, provision shall be made to enable parallel operation control also at time so that the tap changer will be operated simultaneously when one unit is in parallel with another will not become out of step and this will eliminate circulating current.

Additional features like Master / Follower and visual indication during the operation of motor shall also be incorporated.

Control circuit shall incorporate the following:

- a) Local/remote manual electrical operation.
- b) Device to ensure a positive and full completion of tap change once it is initiated even if there is loss of power.
- c) An interlock to cut-off electrical control automatically upon recourse being taken to manual mechanical control in emergency.
- d) Electrical interlock to cut-off a counter impulse for a reverse tap change, being initiated during a progressive tap change and until the mechanism comes to rest and resets circuits for a fresh operation.
- e) All auxiliaries and devices for electrical control of OLTC gear should be housed in a weather-proof cabinet mounted on the transformer and shall include:
  - Local tap position indicator
  - 5 digit operation counter
  - Cubicle lighting
  - Thermostatically controlled space heater.
  - Miniature circuit breaker with magnetic and thermal overload devices for controlling the incoming supply to the OLTC motor.
  - Padlocking arrangement for the hinged cabinet door.
  - Removable plate with cable glands.
  - Inside tag with control scheme indelibly marked.

5.9.17 Necessary interlock, blocking independent control when the units are in parallel, shall be provided.



5.9.18 Under abnormal conditions such as may occur if the contactor controlling one tap changer sticks, the arrangement must be such as to switch off supply to the motor so that an out of step condition is limited to one tap difference between the units. Details of out of step protection provided for the taps should be furnished in the bid.

5.9.19 The contactor and associated gear for the tap change driving motors shall be housed in a local kiosk mounted adjacent to the transformer. The motors shall be suitable for operation on 230 V single phase or 3-phase 440 V, 50 cycle external power supply. The kiosk having space heater, shall be dust and vermin proof and suitable protected against corrosion or deterioration due to condensation, fungi etc.

5.9.20 Indoor cubicle (RTCC panel) shall be provided in the control room which shall contain :

- a) Indication of the transformer ratio in use on each transformer and the number designating the tap in use by means of digital type indicators.
- b) Raise and lower push Button switch and AVR Relay.
- c) Independent/Master/Follower selector switch.
- d) Remote tap position indicator with indicating lamp.
- e) Repeater dial of winding temperature indicator for remote indication with a device for indicating hottest spot winding temperature in addition to a pointer to register the highest temperature reached.
- f) An indication lamp showing tap change in progress.
- g) Necessary audible and visual alarms.
- h) Pressure relief device operation alarm.



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- i) Out of step relay with two spare contacts (2 NC and 2 NO).
- j) The remote indoor cubicle in addition to the above indications shall also have the following trip and non-trip alarm windows facias with 5 spare windows suitable for 110V DC supply.
  - i. Oil Temperature alarm
  - ii. Winding Temperature alarm
  - iii. Winding temperature trip
  - iv. Buchholz alarm
  - v. Buchholz trip
  - vi. Sudden Pressure trip (Main tank)
  - vii. Surge Relay trip (OLTC Gear)
  - viii. Tap changer out of step alarm
  - ix. Low oil level alarm
  - x. Cooling fans working indication
  - xi. Oil pumps on and off indication
  - xii. Failure of group of fans alarm
  - xiii. Failure of group of oil pumps alarm
  - xiv. Failure of supply
  - xv. Oil flow alarm

Each relay for tripping function shall have two normally open and two normally closed contacts for connection.

#### 5.9.21 Remote Electrical Group Control

The OLTC control scheme offered shall have provision of remote electrical group control during the parallel operation of transformer. This is in addition to independent control of OLTC:

- i) A four position selector switch having Master, Follower, Independent and Off position shall be provided in the remote OLTC control panel for each transformer.

This shall be wired to enable operator to select operation of OLTC in Master, Follower or Independent mode.

- ii) Out of step relays with timer contacts shall also be provided to give alarm and indication in case tap position in all the transformers under group control are not in same position.

#### iii) **Master Position**

If the selector switch is in Master position, it shall be possible to control the OLTC units in the follower mode by operating the controls of the master unit. Independent operation of the units under Follower mode shall have to be prevented. However the units under independent mode will be controlled independently.

#### iv) **Follower Position**

If the selector switch is in Follower mode, control of OLTC shall be possible only from panel of the Master unit.

#### v) **Independent Position**

In this position of Selector Switch, Control of OLTC of individual unit shall only be possible

5.9.22 The OLTC shall be provided on the conservator side of the Power Transformer and not in front of H.V. Bushings.

5.9.23 OLTC shall be suitable for bi-directional power flow.

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**5.10 Impedance Voltage**

The impedance voltage of the transformer at 75OC shall be as per latest IS 1180. This shall be guaranteed within limits specified in relevant IS / IEC at principal tap position. There shall not be any negative tolerance.

**5.11 Losses**

The losses at 50 percent of rated load and full load condition, at the rated voltage and frequency shall be indicated by the vendor at 75OC. These shall be guaranteed within the tolerable limits specified in IS:2026 at principal tap position. Owner has the right to impose penalty charges or reject the transformer in case of any difference in the test and guaranteed values.

For upto 2 MVA transformer losses shall be as per energy efficiency level-3 of latest IS 1180.

**5.12 Temperature Rise**

The temperature rise of the winding, oil and core shall not exceed the values specified in IS: 2026 when the transformer is delivering its rated output continuously under the service conditions.

**5.13 Insulation Level**

All windings up to maximum system voltage of 72 KV shall have uniform insulation to earth. For windings having higher maximum system voltage, graded insulation is acceptable.

**5.14 Terminal Arrangements**

The HV and LV side terminal arrangement shall be provided as required. Disconnecting link chambers shall be provided on the transformer primary side in all cases as well as on secondary side, except where the termination is through bus duct. The disconnecting chambers shall be oil filled, preferably connected with the main tank through an isolating valve and also provided with a drain valve. However for system not exceeding 11 KV, air filled disconnecting chamber may be accepted. Suitable cable end box complete with cable glands and lugs shall be provided for termination of cables. Gland plate for single core cables shall be non-magnetic.

5.15 The transformer shall be able to withstand the electro-dynamic and thermal stresses due to terminal short circuit of the secondary, assuming the primary side fed from an infinite bus. All leads and windings in cores shall be properly supported, clamped and tightened after vacuum drying to ensure the short circuit withstand capacity. The short circuit withstand duration shall be 3 Secs.

5.16 The short circuit test results for similar transformers shall be furnished.

5.17 The transformer shall be so designed as to minimise any undue noise and vibration.

The noise level shall be limited to the value specified by latest NEMA Standard / CBIP.

5.18 Due attention shall be given in the design for the suppression of harmonics.

**5.19 Cooling System**



5.19.1 The cooling system shall be provided as required. In case the transformer is designed for two types of cooling, the output rating for each type shall be indicated in the offer. The minimum acceptable output shall be 70% of rated output when forced type of cooling system is not in operation.

5.19.2 Wherever ONAF Cooling is specified, the cooling fans shall be adequately rated and shall be suitable for auto/manual and local/remote operation. Auto operation shall be through winding temperature indicator contact..

5.19.3 Transformer shall have multiple cooling units with standby cooling units.

5.19.4 Cooling fans for each radiator bank shall be housed in fan box to prevent ingress of rain water. Each fan shall be suitably protected by galvanized wire mesh guard. It shall be possible to remove the cooling fan with motors without disturbing and dismantling the cooler structural frame work.

5.19.5 Where OFAF cooling is applicable, two numbers of centrifugal oil pumps shall be used. Measures shall be taken to prevent mal-operation of Buchholz relay or sudden pressure relay

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when all oil pumps are simultaneously put into service. The pumps shall be so designed that on failure of power supply to the pump motor, the pump impeller will not limit the natural circulation of oil.

- 5.19.6 Cooling fans and oil pump motors shall be of squirrel cage, totally enclosed whether proof type suitable for operation on 400 volts, three phase, 50 Hz power supply. All motors having ball and roller bearings and grease lubricators shall be fitted with hexagonal nipples conforming to relevant Indian Standard.
- 5.19.7 An oil flow indicator with alarm contacts shall be provided for the confirmation of the oil pump operating in a normal state. An indication shall be provided on the control panel to indicate that the pump is running.
- 5.19.8 The coolers and theirs accessories shall be hot dip galvanized or corrosive resistant painted.
- 5.19.9 The supporting arrangement for the cooler units or for radiator banks shall be in such a manner that the stresses if developed, shall not be transferred to the flanges of the butterfly valves.
- 5.19.10 The shut off valves shall be provided on the tank at each point of connection of cooler units radiators to the transformer tank. Removable blanking plates shall be provided to permit blanking off the oil connection to cooler radiators.
- 5.19.11 All valves shall be of gun metal or cast steel or may have cast iron bodies with gun metal fittings. They shall be of full way type with internal screw and shall be opened by turning counter clock-wise when facing the hand wheel.
- 5.19.12 Means shall be provided for pad locking of valves in the open and closed position.
- 5.19.13 Every valve shall be provided with indicator to show clearly the position of the valve whether open or closed.
- 5.19.14 All valves shall be provided with flanges having machined faces.
- 5.19.15 The drilling of valve flanges shall comply with the requirements of IS:3639.

## 5.20 CONTROL OF COOLER OPERATION

- 5.20.1 Each motor or group of motors shall be provided with an electrically operated contactor and with control gear of suitable design both for starting and stopping the motor manually and also automatically from the contacts on the winding temperature indicating device as specified. Additional terminal for remote manual electrical control of motors shall be provided. Overload and single phasing protection shall be provided. HRC fuses shall be provided for short circuit protection. This equipment shall be accommodated in the marshalling box. The power supply shall be adequately and properly fused.
- 5.20.2 Where small motors are connected in groups, the group protection shall be arranged so that it operates satisfactorily in the event of a fault occurring on a single motor.
- 5.20.3 Where fans and oil pumps are provided, the connection shall be arranged as to allow the motors or groups of motors to be started up and shutdown either collectively or individually.
- 5.20.4 All motor contactors and their associated apparatus shall be capable of holding in and operating satisfactorily and without over heating for a period of ten minutes if the supply voltage falls for that period, to 75% of normal value and at normal frequency. The motor contactors and associated apparatus shall be capable of normal operation with a supply voltage of 85 % of the normal value and at normal frequency.
- 5.20.5 All contacts and other parts which may require renewal, adjustment or inspection shall be readily accessible.
- 5.20.6 The control arrangements are to be so designed as to prevent the simultaneous starting of motors of total rating of more than 20 HP where such an eventually may arise, two step operation shall be preferred.
- 5.20.7 Alarm indication for failure of group of fans and oil pump shall be provided.
- 5.20.8 Alarm indication shall be provided to indicate failure of power supply.



5.20.9 Provision in the cooler control circuit may be made such that tripping of transformer breaker on Differential or Sudden Pressure should lead to supply disconnection to motor of the cooler pump.

## 6.0 CONSTRUCTIONAL FEATURES

### 6.1 Core

6.1.1 The transformer core shall be of high grade, non-ageing, electrical silicon cold rolled magnetic sheet steel of low hysteresis loss and high permeability. The maximum flux density in any part of the core and yoke at rated voltage and frequency shall not exceed 1.7 Tesla. The core structure shall be securely grounded to prevent electrostatic potential. Lifting eyes and lugs shall be provided on the limbs and coils assembly. Preferably no bolt shall be used in the cores. Clamping shall be done external to the limb. Bolts passing through the yoke, if any, shall be insulated for 2 KV for transformers rated up to 33 KV and 5 KV for higher voltage ratings (rms) for 1 minute.

6.1.2 The temperature of the core shall not exceed that permitted in IS.

6.1.3 The design of the magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux component at right angles to the plane of laminations which may cause local heating. The temperature of any part of the core or its support structure in contact with oil shall not exceed 120 deg C under normal operating condition and 130 deg C under most extreme operating condition. Adequate temperature margin shall be provided to maintain longer life expectancy for this material.

6.1.4 Core and winding shall be capable of withstanding the shock during transport, installation and service. Adequate provision shall be made to prevent movement of core and winding relative to tank during these conditions.

6.1.5 All steel sections used for supporting the core shall be thoroughly sand blasted after cutting, drilling and welding.

6.1.6 Each core lamination shall be insulated with a material that will not deteriorate due to pressure and hot oil.

6.1.7 The supporting frame work of the core shall be so designed as to avoid presence of pockets which would prevent complete emptying of tank through drain valve or cause trapping of air during oil filling.

6.1.8 Adequate lifting lugs will be provided to enable the core and windings to be lifted.

6.1.9 The core shall be earthed to the core clamping structure at one point only, through a removable external link suitably located and protected to facilitate testing after installation of the transformer.


6.1.10 In case core laminations are divided into sections by insulating barriers or cooling ducts parallel to the plane of the lamination, tinned copper bridging strips shall be inserted to maintain electrical continuity between sections.

6.1.11 A drawing furnishing the details of the internal earthing design shall be included in the manual

### 6.2 Tank

6.2.1 The tank shall be made of good commercial grade low carbon steel plate of adequate thickness capable of withstanding stress not less than 0.40 kg/cm<sup>2</sup>, properly welded and gusseted to ensure a rigid construction. It shall also be able to withstand normal transportation shocks without any deformation and shall be capable of withstanding following vacuum.

Highest System Voltage	MVA Rating	Vacuum in mm of Hg
Up to 72 KV	Up to 1.6	250
	Above 1.6 to 20	500
	Above 20	760



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Above 72 KV

For all Ratings

760

- 6.2.2 For outdoor transformer, the top of the tank, the marshalling box and the headers of radiators, shall be of such a construction so as to prevent accumulation of water.
- 6.2.3 Guides shall be provided to facilitate tanking and untanking of the core with the coil assembly. The details of anchoring of core and coil assembly of the tank shall be furnished.
- 6.2.4 Radiators, where necessary, shall be provided on the tank to facilitate cooling. These shall be detachable type and shall be provided with isolating valves at ends, drain plug and air release plug. The radiators shall be fabricated out of minimum 1.25 mm thick seamless steel tubing or pressed sheet steel. For sizes up to 500 KVA, cooling tubes shall be acceptable.
- 6.2.5 Each tank shall be provided with:
- a) Lifting lugs suitable for lifting the equipment complete with oil.
  - b) A minimum of four jacking pads in accessible position to enable the transformer complete with oil to be raised or lowered using hydraulic jacks. Each jacking pad shall be designed to support with an adequate factor of safety for at least half of the total mass of the transformer filled with oil allowing in addition for maximum possible misalignment of the jacking force to the centre of the working surface.
  - c) Suitable haulage holes shall be provided.
- 6.2.6 The tank shall be designed in such a way that it can be mounted on the rollers.
- 6.2.7 The base of each tank shall be so designed that it shall be possible to move the complete transformer unit by skidding in any direction without injury when using plates or rails.
- 6.2.8 All bolted connections shall be fitted with weather proof, hot oil resistant, resilient gasket in between for complete oil tightness. If gasket is compressible, metallic stops/other suitable means shall be provided to prevent over-compression. All gasketed joints shall be designed, manufactured and assembled to ensure long-term leak and maintenance free operation. Groove provided to accommodate round nitrile rubber cord for rectangular openings shall be milled.
- 6.2.9 The transformer shall be mounted on rollers, as per manufacturer's standard practice.
- 6.2.10 The roller mounted transformers are to be provided with flanged bi-directional wheels and axles. This set of wheels and axles shall be suitable for fixing to the under carriage of transformer to facilitate its movement on rail track. Suitable locking arrangement along with foundation bolts shall be provided for the wheels to prevent accidental movement of transformer.
- 6.2.11 The rail track gauge shall be 1676 mm.
- 6.2.12 To prevent transformer movement during earthquake, suitable clamping devices shall be provided for fixing the transformer to the foundation.
- 6.2.13 The tank cover shall be designed to prevent retention of rain water and shall not distort when lifted. The internal surface of the top cover shall be shaped to ensure efficient collection and direction of free gas to the buchholz relay.
- 6.2.14 At least one adequately sized inspection openings shall be provided in the transformers for easy access to bushings and earth connections. The inspection covers shall not weigh more than 25 kg. Handles shall be provided on the inspection cover to facilitate lifting.
- 6.2.15 The tank covers shall be fitted with pockets at the position of maximum oil temperature at maximum continuous rating for bulbs of oil and winding temperature indicators. It shall be possible to remove these bulbs without lowering the oil in the tank. The thermometer shall be fitted with a captive screw to prevent the ingress of water.
- 6.2.16 Bushing turrets, covers of inspection openings, thermometer pockets etc. shall be designed to prevent ingress of water into or leakage of oil from the tank.

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6.2.17 All bolted connections shall be fitted with weather proof, hot oil resistant, resilient gasket in between for complete oil tightness. If gasket is compressible, metallic stops/other suitable means shall be provided to prevent over-compression. All gasketed joints shall be designed, manufactured and assembled to ensure long-term leak and maintenance free operation. Groove provided to accommodate round nitrile rubber cord for rectangular openings shall be milled.

6.2.18 The maximum temperature on any metal part shall not exceed 130 deg. Celsius.

6.2.19 Seamless pipe shall be used upto 80mm conforming to IS 1978 & IS 1979, ERW mild steels pipes as per IS 1239 (Part 1) medium shall be used for  $\geq 100$ mm and IS 3589 for 150mm. Non-magnetic Stainless-steel materials used shall conform to IS 6911 or ISO 683-13 or EN 10088-2 or AISI 304L or ASTM A240 or J4(S20430 Modified).

### 6.3 Windings

6.3.1 Each coil shall be made out of paper insulated electrolytic grade copper conductor. Similar coils shall be interchangeable. Successive coils of a winding shall be connected by accessible joints and shall be brazed and finished smooth to prevent abrasive damage to insulation. There shall be no sharp bends in the connecting leads to prevent corona discharge. Aluminium foil wound transformer will also be acceptable.

6.3.2 Immediately after winding process, it shall be vacuum dried, dimensionally pre-stabilized and oil impregnated before next process.. The insulation resistance and polarization index of the winding measured after impregnation shall be furnished in the test certificate.

6.3.3 The magnitude of impulse surges transferred from HV to the LV winding by inductive and capacitive coupling shall be limited to a value below the rated impulse strength of the LV winding. The impulse voltage test results and surge distribution on windings for similar transformer shall be furnished.

6.3.4 The manufacture shall ensure that windings are made in dust proof, Positive pressure, Desert Climate environment. Movement of windings and active part shall be done on air-casters to prevent shocks and abnormal jerks.

6.3.5 Winding clamping arrangement shall distribute the clamping forces evenly over the ends of the windings. All insulating materials and structures shall be protected from contamination and the effects of humidity during and after fabrication, and after receipt, by storing them in a separate, climate-controlled area.

### 6.4 Insulating Oil

6.4.1 The insulating oil shall be virgin high grade inhibited, conforming to IEC-60296 & all parameters specified below, while tested at supplier's premises. The contractor shall furnish test certificates from the supplier against the acceptance norms as mentioned below, prior to dispatch of oil from refinery to site. Under no circumstances, poor quality oil shall be filled into the transformer and only thereafter be brought up to the specified parameter by circulation within the transformer.

6.4.2 At manufacturer's works the quality of oil used for first filling, testing and impregnation of active parts shall meet at least parameters as mentioned in IEC . The oil test results shall form part of equipment test report.

6.4.3 Prior to filling in main tank at site and shall be tested for

1. Break Down voltage (BDV) : 70kV (min.)
2. Moisture content : 5 ppm (max.)
3. Tan-delta at 90 °C : 0.0025 (max)
4. Interfacial tension : More than 0.004 N/m

6.4.4 Prior to energisation at site oil shall be tested for following properties & acceptance norms as per below generally in line with IEC 60422:

1. Break Down voltage (BDV) : 70 kV (min.)



2. Moisture content : 10 ppm (max.)
3. Tan-delta at 90 °C : 0.01 (max.)
4. Resistivity at 90 °C :  $6 \times 10^{12}$  ohm-cm (min.)
5. Interfacial tension : 0.035 N/m (min.)
6. \*Oxidation Stability (Test method as per IEC 61125 method C, Test duration: 500hour for inhibited oil)
  - a) Acidity: 0.3 (mg KOH /g) (max.)
  - b) Sludge: 0.05 % (max.)
  - c) Tan delta at 90 °C: 0.05 (max.)
7. \* Total PCB content : Not detectable (2 mg/kg total)

\* For Sr. No. 6 & 7 separate oil sample shall be taken and test results shall be submitted within 45 days after commissioning for approval of Consultant.

Oil sample shall be drawn before and after heat run test and shall be tested for dissolved gas analysis. Oil sampling to be done 2 hours prior to commencement of temperature rise test. For ONAN/ONAF cooled transformers, sample shall not be taken earlier than 2 hours after shutdown. The acceptance norms with reference to various gas generation rates shall be as per IEC 61181.

#### 6.5 Insulation Materials

- 6.5.1 Class 'A' insulating materials specified in IS 1271 shall be used. Paper insulation shall be new and free from punctures. Wood insulation, where used, shall be well seasoned and treated.
- 6.5.2 The mineral oil shall comply with IS: 335. 10% extra oil shall be supplied along with the transformer in non-returnable drums.
- 6.5.3 For the transformers required to be filled up with inert gas for transport purpose, the required amount of oil including 10% extra shall be supplied in non-returnable drums.

#### 6.6 Bushing

- 6.6.1 The bushing insulator shall be rated for the maximum system voltage and shall comply with the requirements laid down in IS. The minimum current rating shall be 400 Amps. in case of overhead line connected transformers, the bushings shall be outdoor type having creepage distances of 31mm/kV and complete with arcing horns. In case of transformers connected with bus duct or cable, the bushings shall be enclosed in the terminal box. In either case, they shall be detachable from outside of the tank. The hardware shall be of tinned copper or nickel plated brass suitable to receive the conductors. Separate neutral bushings shall be provided for earthing the neutral, as required. All bushings shall be marked with the symbols corresponding to the connection diagram indicated in the diagram plate and in accordance with IS.
- 6.6.2 Bushing rated 52 KV class and above shall be oil impregnated paper condenser bushings. Bushing rated below 52KV voltage class shall be solid porcelain or oil communicating type.

#### 6.7 Conservator

- 6.7.1 Main conservator shall have air cell type constant oil pressure system to prevent oxidation and contamination of oil due to contact with moisture, and shall be fitted with magnetic oil level gauge with low oil level potential free contacts.
- 6.7.2 OLTC shall have conventional type conservator with prismatic oil level gauge.
- 6.7.3 Conservator tank shall have adequate capacity with highest and lowest visible-levels to meet the requirements of expansion of total cold oil volume in the transformer and cooling equipment from minimum ambient temperature to 100degC. The capacity of the conservator tank shall be such that the transformer shall be able to carry the specified overload without overflowing of oil. The Calculation shall be submitted during design review.



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- 6.7.4 The conservator shall be fitted with integral lifting lugs in such a position so that it can be removed for cleaning purposes. Suitable provision shall be kept to replace air cell and cleaning of the conservator wherever applicable.
- 6.7.5 Conservator shall be positioned so as not to obstruct any electrical connection to transformer. Pipe work shall neither obstruct the removal of tap changers for maintenance or the opening of inspection or manhole covers.
- 6.7.6 Pipe work connections shall be of adequate size for their duty and as short and direct as possible. Only radiused elbows shall be used.
- 6.7.7 The feed pipe to the transformer tank shall enter the transformer cover plate at its highest point and shall be straight for a distance not less than five times its internal diameter on the transformer side of the Buchholz relay, and straight for not less than three times that diameter on the conservator side of the relay.
- 6.7.8 This pipe shall rise towards the oil conservator, through the Buchholz relay, at an angle of not less than 5 degree.
- 6.7.9 Contact of the oil with atmosphere is prohibited by using a flexible air cell of nitrile rubber reinforced with nylon cloth.
- 6.7.10 The temperature of oil is likely to rise upto 100 deg C during operation. As such air cell used shall be suitable for operating continuously at 100 deg C.
- 6.7.11 Air cell of conservator shall be able to withstand the vacuum during installation /maintenance periods. Otherwise provision shall be kept to isolate the conservator from the main tank when the latter is under vacuum by providing a vacuum sealing valve or other suitable means in the pipe connecting main tank with the conservator.
- 6.7.12 The transformer manual shall give full and clear instructions on the operation, maintenance, testing and replacement of the air cell. It shall also indicate shelf life, life expectancy in operation, the recommended replacement intervals and the supplier.
- 6.7.13 The connection of air cell to the top of the conservator is by air proof seal preventing entrance of air into the conservator.



## 6.8 Neutral Earthing Arrangement

The neutral terminals of transformer shall be brought to the ground level by a brass/tinned copper grounding bar, supported from the tank by using porcelain insulators. The end of the brass/tinned copper bar shall be brought to the bottom of the tank, at a convenient point, for making bolted connection to two (2) 75 x 6 mm galvanised steel flats connected to Owner's grounding mat.

## 7.0 FITTINGS

- 7.1 Fittings as listed in Annexure - I shall be provided. Any other fittings which may be necessary for the satisfactory operation of the transformer shall also be provided on each transformer.
- 7.2 All fittings shall conform to relevant Indian Standard Specifications.
- 7.3 Fittings such as conservator and associated pipes, explosion vent pipe etc. shall be designed to withstand vacuum as specified in Clause 6.2.1 against atmospheric pressure.
- 7.4 Fittings such as rating plate, dehydrating breather, off-circuit tapping switch, dial type thermometer etc. which need to be observed/ operated, shall be mounted at convenient heights of not more than 1.5 M from the base of the transformer and located so as to be clearly visible from the front.
- 7.5 All opening shall be provided with gasketed metallic covers for protection during transportation.
- 7.6 All valves shall be of globe/butterfly type provided with blanking plates. The valve body shall be made of either Carbon Steel with trim of 13 Cr. steel or gun metal.



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- 7.7 The rating plate, the terminal diagram and terminal marking plates shall be made of Aluminium and shall contain relevant details as per IS 2026. The Code No. of equipment shall be marked on a separate plate.
- 7.8 All terminals shall be anti loosening type and complete with connectors of required size. The earthing terminals shall have identification marks.
- 7.9 All valves in oil line shall be suitable for continuous operation with transformer oil at 115 deg C.
- 7.10 The oil sampling point for main tank shall have two identical valves to be put in series .Oil sampling valve shall have provision to fix rubber hose of 10 mm size to facilitate oil sampling.
- 7.11 A valve or other suitable means shall be provided to fix (in future) on line dissolved gas monitoring system to facilitate continuous dissolved gas analysis. The location & size of the same shall be finalised during detail engineering stage

**7.12 Winding Temperature Indicator**

Winding temperature indicator for measuring hot spot temperature of the winding shall comprise of current transformer image coil, temperature sensing element, capillary tube jacketed with PVC sleeve, 150 mm dia. local indicating instrument with two pairs of contacts one for alarm and other for trip and maximum point indicator capable of being reset by hand without tools.

In addition to the above, the following equipment shall be provided for remote indication of winding temperature for each of the winding:

a) Signal transmitter for each winding

Signal transmitter shall have additional facility to transmit signal for recording winding temperature at Owner's data acquisition system, for which duplex platinum RTD with nominal resistance of 100 ohms at zero degree centigrade shall be supplied. The RTD shall be three wire ungrounded system. The calibration shall be as per SAMA (USA) standard or equivalent. The RTD may be placed in the pocket containing temperature sensing element and image coil for WTI system which will be used for both remote WTI and DAS. Necessary equipment for sending the signal to remote WTI and DAS shall be provided. In lieu, separate RTD for each of the functions shall be provided.

b) Remote winding temperature indicator

It shall be suitable for flush mounting on Owner's panel. This shall not be repeater dial of local WTI and will operate by signal transmitter. Any special cable required for shielding purpose, for connection between cooler control cabinet and remote WTI control circuit, shall be in the scope of Contractor. Only one RWTI with a selector switch shall be provided for all the windings (HV and LV).



**7.13 Oil Temperature Indicator**

Oil temperature indicator for measuring top oil temperature shall comprise of 150 mm dial type thermometer, thermometer pocket and capillary tube jacketed with PVC sleeve. Thermometer shall have two pairs of contacts, one for alarm and other for trip and maximum point indicator capable of being reset by hand without tools.

In addition to the above, the following equipment shall be provided for remote indication of oil temperature:

a) Signal transmitter

Signal transmitter shall have additional facility to transmit signal for recording oil temperature at Owner's data acquisition system, for which duplex platinum RTD with nominal resistance of 100 ohms at zero degree centigrade shall be supplied. The RTD shall be three wire ungrounded system. The calibration shall be as per SAMA (USA) standard or equivalent. The RTD may be placed in the pocket containing temperature sensing element and image coil for OTI system which will be used for both remote OTI and DAS. Necessary equipment for sending the signal to remote OTI and DAS shall be provided. In lieu, separate RTD for each of the functions shall be provided.

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b) Remote oil temperature indicator

It shall be suitable for flush mounting on Employer's/RTCC panel. This shall not be repeater dial of local OTI and will operate by signal transmitter. Any special cable required for shielding purpose, for connection between cooler control cabinet and remote OTI control circuit, shall be in the scope of Contractor. Only one ROTI with a four point selector switch shall be provided.

7.14 **Buchholz Relay**

The Buchholz relay as per IS 3637 shall be of double float type, provided with, two pairs of contacts, one for alarm and other for trip, facility for testing by injection of air by hand pump and with a cock for draining and venting of air. The relay shall be provided with shutoff valves on the conservator side as well as on the tank side.

The alarm and trip contacts of all protective devices shall be potential free and rated for 1 Amp at 110 V / 220 V D.C.

7.15 **Marshalling Box**

A marshalling box shall be provided to accommodate all auxiliary devices except those which are to be located directly on transformer or housed in a separate panel.

- i. Terminal boxes, Junction Boxes & Marshalling Panel shall have IP 55 enclosure(min.), dust, weather and vermin proof type.
- ii. The marshalling box shall be dust, weather and vermin proof type made of sheet steel of not less than 2 mm thick. The box shall be rectangular in shape having sufficient space for easy termination of cables. The terminal block shall be pressure clamp type. 10% spare terminals shall be provided.

Suitable heavy duty double compression type rolled Aluminium cable glands for all incoming and outgoing cables shall be provided.

7.16 **Current Transformers**

The current transformers shall be provided and shall comply with IS 2705. The C.T. terminals shall be accessible through a weatherproof removable cover for the purpose of testing etc. CT polarity shall be clearly marked. The C.T. for standby earth fault protection shall be 15 VA, 5P10. The C.T's for differential and restricted earth fault protection shall be of Class PS accuracy. The values of  $V_k$  and  $I_{mag}$  for these CTs shall be furnished at the order stage.

7.17 **Wiring**

All controls, indication and protective devices provided on the transformer shall be wired upto the terminal block inside the marshalling box, by means of stranded copper heat resistant PVC insulated armoured cable of 1.1 KV grade and size not less than 2.5 sq. mm. Wiring shall be properly fixed on cable tray with at least 100 mm clearance from the transformer body. Suitable identification mark shall be provided on all wires.



7.18 All bought out items shall be of reputed make to be approved by Consultant/ Owner.

7.19 **NITROGEN INJECTION FIRE PREVENTION AND EXTINGUISHING SYSTEM**

7.19.1 Nitrogen Injection Fire Prevention and Extinguishing System shall be provided for fire protection of Transformer against fire due to an arc, during internal faults and external fires is for preventing tank explosion. The system design shall also conform to TAC/ NFPA norms.

7.19.2 The system should comprise the following :-

- i. Fire Extinguishing Cubicle with base frame and containing, oil drain assembly, nitrogen cylinder, electric mechanical control unit for oil drain and nitrogen release detections necessary for monitoring system flanges on top panel for connecting pipe connections from transformer, panel lighting etc.
- ii. Control Box for monitoring system operation, automatic control and remote operation, with alarms, indication light switches, push buttons, audio signal, suitable for tripping and signaling on 110V DC supply.

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- iii. Pre-stressed non-return valve (PNRV) working on transformer oil flow rate, with proximity switch for remote alarm indication and with visual position indicator.
- iv. Required number of fire detectors rated for 141<sup>0</sup>C for heat sensing, each fitted with two number cable glands.
- v. Signal box for terminating cable connections from PNRV and fire detectors.
- vi. Pressure relief valve with limit switch.

7.19.3 The following arrangements are required to be made on the transformer Tank at the time of fabrication of the tank :-

- i. Oil drain opening with pipe, flange and manual gate valve at about 120mm below the top cover. Pipe size DN125 for 100 MVA and higher ratings.
- ii. Nitrogen Injection openings with pipe size DN 25 with flange and manual gate valve on tank sides at about 100-200 mm from the bottom plate.
- iii. Flanges having 4 Nos. 18 dia. holes with pcd as 155mm and dummy pipe on the conservator pipe between buchholz relay and conservator tank manual gate valve, for fixing PNRV.
- iv. Fire detector brackets on top cover.
- v. Brackets for fixing signal box at a suitable location on top cover or tank size wall.

#### 7.19.4 **ACTIVATION OF NIFPES:**

Mal-functioning of fire prevention / extinguishing systems is their major shortcoming which leads to interruption in power supply. The Contractor shall ensure that the chances of malfunctioning of NIFPES are practically nil. To achieve this objective, the Contractor shall work out their scheme of activating signals which, while preventing mal-operation, should not be too rigorous to make the operation of NIFPES impracticable in case of actual need. Transformer isolation shall be the mandatory pre-requisite for activation of the system in Automatic mode or Remote mode in the control room.

In addition, at least following electrical-signals shall be provided in series for activating NIFPES.

#### 7.19.5 Auto Mode

- a) For Prevention of Fire :
  - i. Differential Relay Operation
  - ii. Buchholz Relay parallel with Pressure Relief Valve or RPRR. (Rapid Pressure Release Relay)
  - iii. Tripping of all concerned breakers is a prerequisite for initiation of system activation.
  
- b) For Extinguishing Fire :
  - i. Fire Detector
  - ii. Buchholz Relay paralleled with Pressure Relief Valve or RPRR.
  - iii. Tripping of all connected breakers is a prerequisite for initiation of system activation.

7.19.6 Manual Mode (Local/Remote): Tripping of all connected breakers is a pre-requisite for initiation of system activation.

7.19.7 Manual Mode (Mechanical): Tripping of all connected breakers is a pre-requisite for initiation of system activation.

#### 7.19.8 **General Description of NIFPES**

#### 7.19.9 **Schematic of the System**

NIFPES should be a stand alone dedicated system for oil filled. It should have a fire extinguishing FE) cubicle placed on a plinth at a distance of 6-10 mtrs. from the transformer. The F.E. cubicle may be connected to the transformer oil tank (near its top) and to the oil pit from its bottom through oil pipes with gate valves. The F.E. cubicle should house a pressurized nitrogen cylinder connected to the transformer oil tank (near its bottom). Cable connections are to be provided from signal box placed on the transformer to the control box in the control room and from control box to F.E. cubicle. Fire detectors placed at the top of transformer are to be connected in parallel to the signal box. The signal box may be connected to a pre-stressed non-return valve fitted between the conservator tank and Buchholz relay. Control box is also to be connected to relay panel in control room for system activation signals.

#### 7.19.10 Operation

On receipt of all activating signals, drain of pre-determined quantity of oil commences thus removing high temp. top oil layer. Simultaneously nitrogen is injected under high pressure at a pre-fixed rate, string the oil thus bringing the temperature of top oil layer down. Nitrogen occupies the space created by oil drained out and acts as an insulating layer between the tank oil & fire on top cover. Pre-stressed non return valve blocks oil flow form conservator tank, thus isolating it & preventing aggravation of fire.

#### 7.19.11 System Components

Broadly, NIFPES shall consist of the following components. It is emphasized that all components, necessary for fast reliable & effective working of NIFPES shall be considered within the scope.

#### 7.19.12 Fire Extinguishing Cubicle



It shall be made of 3mm thick steel sheet, painted dark red from inside & outside with hinged split doors fitted with high quality tamper proof lock. It shall be complete with the base frame and the following:-

- Nitrogen gas cylinder with regulator and falling pressure electrical contact manometer
- Oil drain pipe with mechanical quick drain valve.
- Electro mechanical control equipment for oil drain and pre-determined regulated nitrogen release.
- Pressure monitoring switch for back-up protection for nitrogen release.
- Limit switches for monitoring of the system.
- Flanges on top panel for connecting oil drain and nitrogen injection pipes for transformer.
- Panel lighting (CFL Type)
- Oil drain pipe extension of suitable sizes for connecting pipes to oil pit.

#### 7.20 Control Box

Control Box for monitoring system operation, automatic control and remote operation, with following alarms indication, light switches, push buttons, audio signal, line fault detection suitable for tripping and signaling on 110V DC supply :

- System on\*
- PNRV open\*
- Oil drain valve closed\*
- Gas inlet valve closed\*
- PNRV closed^
- Fire Detector Trip^
- Buchholz Relay Trip^
- Oil drain valve open^
- Extinction in pressure^

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- Cylinder pressure low<sup>^</sup>
- Differential relay trip<sup>^</sup>
- PRV/RPRR trip<sup>^</sup>
- Transformer trip<sup>^</sup>
- System out of service
- Line fault free detector
- Line fault differential relay
- Line fault buchholz relay
- Line fault PRV
- Line fault transformer trip
- Line fault PNRV
- Auto/Manual/Off
- Extinction release on
- Extinction release off
- Lamp test
- Visual / Audio Alarm
- Visual / Audio alarm for DC supply fail

The signals marked (\*) shall be in the topmost row of control box panel. The signals marked (^) shall follow next.

#### 7.21 **Pre-stressed Non Return Valve (PNRV)**

PNRV is to be fitted in the conservator pipe line between conservator & Buchholz relay. It shall have the proximity switch for remote alarm, indication and with visual position indicator. The PNRV should be of the best quality because malfunction of PNRV shall be of serious consequence as its closing leads to stoppage of breathing of transformer.

#### 7.22 **Fire Detectors**

The system shall be complete with adequate number of fire detectors fitted on the top of oil tank, OLTC/Off ckt. Tap changer rated for 1410C for heat sensing each fitted with two no. cable glands (water proof/weather proof).

#### 7.23 **Signal Box**

It shall be fitted on the transformer for terminating cable connections from PNRV & fire detectors and for further connection to the control box.

#### 7.24 **Cables**

Fire survival cables, able to withstand 7500C, 4 core x 1.5mm sq. for connection of fire detectors in parallel shall be used. Fire retardant low smoke (FRLS) cable 12 core x 1.5mm sq. for connection between transformer signal box/marshalling box to control box and control box to fire extinguishing cubicle shall be used.

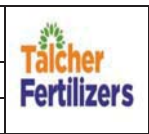
Fire retardant low smoke (FRLS) cable 4 core x 1.5mm sq. for connection between control box to DC supply source and fire extinguishing cubicle to AC supply source, signal box marshalling box to prestressed non return valve connection on transformer shall be used.

#### 7.25 **Pipes**

Pipes, complete with connections, flanges, bends, tees etc. shall be supplied alongwith the system.

#### 7.26 **Other items**

- a) Oil drain and nitrogen injection openings with gate valves on transformer tank at suitable locations
- b) Flanges with dummy piece in conservator pipe between Buchholz relay and conservator tank for fixing PNRV.



- c) Fire detector brackets on transformer top cover.
- d) Spare potential free contacts for system activating signals i.e. differential relay, buchholz relay, pressure relief valve, transformer isolation (master trip relay).
- e) Pipe connections between transformer to fire extinguishing cubicle and fire extinguishing cubicle to oil pit.
- f) Cabling on transformer top cover for fire detectors to be connected in parallel and inter cabling between signal box to control box and control box to fire extinguishing cubicle
- g) Mild steel oil tank with moisture proof coating with capacity as minimum 10% of total oil quantity of transformer, with water tight cover, to be place in the oil pit. This tank shall be provided with the manhole, air vent pipe through silica gel breather, drain valve and a spare gate valve at the top.
- h) Gate valves on oil drain pipe & nitrogen injection pipe should be able to withstand full vacuum. A non-return valve shall also be fitted on nitrogen injection pipe between transformers & gate valve.
- i) Pressure relief valve, wherever not fitted on the transformer.
- j) The F.E. cubicle shall be painted with post office red colour (Shade 538 of IS-5). All the exposed parts i.e. pipes, supports, signal box etc. shall be painted with enameled paint.

#### 7.27 Modification on the transformer

No modification on the transformer shall be allowed which affects its performance (i.e. efficiency, losses, heat dissipation ability etc.), safety, life etc. or its any other useful parameter. This requirement shall be of paramount importance and shall be followed.

However, in any case, performance of transformer should not be affected in any manner by having NIFPES system and the Contractor shall give an undertaking to this effect. All pipes should be washed/rinsed with transformer oil. If any damage is done to the transformer and/or any connected equipment during installation & commissioning full recovery therefore shall be effected from the Contractor.



It shall be solely the responsibility of Contractor/Sub-Contractor to install, carry out pre-commissioning tests & commission NIFPES at Ridge Valley indicated in this Specification, to the entire satisfaction of the Owner/Consultant..

#### 7.28 Interlocks

It shall be ensured that once the NIFPES gets activated manually or in auto mode, all the connected breakers shall not close until the system is actually put in OFF mode. Also PNRV shall get closed only if all the connected breakers are open.

#### 7.29 In general, following Fire Extinction period and other data shall be followed :

On commencement of Nitrogen Injection	:	Maximum 30 seconds
From the moment of system activation to complete cooling	:	Maximum 3 minutes
Fire detectors heat sensing temperature	:	141 <sup>0</sup> C
Heat sensing area	:	800mm radius
Pre-stressed non return valve setting for Operation	:	minimum 60 ltr. Per minute
Capacity of Nitrogen cylinder :	:	Minimum 68 litre water capacity And shall hold minimum 10 cubic Meter gas to 150 bar pressure
Power Source	:	
Control Box	:	220VDC

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Fire extinguishing cubicle for 230VAC lighting

7.30 The following information in detail shall be provided :

- a) The maintenance and testing schedule for NIFPES.
- b) All the steps required to be undertaken for restarting the transformer and connected equipment after operation and mal-operation (if any) of the NIFPES.
- c) The process of venting nitrogen in case nitrogen pressure in the cylinder exceeds the stipulated maximum value.

## 8.0 PAINTING



- 8.1 The surface to be painted shall be shot or sand blasted to remove all dust, scale and foreign adhering matter. All traces of oil and greases should be removed by suitable treatment.
- 8.2 All steel surfaces in contact with insulating oil shall be painted with heat resistant oil insoluble insulating varnish.
- 8.3 All steel surfaces exposed to outside shall be painted with suitable anti-rust and anticorrosive paints. Epoxy paints shall be used.
- 8.4 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- 8.5 The paint should not fade during drying process. The paint should be able to withstand temperature up to 120 deg. C .The detailed painting procedure shall also be submitted along with the bid which shall be finalized before award of the contract.
- 8.6 Unless otherwise specified, the finishing shade shall be light grey Shade No. 631 as per IS 5.
- 8.7 1 litre of paint per transformer shall be supplied for touch up at Site.

## 9.0 TESTS AND INSPECTION

- 9.1 All transformers shall be routine tested as per IS 2026. Transformer oil shall be tested as per IS 335. Heat run test shall be carried out for one transformer of each rating.
- 9.2 Type test certificate shall be furnished.
  - a. Temperature-rise tests (IEC 60076-2)
  - b. Dielectric tests: Full-wave impulse-voltage withstand test (IEC 60076-3)
- 9.3 Additional tests, wherever specified, shall be carried out on one transformer of each rating.
- 9.4 All the above mentioned tests shall be carried out in the presence of Purchaser's representative. In addition, the transformers shall be subject to stage inspection at works and inspection at site for final acceptance.
- 9.5 These inspections shall, however, not absolve the Vendor from their responsibility for making good any defect which may be noticed subsequently.

## 10.0 DRAWINGS AND DOCUMENTS

- 10.1 The drawings and documents as per Annexure-III shall be furnished, unless otherwise specified.
- 10.2 All drawings and documents shall have the following descriptions written boldly:
  - Name of Client
  - Name of Consultant
  - Enquiry / order number with plant / project name
  - Equipment Code No. and Description
- 10.3 The transformer shall be suitably packed to avoid damage in transit and shall be properly sealed so as to completely exclude oxygen and moisture from coming in contact with oil.

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Bushing shall be wrapped in straw ropes or similar material and complete transformer shall be packed in wooden crates.

- 10.4 The packing box shall contain a copy of the installation, operation and maintenance manual.
- 10.5 All loose pieces shall be separately wrapped in moisture resistant paper and marked with identification mark of the corresponding transformer.

#### **11.0 SPARES**

- 11.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.
- 11.4 All spare parts shall be identical to the parts used in the equipment.

#### **12.0 PACKING**

- 12.1 The transformer shall be suitably packed to avoid damage in transit and shall be properly sealed so as to completely exclude oxygen and moisture from coming in contact with oil. Bushing shall be wrapped in straw ropes or similar material and complete transformer shall be packed in wooden crates.
- 12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.
- 12.3 All loose pieces shall be separately wrapped in moisture resistant paper and marked with identification mark of the corresponding transformer.





**ANNEXURE - I**  
**LIST OF FITTINGS**

I. The fittings as given below shall be provided for all the ratings of transformers.

1. Oil Sampling Valve.
2. Filter valves with plug.
3. Radiator shutoff valves on top and bottom for each unit.
4. Buchholz relay shutoff valves.
5. Winding temperature indicator for 1000 KVA and above.
6. Oil temperature indicator.
7. Oil level indicator with minimum marking.
8. Oil conservator complete with drain plug and oil filling hole with cover.
9. Buchholz relay with air release device and alarm and trip contacts.
10. Silica gel breather with oil seal and connecting pipe.
11. Explosion vent.
12. Bi-directional rollers.
13. Inspection holes with cover.
14. Marshalling Box.
15. Rating Plate.
16. Diagram and Terminal marking plate.
17. Lifting lugs.
18. Jacking pad.
19. Earthing Terminals.
20. Air release device.
21. Neutral bushing for earthing.
22. Ladder with safety device for access to the top of transformer tank.

II. The additional fittings as given below shall also be provided, as per requirement:

1. Magnetic oil level gauge with low oil level alarm contact.
2. Hauling lugs for extra high voltage transformers.
3. Protective CTs for
  - a) Stand-by earth fault.
  - b) Restricted earth fault.
  - c) Differential protection.
4. Bi-directional wheels if already bi-directional rollers not considered.
5. Skids.
6. Cooler units complete with valves, fans, pumps, oil flow indicators, supporting structure with fixing and foundation bolts etc as required and Cooler Control panel.
7. Tap-changing gear complete with tap position indicator, operation counter etc. For OLTC gear(where specified), oil surge relay(OSL) with shut-off valve, Local control cabinet.
8. Nitrogen Injection Fire Prevention and Extinguishing System

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**ANNEXURE - II**  
**DOCUMENTATION FOR TRANSFORMERS**

Sl. No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	Dimensional drawing for complete Transformer, Marshalling Box, disconnecting chamber, terminal chambers etc.	N	Y	Y
4.	Schematic and Wiring Diagram	N	Y	Y
5.	Terminal arrangement drawing	N	Y	Y
6.	Installation, operation and maintenance manual	N	N	Y
7.	Catalogues and test certificates for bought out accessories	N	N	Y
8.	Type test certificates of similar transformer	N	N	Y
9.	Test Certificates	N	N	Y
10.	Guarantee Certificates	N	N	Y
11.	Spare parts list with identification marks	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



**TALCHER FERTILIZERS LIMITED**  
**TECHNICAL SPECIFICATION - MEDIUM VOLTAGE**  
**SWITCH BOARDS**

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**TECHNICAL SPECIFICATION**  
**MEDIUM VOLTAGE SWITCH BOARDS**



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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of Medium Voltage Switchboards.
- 1.2 This standard shall be applicable for the Power Control Centres, Power cum Motor Control Centres and Motor Control Centres.
- 1.3 This standard shall be read in conjunction with relevant part of Design Philosophy – Electrical, Schematic diagrams etc.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment shall comply with the latest issue of the following Indian Standards, unless otherwise Specified. Equipment complying with equivalent IEC standards shall also be acceptable.

- IS 8623 - Specification for low voltage switchgear and control gear assemblies
- IS/IEC 60947 - Low-voltage switchgear and control gear (General Rules)
- IS 5578 - Guide for marking of insulated conductors
- IS 10118 - Code of practice for selection, installation and maintenance of switchgear and control gear
- IS 11353 - Guide for uniform system of marking and identification of conductors and apparatus terminals

Various components housed in the switchboards shall conform to the Indian Standard specifications as mentioned against the component details or IEC specifications.

- 2.2 The design and operational features of all the equipment offered shall also comply with the provisions of the latest issue of the Indian Electricity Rules and other Statutory Acts and Regulations, as applicable. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specification / IEC Specification, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy – Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy – Electrical.

## 4.0 OPERATING REQUIREMENTS

The Medium Voltage Switchboards shall be suitable for operating at the specified rating continuously, with the specified voltage and frequency variations under the ambient conditions, without exceeding the permissible temperature rise and without any detrimental effect on any part.

## 5.0 DESIGN AND CONSTRUCTIONAL FEATURES

### 5.1 General

- 5.1.1 The switchboards shall consist of an assembly of a series of floor mounting, identical, metal clad, dead front type sheet steel panels of unitized design. The panels shall be placed side by side to form a compact assembly and shall be extensible on either side.
- 5.1.2 The complete assembly shall be dust, damp and vermin proof having minimum degree of protection equivalent to IP-52 as per IS/IEC:60947.
- 5.1.3 The frame work of the cubicles shall be of bolted/welded construction. The minimum thickness of sheet steel shall be 2 mm for load bearing members, 1.6 mm for non-load bearing members and 3 mm for base channel. The doors and covers shall be fabricated from cold rolled sheets. Suitable reinforcement, wherever necessary, shall be provided.
- 5.1.4 The door hinges shall be concealed type.
- 5.1.5 All external hardwares shall be cadmium plated. The hardwares for fixing the removable parts shall be provided with retaining devices.
- 5.1.6 The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets. Gaskets without any discontinuity shall be preferred. Gaskets shall be held in position in groove, in shaped sheet steel work or these shall be of U type. Adhesive cement, if used, shall be of good quality so that the gaskets do not come off during service.
- 5.1.7 All the components shall be accessible for inspection and maintenance without the necessity for removal of the adjacent ones.
- 5.1.8 The layout of the component inside the module shall be liberal to facilitate maintenance and interconnecting wiring between the components shall not be subjected to any undue stresses at the bends.
- 5.1.9 Mounting height of components requiring operations and observation shall not be lower than 300 mm and higher than 1800 mm.
- 5.1.10 Inter panel barriers shall be provided.
- 5.1.11 All the live parts which are accessible after opening of front cover/cable alley cover/back cover shall be properly insulated or provided with insulating barrier to prevent accidental contact. Removal facility shall be provided for all such parts.
- 5.1.12 Adequate arrangement for earthing shall be provided to safeguard the operator or other personnel from electric hazards under all conditions of operation.

### 5.2 Panel Arrangement

The Switchboards shall be in fixed/draw out, single front execution, fully compartmentalised type and divided into distinct panels, each comprising of :

- i) A completely metal enclosed bus-bars compartment running horizontally the top.
- ii) Individual feeder modules.
- iii) Enclosed vertical bus-bars serving all modules, in case of multi-tier panels.
- iv) A vertical cable alley.
- v) Separate horizontal enclosure for all auxiliary power and control buses.

### 5.3 Circuit Breaker Controlled Feeders

- 5.3.1 The panels housing circuit breaker feeders shall be in single front draw out execution. The incoming and bus coupler circuit breaker feeders shall be in single tier formation while the outgoing circuit breaker feeders may be in double tier formation.

- 5.3.2 A suitable barrier shall be provided between the circuit breaker and the associated control, protective and indication devices including instrument transformers.
- 5.3.3 All the protective relays and meters shall be flush mounted type. The relays and meters pertaining to a particular circuit breaker shall be mounted on the same panel. Where it is not possible to accommodate all the relays and meters in the same panel, one metering panel shall be provided adjacent to the circuit breaker panel exclusively for that feeder. Location of these in the adjacent panel of other feeders shall not be acceptable.
- 5.3.4 A spacious cable chamber suitable for accommodation, support and termination of required number of power cables shall be provided at the back. No bare bus-bars or live connection shall intrude into the cabling space.
- 5.3.5 The switchboard shall be provided with following inter locks and safety features:
- i) It shall not be possible to open the compartment door unless the breaker is drawn to isolated position.
  - ii) The withdrawn and engagement of a circuit breaker shall not be possible unless it is in open position.
  - iii) The operation of a circuit breaker shall not be possible unless it is in fully service, test or isolated position.
  - iv) It shall not be possible to close the circuit breaker in service position unless all auxiliary and control circuits are connected.
  - v) A breaker of the lower rating shall be prevented from engaging with the stationary element of higher rating.
  - vi) Insertion of the manual mechanism shall render the motorised mechanism in operation.
  - vii) Circuit breaker 'ON', 'OFF' indication shall be provided at the back of each panel. Alternatively, alarm shall be provided in case panel back door is opened with breaker "ON".
  - viii) Caution nameplate shall be provided at the back of incomer's panels where terminals are likely to remain live and isolation is possible only from remote end.
  - ix) Automatic safety shutter, with Padlocking facility for locking in closed position, to completely cover the spouts for the bus-bars and cable connection when the breaker is withdrawn.
- 5.4 **Switch/MCCB Controlled Feeders**
- 5.4.1 The panels housing motor starter or other feeders shall be either fixed or draw out type in single front execution.
- 5.4.2 All components of one feeder shall be mounted on a rigid sheet steel chassis.
- 5.4.3 Each panel shall be divided into a number of modules in tier formation placed one above the other. These modules shall be closed on all sides.
- 5.4.4 The modules shall be so placed that largest one is placed at the bottom of the panel. Type modules shall be at least 300 mm from the base channel.
- 5.4.5 The number of modules shall be so decided that the cables in the cable alley are not over crowded. However the number of module in any panel shall not exceed six.
- 5.4.6 The minimum size of module shall be 300 mm and 200 mm for starter and switch fuse feeders respectively.
- 5.4.7 The minimum clear width of cable alley shall be 250 mm.

5.4.8 For MCC rated above 630 Amp. The incomer and bus coupler modules shall be located in individual single panel. For MCC rated for 630 Amp. and below the incomer and bus coupler modules shall be half the panel size.

5.4.9 The module door shall be so interlocked that it shall not be possible to open the door with switch in closed position and close the door unless the module is fully plugged in. Defeat interlock facility shall be provided.

### 5.5 Special Features of Draw out Modules

5.5.1 The module shall be fully draw out type with sheet steel chassis moving freely on the guides. Chassis of the same size shall be fully interchangeable.

5.5.2 The module shall have the following distinct mechanical positions:

- i) Service -- In which both power and control contacts shall be made.
- ii) Test -- In which power contacts shall be isolated but control contacts shall be made.
- iii) Isolated -- In which both power and control contacts shall be Isolated.

Maintenance position shall be preferred.

5.5.3 Each position shall be clearly marked. Padlocking facility shall be provided to padlock the chassis in any of the position.

5.5.4 The movement of the chassis from one position to the other shall be controlled by using an appropriate racking mechanism. Stopper shall be provided to prevent over travel of the chassis beyond the isolated position.

5.5.5 The guiding system shall permit smooth movement of the module and the power and control contacts shall be self-aligning type so that accurate alignment of the contacts is ensured.

5.5.6 No wiring shall be taken to the door. Only the actuators of the push buttons and switches, lenses for the indicating lamps and Perspex cover for meters shall be mounted on the door.

5.5.7 The power contacts shall be of plug-in/stab-in type made of silver plated copper, spring loaded and of adequate current carrying capacity. The contacts shall be so designed that contact pressure is maintained both under normal and short circuit conditions.

5.5.8 The parting contacts, both on bus-bar side and outgoing cable side, shall always be copper to copper and both sides silver plated. A bimetallic strip shall be used where two dissimilar materials are in contact.

### 5.6 Bus-Bars and Connections

5.6.1 The bus-bars shall be for three phase and neutral. The main bus-bars and connections shall be made of electrolytic grade copper of rectangular cross-section. Auxiliary bus-bars for control supply, space heater supply etc. shall be made of electrolytic copper.

5.6.2 The horizontal bus-bars shall be insulated with heat shrinkable PVC sleeves of reputed make to protect against approach to live parts. The vertical bus-bars shall be sleeved or shrouded by barriers. Removable type insulating shrouds shall be provided for all joints of horizontal bus-bars.

5.6.3 The bus-bars shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding temperature limits specified in IS: 8084. The thermal rating of the bus-bars shall be designed to withstand the system fault current for 1 second without exceeding the limiting temperature of 200°C for bare Aluminium/Copper. Calculation for bus-bars sizing shall be furnished along with the offer.



- 5.6.4 Horizontal bus-bars shall be of the same cross-section through out. Stepped bus-bars shall not be acceptable.
- 5.6.5 The bus-bars shall be arranged and colour coded according to IS: 5578 / IS: 11353.
- 5.6.6 The bus-bar chamber shall be sufficiently spacious and shall have separate screwed covers for maintenance purpose.
- 5.6.7 The bus-bars shall be rigidly supported at equal intervals to withstand maximum short circuit stresses. The supports shall be of moulded construction with built-in anti-tracking barriers. The support materials shall be of DMC or fibreglass reinforced thermosetting plastic.
- 5.6.8 Bus-bar joints shall be between the two transporting sections only.
- 5.6.9 A minimum of two bolts shall be used in bus-bar joints. Only high tensile electric galvanized bolts, nuts and washers shall be used.
- 5.6.10 In case of Aluminium bus-bars, all joints shall be suitably treated to avoid oxidation of contact surfaces and bimetallic corrosion.

## 5.7 **Earth Bus**

A continuous earth bus of electrolytic grade copper, running along the entire length of the lower part of the switchboard shall be provided with lugs at two ends for external connections. The minimum size of earth bus shall be suitable for carrying three phase fault current for 1 sec.

## 5.8 **Bus Duct**

- 5.8.1 Suitable extension of bus-bars in proper phase sequence on the top, with the connecting bolts shall be provided where connection of transformer to switchboard is specified to be through bus duct.
- 5.8.2 Bus duct between two halves of a switchboard, if required, shall be supplied by the switchboard manufacturer. The bus-bars of interconnecting bust duct shall be similar to the main bus-bars of the switchboard and as specified above.
- 5.8.3 Bust duct between transformer and incoming breaker panel, if included in Vendor's scope, shall conform to ES-8062.

## 5.9 **Clearances and Creepage Distances**

- 5.9.1 The clearances and creepage distances shall not be lower than the values specified below:
- i) Minimum clearance between two live conductors -- 20 mm
  - ii) Minimum clearance between live parts and accidentally dangerous part -- 20 mm
  - iii) Minimum creepage distance -- 28 mm
- 5.9.2 The clearances and creepage, as specified above, shall definitely be maintained in the bus-bar system. Provision of bus-bar insulation, separators or barriers shall not be considered to reduce the clearance from the values specified above.
- 5.9.3 At the termination points in the equipment e.g. switches, contactors, thermal relays etc. It is realized that above clearances may not always be possible to be maintained. All such points, where above clearances and creepage distances are not possible to be maintained, shall be insulated or taped.

## 5.10 **Insulation**

- 5.10.1 The insulation used shall be non-hygroscopic and may be of porcelain, epoxy resins or fibreglass moulded with plastic. It shall be of adequate electrical, mechanical and

thermal strength to give trouble free service during normal operation and short circuit conditions.

5.10.2 The insulation shall be treated suitably to withstand the tropical conditions and atmospheric pollution.

#### 5.11 **Power Wiring**

5.11.1 The connections from bus-bar to individual functional unit on the modules shall be of PVC insulated flexible copper cables or taped Copper/Aluminium strip.

5.11.2 The power wiring size shall be decided based on rating of the switch/breaker after using a rating factor of not more than 50% over the current rating in free air.

5.11.3 Power wiring size selected for breaker controlled module shall also be able to withstand full short circuit current for duration of 0.25 sec.

5.11.4 In any case minimum size of power wiring shall not be less than 4 sq. mm copper.

5.11.5 The size of connection from incomer to horizontal bus-bar and from horizontal bus-bar to bus-coupler shall not be less than the size adopted for horizontal bus-bar.

#### 5.12 **Control Wiring**

5.12.1 The switchboard shall be completely factory wired and ready for external connections.

5.12.2 The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables of 1100 Volt grade. The size of wires shall be as follows:

C.T. Circuit -- 2.5 sq. mm

V.T. and Control Circuits -- 1.5 sq. mm

5.12.3 All wiring shall be provided with dependent both ends marking as per IS: 5578. Numbered ferrules, reading from the terminals outwards, shall be provided at both ends of all wiring for easy identification. These shall be interlocking type plastic ferrules.

5.12.4 Control wiring circuits, fed from a supply common to a number of panels, shall be so protected that failure of a circuit in one panel does not effect the operation of the other panels.

5.12.5 The wiring to the equipment mounted on the doors shall be carried out with flexible multi strand copper conductor cable and so supported that on opening of the door there is no undue strain on wire leads.

5.12.6 The control cables shall be neatly arranged and property supported.

#### 5.13 **External Cable Termination**

5.13.1 All power and control cables shall enter the switchboard from the bottom. Sufficient space shall be provided for ease of connection and termination of cables.

5.13.2 The type, number and sizes of cables shall be as indicated in Feeder details.

5.13.3 Compression type cable glands along with the cable lugs as required shall be provided for termination of cables.

5.13.4 The cable glands shall be of rolled Aluminium heavy duty double compression type and shall be mounted on a removable gland plate, provided at a minimum height of 75 mm from the bottom of the switchboard. Two number spare knockouts of size 20 mm shall also be provided on the gland plates for future use. Gland for termination of single core cables shall be nonmagnetic type.

5.13.5 For all power cables, crimped type Aluminium lugs for Aluminium cables and tinned Copper lugs for Copper cables shall be provided.

5.13.6 The terminal blocks shall be pressure clamp type up to 35 sq. mm cable sizes and bolted lug type for higher sizes of cables. These shall be protected type and rated for

1100 Volts service. The minimum current rating of terminal block shall be 16 Amp. The construction shall be such that after the connection of cables by means of lugs, necessary clearance and creepage distance are available.

- 5.13.7 Where more than two cables in parallel are required to be terminated, a system of bus links shall be provided with adequate clearance and spacing.
- 5.13.8 Suitable clamps to support the vertical run of cables shall be provided.
- 5.13.9 The terminal block shall be grouped according to circuit functions and suitably numbered. 20% extra terminals shall be provided in the terminal block.
- 5.13.10 For power connections, suitable marking on the terminals shall be provided to identify the phases.

#### 5.14 Feeder Details

- 5.14.1 The requirements of incomer, bus coupler and outgoing feeders shall be as indicated in the single line diagram, feeder details and corresponding schematic diagrams.
- 5.14.2 Interlocks shall be provided between incomers and bus section panels. The interlocks shall be either electrical or mechanical type. In addition, arrangement for defeating the interlock shall also be provided to facilitate manual changeover.
- 5.14.3 Auto changeover scheme, wherever specified, shall be provided.

#### 5.15 Dummy Panels

Dummy panels complete with bus-bar system in 400 mm width may be required for which unit price shall be indicated.

#### 5.16 Control Power Supply

- 5.16.1 D.C. Power required for closing, tripping and indication of circuit breaker feeders shall be supplied at the bus coupler panel through two completely separate circuits by owner, one for tripping and other for closing and indication.
- 5.16.2 For receiving each external control supply, a double pole miniature circuit breaker shall be provided. This power shall be distributed inside the switchboard for each circuit breaker feeder having its MCB unit.

#### 5.17 Space Heater Power Supply

- 5.17.1 Panel space heater shall be fed from a separate bus common for the whole board. This bus shall be fed from owner's supply for which a double pole MCB shall be provided in bus section panel.
- 5.17.2 Power supply for space heaters of motors shall be tapped from this bus by means of a MCB located in the motor feeder compartment. These MCBs shall be of triple pole and rated for 15 Amp.

### 6.0 COMPONENT DETAILS

Components of the switchgear shall ensure type of coordination 'C' as per IS:60947 (Part 4/ Section 1). Makes of all components shall be subject to owner's / consultant's approval

#### 6.1 Circuit Breaker

- 6.1.1 The circuit breakers shall comply with the requirement of IS/IEC 60947.
- 6.1.2 All circuit breakers shall be of P2 (0-3 min - CO - 3 min - CO) category, capable of carrying the specified current at the site conditions and making/breaking of the system fault current.



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- 6.1.3 Type test certificates from an independent testing authority shall be furnished along with the offer for each circuit breaker rating and type.
- 6.1.4 The circuit breakers controlling motors shall be suitable for DOL starting and stopping of induction motor a number of times.
- 6.1.5 The circuit breakers controlling capacitors shall be suitable for energizing and de-energizing the rated capacitor bank.
- 6.1.6 The circuit breakers shall be of the 3 phase, 4 pole horizontal draw out, horizontal isolation, air break type.
- 6.1.7 The circuit breaker shall be suitable for electrical or manual closing as specified. Manual operated breakers shall have independent manual spring closing mechanism. In case of electrically operated breaker, it shall have motor wound spring mechanism. In all cases tripping shall be by means of shunt trip coil.
- 6.1.8 All circuit breaker units of the same rating shall be physically and electrically interchangeable.
- 6.1.9 The circuit breakers shall be electrically and mechanically trip free and provided with anti-pumping feature.
- 6.1.10 Provision shall be made for slow closing for maintenance purposes. A suitable handle shall be provided one for each board for this purpose.
- 6.1.11 The circuit breakers shall have three positions i.e. service, test and isolated with the cubicle door closed. Necessary stoppers shall be provided to prevent the excessive movement of the breaker cradle than desired for the position. Service and test positions of the breaker shall have monitoring switch having 1NO+1NC contacts.
- 6.1.12 The circuit breaker shall be provided with emergency manual trip device, mechanical 'ON', 'OFF' and 'ISOLATED' position indicators and operation counter.
- 6.1.13 A maintenance truck/device for raising, lowering and withdrawal of the circuit breaker shall be supplied for each switch board.
- 6.1.14 The arc interrupting devices shall be capable of interrupting satisfactorily current from zero to the rated interrupting current when used on predominantly capacitive or inductive circuits, without requiring excessive maintenance of the contacts. The arc shall be restricted within the interrupting chamber and no emission of flame shall be allowed which may cause electrical breakdown or damage to insulation on the apparatus.
- 6.1.15 The main contacts shall be self aligning, adjustable and replaceable type.
- 6.1.16 The arcing contacts shall be easily accessible for maintenance and inspection and shall be easily replaceable type. They shall be provided with, contact face of special arc-resisting and non-pitting metal.
- 6.1.17 Mechanical safety interlock shall be provided for safe operation and movement of the breaker.
- 6.1.18 The circuit breakers shall be provided with minimum of four normally open and four normally closed auxiliary switch contacts, over and above those required for its own control scheme, for Owner's use. The contacts shall be wired separately to the terminal board.
- 6.2 **Moulded Case Circuit Breakers**
- 6.2.1 The circuit breaker shall conform to IS/IEC 60947 and shall be of P2 category having rupturing capacity as per system requirement and mounted on a draw out chassis.
- 6.2.2 The circuit breaker shall be provided with spring assisted quick make quick break type manually operated trip free mechanism, mechanical 'ON', 'OFF' position indicators,

thermal tripping devices of inverse characteristics, instantaneous short circuit tripping devices and necessary auxiliary and alarm switches. The MCCB Chassis shall be provided with service, test and isolated position and automatic safety shutter.

6.2.3 The thermal and short circuit tripping devices shall be adjustable type.

6.2.4 When used for motor circuits, shunt trip device shall be provided and the let through power of controlling MCCB shall be lower than the respective contactor.

6.2.5 In addition, under voltage trip shall be provided.

### 6.3 Switches

6.3.1 The switches shall be motor duty type AC 23 Category and shall comply with the requirements laid down in IS/IEC 60947. Switches up to 63 Amps shall be rotary type and those of 100 Amps. & above, link type.

6.3.2 'ON' and 'OFF' position of the switches shall be indicated on the module. Provision shall be made to lock the switch in the 'OFF' position.

6.3.3 The fixed contacts shall be shrouded type. All contacts shall be silver plated.

### 6.4 Fuses

6.4.1 The fuses shall be of non-deteriorating HRC cartridge link type and shall conform to IS: 13703. They shall be suitable for the load and service required in the circuit.

6.4.2 One fuse puller shall be supplied along with each board.

### 6.5 Air Break Contactors

6.5.1 The Air Break Contactors shall be of Category AC3/AC4, unless otherwise specified, conforming to IS: 60947 and flapper type.

6.5.2 The dropout voltage shall not exceed 65% of rated voltage.

6.5.3 Each contactor shall be provided with auxiliary contacts as required. The rating of the auxiliary contacts shall be 5 Amps. AC or 1 Amp DC at the specified control voltages. The spare auxiliary contacts shall also be wired up to the terminal blocks.

### 6.6 Bimetal Thermal Overload Relays

6.6.1 The contactor shall be provided with three pole bimetal thermal overload relays, unless other-wise specified. The bimetal relays shall be of suitable range, ambient temperature compensated and shall be separate mounting type. They shall be adjustable through graduated scale and shall be provided with changeover contact. Thermal relays having long time/current characteristics, operated through saturated C.T.s shall be supplied, wherever required.

6.6.2 Bimetal thermal relays shall conform to IS: 3231 and IS/IEC 60947 and shall have built-in single phasing preventor.

6.6.3 The bimetal relays shall be provided with a manual resetting device resetable after opening module door. Auto reset thermal relays are not acceptable.

### 6.7 Current Transformers

6.7.1 The current transformers shall conform to IS: 2705.

6.7.2 C.T.s shall be Class F insulated and vacuum impregnated or resin cast. The C.T.s shall be rigidly mounted and shall be easily accessible for maintenance and testing.

6.7.3 The short time thermal withstand ratings of C.T.s shall be same as the thermal withstand rating of the breakers.

6.7.4 The C.T.s output shall be minimum 15VA for breaker feeders and 7.5 VA for the other feeders per phase and in any case, the output shall be adequate for the protection and

metering duties involved with sufficient margin. The C.T.s shall have the following accuracies for the various applications:

<b>Application</b>	<b>Class of accuracy as per IS: 2705</b>
--------------------	--

- |  |      |
|--|------|
| i) For metering service  | - 1  |
| ii) For use with protective relays                               | - 5P |
| iii) For use with restricted earth fault and differential relays | - PS |

6.7.5 The C.T. cores for metering and protection shall be separate.

6.7.6 The ratio of C.T.s shall be as specified in Feeder details.

6.7.7 All the C.T.s shall be provided with terminals and shorting links. One of the terminals of the C.T. shall be earthed. The polarity of the C.T.s shall be clearly marked.

6.7.8 Provision of Interposing C.T.s is not acceptable.

6.7.9 The C.T.s shall be capable of withstanding momentary open circuit on the secondary side without injurious effects.

## 6.8 Voltage Transformers

6.8.1 The V.T.s shall be Class F insulated and vacuum impregnated or resin cast conforming to IS: 3156.

6.8.2 The primary nominal voltage shall be equal to the system nominal voltage. The secondary terminal voltage shall be 110 V.

6.8.3 The primary and secondary winding shall be protected by HRC fuses in each phase except in the ground phase of the secondary side.

6.8.4 The V.T.s shall be mounted on separate withdrawable carriage. The accuracy Class of V.T.s shall be 1.

6.8.5 The rated output of each V.T. shall be adequate for the relays, meters and associated wiring connected to it and shall not be less than 50 VA per phase.

## 6.9 Control Transformers

These shall be air cooled Class F insulated and vacuum impregnated. The rating of control transformer shall be twice the hold on VA of all contactor/relays or 2.5 KVA whichever is high. It shall be free from hum and rigidly mounted. Epoxy cast transformers shall be preferred.

## 6.10 Transformers for Kondorffer Starting

These shall be three phase core type, Class F insulated and vacuum impregnated. Tapping at 90%, 80%, 70% & 60% shall be provided and terminals shall be brought out for easy change of tapping at site. The operating temperature shall not exceed 80°C. The transformers shall be suitable for taking 7.5 times the specified full load current of the motor continuously for 120 secs.

## 6.11 Relays

6.11.1 All protective relays shall be of latest version, microprocessor based numerical type with communication port and interlinked with online energy management system. 100% redundancy shall be provided for communication.

## 6.12 Timers

The timers shall be electronic pneumatic or synchronous type with manual/auto reset

features as per the functional requirements. The time delay shall be 'ON' delay or 'OFF' delay type as specified. The repeat accuracy shall be 0.5% or better.

### 6.13 Single Phasing Preventor

6.13.1 Single phasing preventor relay shall be of the current operated type, suitable for the system voltage. The relay shall not operate for normal system voltage but operate positively in the event of unbalanced voltage more than the normal. The relay shall not operate in case of total interruption of power.

6.13.2 The relay shall be fail safe, self reset type and provided with flag indication. The relay operation shall be independent of the motor rating, loading and speed.

### 6.14 Instruments and Meters

6.14.1 All instruments shall be flush mounting type with square face of 96 mm x 96 mm. They shall be tropicalized and dust tight.

6.14.2 Meters shall be digital multifunctional meters with communication port for energy management at remote location.

6.14.3 All ammeters and voltmeters, to be provided separately, shall have 0-90° scale and shall be moving iron spring controlled type of class 1.5 accuracy as per IS: 1248. The scale range of the ammeters and voltmeters shall be as indicated in the Feeder details.

6.14.4 In case of motor feeders, the ammeters shall be graduated uniformly upto C.T. primary current and with compressed end scale upto 6 times C.T. primary current. Red pointer shall be provided, which shall be adjusted at site for indicating full load current of the motor.

### 6.15 Push Buttons and Control Switches

6.15.1 The switches and push buttons shall conform to utilization category AC11/DC11 as per IS: 60947. The contact shall be rated to make, break and carry inductive current of 5 Amp at 415 V AC and 1 Amp at 220 V DC.

6.15.2 The control switches shall be spring return rotary type, unless otherwise specified and provided with pistol grip type handle. The control switches for circuit breakers shall be additionally fitted with lost motion devices and sequencing devices.

6.15.3 The selector switches shall be stay put rotary type and provided with oval shape handles.

6.15.4 The push buttons shall be of momentary contact spring loaded type with a set of normally close and open contacts. The push button for 'Start' shall be shrouded type and coloured green, stop push button shall be un-shrouded type and coloured red and other push buttons shall be un-shrouded type coloured black. The fixing ring shall be metallic white.

6.15.5 Emergency stop push buttons, if specified, shall be lockable in pushed position.

### 6.16 Miniature Circuit Breakers

6.16.1 The miniature circuit breakers shall conform to IS: 8828 and shall be of duty category M-9.

6.16.2 It shall be provided with overload and short circuit protective devices in a heat resistant housing.

6.16.3 A certificate for short circuit rating and Current-Time tripping curve shall be furnished along with the offer.

### 6.17 Signal Lamps

6.17.1 Signal lamps shall be provided to indicate the various circuit conditions as shown in scheme drawings. The colour of the lamps for various functions shall be as follows :



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- Red -- Circuit breaker/switch/contactor closed.
- Green -- Circuit breaker/switch/contactor open.
- White -- Trip circuit healthy.
- Amber -- Alarm and auto trip.
- Blue -- Non-Trip

6.17.2 All lamps shall be of LED type with lumen output of 200 mili candela in axial direction.

## **7.0 ACCESSORIES**

7.1 The supply shall include the following accessories:

- Maintenance truck/device for raising, lowering and withdrawal of circuit breaker, if required.
- Fuse puller.
- Test plug for relays.
- Test plug for kWh meters.

## **7.2 Space Heater**

Each vertical section shall be provided with a thermostatically controlled space heater, rated for 240 V, 50 Hz and controlled through double pole miniature circuit breaker.

## **7.3 Name Plates**

7.3.1 The switchboard shall have large name plate on the top indicating its Name, Designation and Code No.

7.3.2 Each feeder shall be provided with name plate. Each single front panel shall have name plate indicating panel number both in front and back.

7.3.3 All control switches, push buttons, lamps etc. shall have functional identification labels.

7.3.4 Name plate shall be of black Perspex with white engraving and of minimum 3mm thick.

7.4 Any other accessories required, but not specified, shall also be supplied to make the switchboard complete in all respects and ensure safe and proper operation.

## **8.0 PAINTING**

8.1 The enclosure, after degreasing, pickling in acid, cold rinsing, phosphatising, passivating etc. shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.

8.2 Epoxy based paint shall be used.

8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

8.4 Unless otherwise specified, the finishing shade shall be light grey having Shade No.631 as per IS: 5.

8.5 One litre of paint shall be supplied along with each board for touch up at site.

## **9.0 TESTS AND INSPECTION**

9.1 All the switchboards shall be subjected to routine test as per IS: 8623 and their components as per relevant standards.

9.2 Additional tests, wherever specified, shall be carried out.





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9.3 All the above tests shall be carried out in presence of Purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.

9.4 These inspections shall however, not absolve the vendor from their responsibility for making good any defect which may be noticed subsequently.

### **10.0 DRAWINGS AND DOCUMENTS**

10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

10.2 All drawings and documents shall have the following description written boldly:

- Name of Client
- Name of Consultant
- Enquiry / Order Number with Project / Plant Name
- Code No. & Description

### **11.0 SPARES**

11.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.

11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.

11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.

11.4 All spare parts shall be identical to the parts used in the equipment

### **12.0 PACKING**

12.1 The board shall be properly packed before despatch to avoid damage during transport, storage and handling.

12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

12.3 A sign to indicate the upright position of the panels to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.

**ANNEXURE - I**

**DOCUMENTATION FOR MEDIUM VOLTAGE SWITCHBOARDS**

SI.No.	Documentation Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheets	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	Feeder Details	N	Y	Y
4.	General arrangement and Foundation Drgs.	N	Y	Y
5.	Schematic and Wiring Diagrams	N	Y	Y
6.	Calculation for Bus-bar sizing	N	Y	N
7.	Terminal Arrangement Drgs.	N	Y	Y
8.	Illustrative and Descriptive Literature	N	N	Y
9.	Catalogues for bought out accessories.	N	N	Y
10.	Installation, Operation and maintenance manual.	N	N	Y
11.	Test Certificates			
	i) Type -- Switchboard	N	N	N
	-- Circuit Breaker	N	N	N
	-- MCCB's	N	N	N
	ii) Routine	N	N	Y
12.	Guarantee Certificates	N	N	Y
13.	Spare Parts List	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N – No



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## 1.0 SCOPE

1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of High Voltage Switch Boards.

1.2 This standard shall be read in conjunction with relevant part of Design Philosophy – Electrical , Schematic diagrams etc.

## 2.0 STANDARDS TO BE FOLLOWED

2.1 The design, manufacture and testing of the equipment shall comply with the latest issues of the following standard, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.

IS: 3427 A.C. Metal enclosed switchgear and control gear for rated voltages above 1 kV up to and including 52 kV.

IS: 13118 Specification for high voltage alternating current circuit breakers.

IS: 5578 Guide for marking of insulated conductors.

IS: 11353 Guide for uniform system of marking and identification of conductors and apparatus terminals.

IS: 10118 Code of Practice for selection, installation and maintenance of switchgear and control gear.

Various components housed in the switchboards shall conform to the Indian Standards Specification as mentioned against the component details or IEC Specifications.

2.2 The design and operational features of all the equipment offered shall also comply with the provisions of the latest issue of the Indian Electricity Rules and other Statutory Acts and Regulations. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.

2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications / IEC Specification, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy – Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy – Electrical.

## 4.0 OPERATING REQUIREMENTS

The switchboards shall be suitable for operating at the specified rating continuously, with the specified voltage and frequency variations under the ambient conditions, without exceeding the permissible temperature rise and without any detrimental effect on any part.

## 5.0 DESIGN AND CONSTRUCTIONAL FEATURES



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5.1 **General**

- 5.1.1 The switchboards shall consist of an assembly of a series of floor mounting, identical, metal clad, cubicle type panels placed side by side to form a compact assembly and shall be extensible on either side.
- 5.1.2 The complete assembly shall be dust, damp and vermin proof having minimum degree of protection equivalent to IP4X as per IS/IEC:60529. However, in case some ventilation openings are to be provided, these may be permitted for equipment located indoors and such openings shall be covered by fine wire mesh ensuring minimum IP3X protection.
- 5.1.3 The framework of the cubicles shall be bolted / welded construction. The minimum thickness of sheet steel shall be 3 mm for base channel and 2 mm for other members. The doors and covers shall be fabricated from cold rolled sheet steel. Suitable reinforcement, wherever necessary, shall be provided.
- 5.1.4 The switchboard shall be mounted on the channel which shall be included in the vendor's scope.
- 5.1.5 Each cubicle shall be provided with front access door with handle lock and key for breaker compartment and a removable back cover. The door hinges shall be concealed type. Front doors of the panels shall mechanically stop in full open position to facilitate removal of breakers and for ease of maintenance.
- 5.1.6 All external hardwares shall be cadmium plated. The hardwares for fixing removable parts shall be provided with retaining devices.
- 5.1.7 The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets. Gaskets without any discontinuity shall be preferred. Gaskets shall be held in position in groove, in shaped sheet steel work or these shall be U-type.
- 5.1.8 Each cubicle shall have separate compartment within the cubicle for circuit breaker, bus-bars, instrument transformers, metering and relaying devices and cable termination.
- 5.1.9 Inter-panel and inter-compartment fire resistant barrier shall be provided. Cast resin seal off bushing shall be provided in the bus compartment, through which connections to breaker compartment/cable compartment/bus compartment of adjacent panel shall be taken. Failure of one of the equipment shall not effect the equipment in the adjacent compartment.
- 5.1.10 All the components shall be accessible for inspection and maintenance without the necessity of removing the adjacent ones. Their mounting shall be accessible and ensure the necessary degree of safety.
- 5.1.11 The layout of the components inside the cubicle shall be liberal to facilitate maintenance and the interconnecting wiring between components shall not be subjected to undue stresses at the bends.
- 5.1.12 Mounting height of components requiring operation and maintenance shall not be lower than 300 mm and higher than 1800 mm.
- 5.1.13 All live parts which are accessible after opening of front and back door/cover shall be properly insulated or provided with insulating barrier to prevent accidental contact. Phase insulating barriers shall be provided between the breaker poles. Removal facility shall be provided for all such barriers.
- 5.1.14 Adequate arrangement for earthing shall be provided to safeguard the operator or other personnel from electric hazards under all conditions of operation.
- 5.1.15 The switchboard shall be provided with following interlocks and safety features:
- i) The withdrawal and engagement of a circuit breaker shall not be possible unless it is in open position.



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- ii) The operation of a circuit breaker shall not be possible unless it is in fully service, test or isolated position.
- iii) It shall not be possible to close the circuit breaker in service position unless all auxiliary and control circuits are connected.
- iv) A breaker of the lower rating shall be prevented from engaging with the stationary element of higher rating.
- v) Insertion of the manual mechanism shall render the motorized mechanism inoperable.
- vi) Circuit breaker "ON", "OFF" indication shall be provided at the back of each panel.
- vii) Caution name plate shall be provided at the back of incomer panels where terminals are likely to remain live and isolation is possible only from remote end.
- viii) Automatic safety shutter, with padlocking facility for locking in closed position, to completely cover the spouts for bus-bars and cable connection when the breaker is withdrawn.

## 5.2 Bus-Bars and Connections

- 5.2.1 The bus-bars shall be for three phases. The bus-bars and connection shall be made of electrolytic grade copper of rectangular cross-section.
- 5.2.2 Bus-bars and connections shall be sleeved to protect against approach to live parts and to eliminate potential arcing points. Sleeving material shall have adequate electrical, thermal and mechanical properties to withstand impulse level, temperature rise during normal and short circuit condition and allow easy bending of bus bars.
- 5.2.3 The bus-bars shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding the limits specified in IS: 8084. The thermal rating of the bus-bars shall be designed to withstand the system fault current for 3 seconds without exceeding the limiting temperature of 250°C for bare copper. Calculation for bus-bar sizing shall be furnished along with the offer.
- 5.2.4 Horizontal bus-bars shall run in a separate compartment through the entire length of the board and shall be of same cross-section throughout. Stepped bus-bars shall not be acceptable.
- 5.2.5 The bus-bars shall be arranged and colour coded according to IS: 5578 & IS: 11353.
- 5.2.6 The bus-bars chamber shall be sufficiently spacious and shall have separate screwed covers for maintenance purpose. It shall be adequately ventilated and shall allow the escape of the hot gases.
- 5.2.7 The bus-bars shall be rigidly supported at equal intervals to withstand the stresses due to full short circuit and also to take care of thermal expansion.
- 5.2.8 A minimum of two bolts shall be used per bus-bar joint. Only high tensile electro galvanized cadmium plated bolts, nuts and washers shall be used. The washers shall be spring and plain type. The bus-bar supports shall be of molded construction with built-in anti-tracking barriers. The support materials shall be of DMC or fiber glass reinforced thermosetting plastic.
- 5.2.9 The bus-bars, both horizontal and vertical, shall be PVC sleeved. Insulating shrouds shall be provided for all joints of insulated bus-bars.

## 5.3 Earth Bus

A continuous earth bus of Aluminium running along the lower part of the switchboard shall be provided with two end terminals with lugs for external connection. The earth bus shall be rated to carry three phase fault current for a period of 3 sec.

## 5.4 Bus Duct



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- 5.4.1 Suitable extension of bus-bars in proper phase sequence on the top, with connecting bolts shall be provided where connections between transformer and switchboard or between two halves of the switchboard is specified to be through bus duct.
- 5.4.2 Bus duct between two halves of the switchboard, if required, shall be supplied by the switchboard manufacturer. The bus-bars of interconnecting bus duct shall be similar to the main bus-bars of switchboard as specified above and shall conform to IS: 8084.
- 5.4.3 Bus duct between transformer and switchboard, if included in vendor's scope shall conform to IS: 8084.
- 5.5 **Clearances and Creepage Distance**
- The clearance and creepage distance shall be adequate to meet the BIL of the equipment.
- 5.6 **Insulation**
- 5.6.1 The insulation used shall be non-hygroscopic and shall be of porcelain, epoxy resins or fiber glass molded with plastic. It shall be of adequate electrical, mechanical and thermal strength to give trouble free service during normal operation and short circuit conditions.
- 5.6.2 The insulation shall be treated suitably to withstand the tropical conditions and atmospheric pollution.
- 5.7 **Control Wiring**
- 5.7.1 The switchboard shall be completely factory wired and ready for external connections.
- 5.7.2 The wiring shall be complete in all respect so as to ensure proper functioning of control, interlocking, protection, metering, indications and annunciations.
- 5.7.3 The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables of 1100 Volt grade. The minimum size of wires shall be as follows:
- |                           |    |            |
|---------------------------|----|------------|
| C.T. Circuit              | -- | 2.5 Sq. mm |
| V.T. and Control Circuits | -- | 1.5 Sq. mm |
- 5.7.4 All wiring shall be provided with dependent both ends marking as per IS: 5578. Numbered ferrules, reading from the terminal outwards, shall be provided at both ends of all wiring for easy identification. These shall be interlocking type plastic ferrules.
- 5.7.5 Control wiring circuits, fed from a supply common to a number of panels, shall be so protected that failure of a circuit in one panel does not affect the operation of other panels.
- 5.7.6 The wiring to the equipment mounted on the doors shall be carried out with flexible multi-strand copper conductor cable and so supported that on opening of the door, there is no undue strain on wire leads.
- 5.7.7 The control cables shall be neatly arranged and properly supported.
- 5.8 **External Cable Termination**
- 5.8.1 All power and control cables shall enter the switchboard from the bottom on the back of the panel. Sufficient space shall be provided for ease of connection and termination of cables.
- 5.8.2 All power cables and control cables shall be of type, number and size as indicated in Feeder Details.
- 5.8.3 The termination arrangement for single core cables shall be such that so as to minimize flow of eddy current and heating due to eddy currents.
- 5.8.4 Heavy duty double compression type rolled Aluminium cable glands along with the



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cable lugs, as required shall be provided for termination of control cables and auxiliary power supply cables.

- 5.8.5 The cable glands shall be mounted on a removable gland plate, provided at a minimum height of 75 mm from the bottom of the switchboard. Two number spare knockouts of size 20 mm shall also be provided on the gland plate for future use.
- 5.8.6 Terminal blocks shall be provided at suitable locations inside the panels for termination of control and auxiliary power supply wiring. These terminal blocks shall be pressure clamp type up to 35 sq. mm cables and bolted lug type for higher sizes of cables. These shall be protected type and rated for 1100 Volt service. The minimum current rating of the terminal block shall be 16 Amp.
- 5.8.7 Where more than two cables in parallel are required to be terminated, a system of bus links shall be provided with adequate clearance and spacing.
- 5.8.8 The terminal block shall be grouped according to circuit functions and numbered suitably. 20% extra terminals shall be provided in the terminal block.
- 5.8.9 Suitable clamps to support the vertical run of cables shall be provided.
- 5.8.10 For power connections, suitable marking on the terminals shall be provided to identify the phases.

#### 5.9 Feeder Details

- 5.9.1 The requirements of incomer, bus coupler and outgoing feeders shall be as indicated in the single line diagram, feeder details and corresponding schematic diagrams.
- 5.9.2 Non-paralleling interlocks shall be provided between incomers and bus section panels. The interlocks shall be either electrical or mechanical type. Arrangement for defeating the interlock shall also be provided.
- 5.9.3 Auto changeover scheme, wherever specified, shall be provided.

#### 5.10 Dummy Panels

Dummy panels complete with bus-bar system in 400 mm width shall be required for which unit price shall be indicated.

#### 5.11 Control Power Supply

- 5.11.1 D.C. power required for closing, tripping and indication shall be supplied at the bus coupler panel through two completely separate circuits by the owner, one for tripping and another for closing and indication for the whole board.
- 5.11.2 For receiving each external control power supply, a double pole miniature circuit breaker shall be provided. This power shall be distributed inside the switchboard for each feeder having its MCB unit.

#### 5.12 Space Heater Power Supply

- 5.12.1 Panel space heaters shall be fed from a separate bus, common for the whole board. This bus shall be fed from owner's supply for which a double pole MCB shall be provided in bus section panel.
- 5.12.2 Power supply for space heaters of motors shall be tapped from this bus by means of miniature circuit breakers located in the motor feeder panels. These MCB's shall be of triple pole and rated for 15 Amp.

### 6.0 COMPONENT DETAILS

Makes of all components shall be subject to owner's / consultant's approval



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**6.1 Circuit Breakers**

- 6.1.1 The circuit breakers shall comply with the requirements of IS: 13118.
- 6.1.2 All circuit breakers shall be of 0-3 min-CO-3 min-CO rated operating sequence capable of carrying the specified current at the site conditions and making/breaking of the system fault current.
- 6.1.3 Type test certificates from an independent testing authority shall be furnished along with the offer for each circuit breaker rating and type.
- 6.1.4 The circuit breakers controlling motors shall be suitable for DOL starting and stopping induction motor a number of times and shall have provision to limit over voltage to the value safe for motor insulation. Unless otherwise specified this value shall be taken as 2.5 times the rated voltage. The magnitude of the voltage surge produced by the breaker when switching off the smallest motor shall be indicated.
- 6.1.5 The circuit breakers controlling capacitors shall be suitable for energizing and de-energizing the rated capacitor bank.
- 6.1.6 The circuit breakers shall be of the 3 phase, single/double break, horizontal draw-out, vertical/horizontal isolation type. The medium of arc quenching shall be minimum Oil/Bulk oil/vacuum/SF6 as specified elsewhere.
- 6.1.7 The circuit breakers shall be suitable for electrical/manual closing as specified in Feeder details. Electrically operated circuit breakers shall preferably have motor wound spring closing mechanism with provision for manual closing arrangement. Manually operated circuit breakers shall have independent manual spring closing mechanism. In all cases tripping shall be by means of shunt trip coil.
- 6.1.8 All circuit breaker units of the same rating shall be physically and electrically interchangeable.
- 6.1.9 The circuit breakers shall be electrically and mechanically trip free and provided with anti-pumping feature.
- 6.1.10 The circuit breakers shall have three positions, i.e. service, test and isolated with the cubicle door closed. Necessary stoppers shall be provided to prevent the excessive movement of the breaker cradle than desired for the position. Service and test positions of the breaker shall have monitoring switch having 1NO+1NC contacts.
- 6.1.11 The circuit breakers shall be provided with emergency manual trip device, mechanical 'ON', 'OFF', 'ISOLATED' position and spring 'CHARGED', 'DISCHARGED' indicators and operation counter.
- 6.1.12 A maintenance truck/device, if required, for raising, lowering and withdrawals of the circuit breaker shall be supplied for each switchboard.
- 6.1.13 The arc interrupting devices shall be capable of interrupting satisfactorily current from zero to the rated interrupting current when used on predominantly capacitive or inductive circuits, without requiring excessive maintenance of the contacts. The arc shall be restricted within the interrupting chamber and no emission of flame shall be allowed which may cause electrical breakdown or damage to insulation on the apparatus.
- 6.1.14 Mechanical safety interlock shall be provided for safe operating and movement of the breaker.
- 6.1.15 The circuit breakers shall be provided with minimum of four normally open and four normally closed auxiliary switch contacts, over and above those required for its own control scheme, for owner's use. These contacts shall be wired separately to the terminal board.
- 6.1.16 The closing coil and other associated auxiliary relays shall operate satisfactorily at all



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voltages between 85% and 110% of the rated control voltage. The tripping coil and other associated relays shall operate satisfactorily at all voltages between 70% and 110% of the rated control voltage.

6.1.17 Cable earthing facility shall be provided in the circuit breaker for discharging of power cable through the circuit breaker contact with circuit breaker in drawn-out position. An integral earthing arrangement shall be preferred. In case the integral earthing arrangement is not feasible due to circuit breaker design, a separate earthing truck, which shall be inserted in place of circuit breaker, shall be provided per board.

6.1.18 Positive earthing of circuit breaker frame shall be maintained at every position of circuit breaker. The earthing contact shall be line/scraping type and not of point type.

## 6.2 Current Transformers

6.2.1 The current transformers shall conform to IS: 2705.

6.2.2 C.T.s shall be class F insulated and vacuum impregnated or resin cast type. The C.T.s shall be rigidly mounted and shall be easily accessible for maintenance and testing.

6.2.3 The short time thermal withstand ratings of the C.T.s shall be same as the thermal withstand ratings of the breakers.

6.2.4 The C.T.s output shall be minimum 15 VA per phase and in any case, the output shall be adequate for the protection and metering duties involved with sufficient margin. The C.T.s shall have the following accuracies for the various applications:

<u>Application</u>	<u>Class of Accuracy as per IS: 2705</u>
i) For metering service	1
ii) For use with protective relays	5 P
iii) For use with restricted earth fault and differential relays	PS

6.2.5 The C.T. cores for metering and protection shall be separate.

6.2.6 The ratios of the current transformers shall be as indicated in Feeder details.

6.2.7 All the C.T.s shall be provided with terminals and shorting links. One of the terminals of the C.T. shall be earthed. The polarity of the C.T. shall be clearly marked.

6.2.8 Provision of interposing C.T. is not acceptable.

6.2.9 The C.T.s shall be capable of withstanding momentary open-circuit on the secondary side without injurious effects.

## 6.3 Voltage Transformers

6.3.1 The V.T.s shall be class F insulated and vacuum impregnated or resin cast type conforming to IS: 3156.

6.3.2 The primary nominal voltage shall be equal to the system nominal voltage. The secondary terminal voltage shall be  $110 / \sqrt{3}$  V.

6.3.3 The rated output of each VT shall be adequate for the relays, meters and associated wiring connected to it with sufficient margin and shall not be less than 200 VA per phase.

6.3.4 The accuracy class of V.T.s shall be 1 as per IS: 3156.

6.3.5 The primary and secondary winding shall be protected by HRC fuses in each phase except in the grounded phase of the secondary side.

6.3.6 The V.T. shall be mounted on a with-drawable carriage. Shutters with padlocking facility, provided on high voltage sides, shall be so arranged that the live orifices are



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automatically closed when the V.T. is withdrawn.

6.3.7 Mechanical interlocking arrangement shall be provided so that the access to the high voltage fuse is possible only when the V.T. is fully withdrawn.

**6.4 Relays**

6.4.1 All protective relays shall be of latest version, microprocessor based numerical type with communication port and interlinked with online energy management system. 100% redundancy shall be provided for communication.

**6.5 Timers**

6.5.1 The timers shall be electronic, pneumatic or synchronous type with manual/ auto reset features as per the functional requirements. The timers shall be 'ON' delay or 'OFF' delay type as specified. The repeat accuracy shall be 0.5% or better.

**6.6 Instruments and Meters**

6.6.1 All instruments shall be flush mounting type with square face of 96 mm x 96 mm. They shall be tropicalized and dust tight.

6.6.2 Meters shall be digital multifunctional meters with communication port for energy management at remote location.

6.6.3 All ammeters and voltmeters, to be provided separately, shall have 0-90° scale and shall be moving iron spring controlled type of class 1.5 accuracy as per IS: 1248. The scale range of the ammeters and voltmeters shall be as indicated in the Feeder details.

6.6.4 In case of motor feeders, the ammeters shall be graduated uniformly upto C.T. primary current and with compressed end scale upto 6 times C.T. primary current. Red pointer shall be provided, which shall be adjusted at site for indicating full load current of the motor.

**6.7 Push Buttons and Control Switches**

6.7.1 The switches and push buttons shall conform to utilization category AC11/DC11 as per IS/IEC:60947. The contact shall be rated to make, break and carry inductive current of 5 Amps. at 415 V AC and 1 Amp. at 220 V DC.

6.7.2 The control switches shall be spring return rotary type, unless otherwise specified and provided with Pistol grip type handle. The control switches for circuit breakers shall be additionally fitted with lost motion devices and sequencing devices, if required.

6.7.3 The selector switches shall be stay put rotary type and provided with oval shape handles.

6.7.4 The push buttons shall be of momentary contact spring loaded type with a set of normally close and open contacts. The start push button shall be shrouded type and coloured green. The stop push button shall be un-shrouded type and coloured red and other push buttons shall be un-shrouded type and coloured black. The fixing ring shall be metallic white.

6.7.5 Emergency stop push buttons, if specified, shall be lockable in pushed position.



**6.8 Control Fuses**

6.8.1 The fuses shall be non-deteriorating HRC cartridge link type and shall conform to IS: 13703. They shall be suitable for load and service required in the circuit.

6.8.2 One fuse puller shall be supplied along with each board.

**6.9 Miniature Circuit Breakers**

6.9.1 The miniature circuit breakers shall conform to IS: 8828 and shall be of duty category M-9.

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6.9.2 It shall be provided with overload and short circuit protective devices in a heat resistant housing.

6.9.3 Type test certificate for short circuit rating and current time tripping curve shall be furnished along with the offer.

**6.10 Signal Lamps**

6.10.1 Signal lamps shall be provided to indicate the various circuit conditions as shown in scheme drawings. The colour of the lamps for various functions shall be as follow:

- |       |   |                       |
|-------|---|-----------------------|
| Red   | - | Circuit breaker 'ON'  |
| Green | - | Circuit breaker 'OFF' |
| White | - | Trip circuit healthy  |
| Amber | - | Alarm and auto trip   |
| Blue  | - | Non-Trip              |

6.10.2 The lamps shall LED type with lumen output of 200 millicandella in axial direction.

**7.0 ACCESSORIES**

7.1 The supply shall include the following accessories.

- Maintenance truck/device for raising, lowering and withdrawal of circuit breaker, if required.
- Earthing truck, in case the integral earthing arrangement is not feasible in the circuit breaker.
- Fuse puller.
- Test plug for relays.
- Test plug for kWh meters.
- Special tools and tackles, as required.

**7.2 Space Heater**

7.2.1 Each panel shall be provided with a thermostatically controlled space heater, rated for 240 V, 50 Hz and controlled through double pole miniature circuit breaker.

**7.3 Name Plates**

7.3.1 The switchboard shall have large name plate on the top to indicate its name and designation.

7.3.2 Each panel shall be provided with name plate both in front and back.

7.3.3 All control switches, push buttons, lamps etc. shall have functional identification labels.

7.3.4 Name plate shall be of black Perspex with white engraving and of minimum 3 mm thick.



7.4 Any other accessories required, but not specified, shall also be supplied to make the switchboard complete in all respects and ensure safe and proper operation.

**8.0 PAINTING**

8.1 The enclosure, after degreasing, pickling in acid, cold rinsing, phosphatising, passivating etc. shall be painted with two coats of anti-rust paint followed by two coats of anti-corrosive paint.

8.2 Epoxy based paint shall be used.

8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

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8.4 Unless otherwise specified, the finishing shade shall be light grey having shade No.631 as per IS: 5.

8.5 One litre of paint shall be supplied along with each board for touch up at site.

### 9.0 TESTS AND INSPECTION

9.1 All the switchboards shall be subjected to routine test as per IS: 3427 and their components as per relevant standards.

9.2 Additional tests, wherever specified, shall be carried out.

9.3 All the above tests shall be carried out in presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.

9.4 These inspection shall, however, not absolve the vendor from his responsibility for making good any defect which shall be noticed subsequently.

### 10.0 DRAWINGS AND DOCUMENTS

10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

10.2 All drawings and documents shall have the following description written boldly.

- Name of client
- Name of consultant
- Enquiry / Order Number with plant / project name
- Code No. and Description

### 11.0 SPARES

11.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.

11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.

11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.

11.4 All spare parts shall be identical to the parts used in the equipment.

### 12.0 PACKING

12.1 The switchboard shall be properly packed before dispatch to avoid damage during transport, storage and handling.

12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

12.3 A sign to indicate the upright position of the panels to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.



**ANNEXURE - I**  
**DOCUMENTATION FOR HIGH VOLTAGE SWITCHBOARDS**

Sl. No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheets	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	Feeder Details	N	Y	Y
4.	General arrangement and Foundation Drawings	N	Y	Y
5.	Schematic/Wiring Diagrams	N	Y	Y
6.	Calculation for Bus-bar sizing	N	Y	N
7.	Terminal Arrangement Drawings	N	Y	Y
8.	Illustrative and Descriptive Literature	N	N	Y
9.	Catalogues for bought out accessories	N	N	Y
10.	Installation, Operation and maintenance manual	N	N	Y
11.	Test Certificates			
	i) Type - Switchboard	N	N	N
	- Circuit Breaker	N	N	N
	- MCB	N	N	N
	ii) Routine	N	N	Y
12.	Guarantee Certificates	N	N	Y
13.	Spare Parts List	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
  2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.
- Y - Yes, N – No

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## TECHNICAL SPECIFICATION

### SHEET STEEL DISTRIBUTION BOARDS





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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of Sheet Steel Distribution Boards.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy – Electrical.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment shall comply with the latest issue of the following Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.

- IS: 8623 - Specification for low voltage switchgear and control gear assemblies.
- IS/IEC:60947 - Specification for Low-voltage Switchgear and Control gear
- IS: 5578 - Guide for marking of insulated conductors.
- IS: 11353 - Guide for uniform system of marking and identification of conductors and apparatus terminals.
- IS: 10118 - Code of practice for selection, installation and maintenance of switchgear and control gear.

Various components housed in the distribution board shall conform to the Indian Standard Specification as mentioned against the component details.

- 2.2 The design and operational features of the equipment offered shall also comply with the provisions of the latest issue of the Indian Electricity Rules and other Statutory Acts and Regulations. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specification the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy – Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy – Electrical.


## 4.0 OPERATING REQUIREMENTS

The distribution board shall be suitable for operating at the specified rating continuously with the specified voltage and frequency variations under the ambient conditions, without exceeding the permissible temperature rise and without any detrimental effect on any part.

## 5.0 DESIGN AND CONSTRUCTIONAL FEATURES

### 5.1 General

- 5.1.1 The distribution board shall consist of an assembly of a series of floor mounting, identical, metal clad, dead front type panels of unitized design. The panels shall be placed side by side to form a compact assembly and shall be extensible on either side.
- 5.1.2 The complete assembly shall be dust, damp and vermin proof having minimum degree of protection equivalent to IP-52 as per IS/IEC:60947.
- 5.1.3 The frame work of the cubicles shall be of bolted/welded construction. The minimum thickness of steel shall be 2 mm for load bearing members, 1.6 mm for non-load bearing

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members and 3 mm for base channel. The doors and covers shall be fabricated from cold rolled sheet steel. Suitable reinforcement, wherever necessary, shall be provided.


- 5.1.4 The door hinges shall be concealed type.
- 5.1.5 All external hardware shall be cadmium plated/zinc passivated. The hardware for fixing the removable parts shall be provided with retaining devices.
- 5.1.6 The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets. Gaskets without any discontinuity shall be preferred. Gaskets shall be held in position in groove of shaped sheet steel work or these shall be of U type. Adhesive cement, if used, shall be of good quality so that the gaskets do not come off during service.
- 5.1.7 All the components shall be accessible for inspection and maintenance without the necessity for removal of the adjacent ones. In case of single front design all components shall be accessible from the front for maintenance and back opening doors/ openable covers for maintenance shall not be acceptable.
- 5.1.8 The layout of the components inside a module shall be liberal to facilitate maintenance and the interconnection of wiring between the components shall not be subjected to any undue stress at the bends.
- 5.1.9 Mounting height of components requiring operation and observation shall not be lower than 300 mm and higher than 1800 mm.
- 5.1.10 Inter panel barriers shall be provided.
- 5.1.11 Adequate arrangement for earthing shall be provided to safeguard the operator or other personnel from electric hazards under all conditions of operation.

## 5.2 Panel Arrangement

- 5.2.1 The distribution board shall be non-drawout type in single front configuration.
- 5.2.2 Each Panel shall have its horizontal bus-bar chamber running on the top with multi-tier module units in the centre and having vertical bus-bar chamber and cable alley on either side.
- 5.2.3 The modules shall be enclosed on all sides and shall be so arranged that larger ones are placed at the bottom portion of the panel. Fixed type modules shall be at least 300 mm from the base channel.
- 5.2.4 The number of modules in the panel shall not exceed six for motor starter feeders and eight for switch fuse/MCB/MCCB feeders. The minimum size of module shall be 300 mm and 200 mm for starter and switch fuse feeders. The incomer and bus coupler module sizes for ratings up to 400 A shall be half the panel size. For higher ratings they shall be housed in single panel.
- 5.2.5 The module door shall be so interlocked that it shall not be possible to open the door with switch in closed position. Defeat interlock facility shall be provided.
- 5.2.6 The relay, meters, switches and lamps shall be flush mounted. All components of one module shall be mounted on the same module on a rigid sheet steel chassis. A 20 mm dia. rotating knob on the door shall be provided for closing and opening.

## 5.3 Bus Bars and Connections

- 5.3.1 The bus-bar shall be suitable for the supply system. The bus-bar and connections shall be made of electrolytic copper or high conductivity aluminium alloy conforming to Grade E91E of IS: 5082.
- 5.3.2 The bus-bar shall be amply sized to carry the rated continuous current under the specified ambient temperature without exceeding the temperature of 90°C. The bus-bars shall also be designed to withstand the system fault current for 1 second without


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exceeding the temperature of 200°C for bare aluminium and 250°C for bare copper. The minimum acceptable size of bus-bars shall be 250 sq. mm (Al). Calculation for the bus-bar sizing shall be furnished along with the offer.

- 5.3.3 In case of double front arrangement of distribution boards, different sets of vertical bus-bars shall be provided. The vertical bus-bars shall be PVC sleeved or shrouded by insulating barriers which shall have cut-outs to permit entry of power wires. It shall be possible to remove the shroud for inspection and maintenance. Neutral-bars shall be provided in this chamber.
- 5.3.4 Horizontal bus-bars shall be of same cross-section through out. Stepped bus-bars shall not be acceptable.
- 5.3.5 All bus-bars shall be arranged and colours coded according to IS: 5578/11353.
- 5.3.6 The horizontal bus-bar shall run in a separate bus chamber located at the top shall have separate screwed cover for inspection purpose.
- 5.3.7 The bus-bars shall be rigidly supported at equal intervals to withstand maximum short circuit stresses. The supports shall be of moulded construction with built in anti tracking barriers. The support material shall be of fibre glass reinforced thermosetting plastic.
- 5.3.8 All joints shall be suitably treated to avoid oxidation of contact surfaces and bimetallic corrosion. A minimum of two bolts with spring washers shall be used for horizontal bus-bar joints.
- 5.3.9 Horizontal bus bars shall be insulated with heat shrinkable PVC sleeves of reputed makes. Insulating shrouds shall be provided for all joints of insulated bus-bars.
- 5.4 Clearance and Creepage Distances**
- 5.4.1 The clearance and creepage distances shall not be lower than the values specified below :
- |      |   |    |       |
|------|---|----|-------|
| i)   | Minimum clearance between two live conductors                       | -- | 20 mm |
| ii)  | Minimum clearance between live part and accidentally dangerous part | -- | 20 mm |
| iii) | Minimum creepage distance   | -- | 28 mm |
- 5.4.2 The clearances and the creepage, as specified above, shall definitely be maintained in the bus-bar system. Provision of bus-bar insulations, separator or barriers shall not be considered to reduce the clearance from the values specified above.
- 5.4.3 At the termination points in the equipment, e.g. switches, contactors, thermal relays, etc. it is realized that above clearance shall not always be possible to be maintained. All such points where above clearance are not possible to be maintained shall, therefore, be insulated or taped.
- 5.5 Insulation**
- 5.5.1 The insulation used shall be non-hygroscopic and shall be of porcelain, Epoxy- resins or fibre glass moulded with plastic. It shall be of adequate electrical and mechanical strength to give trouble free service during normal operation and short circuit conditions.
- 5.5.2 The insulation shall be treated suitably to withstand the tropical conditions and atmospheric pollution.
- 5.6 Power Wiring**
- 5.6.1 The connections from bus-bar including neutral to individual units on the modules shall consist of PVC insulated flexible copper cable or tapped copper strip.

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- 5.6.2 The power wiring size shall be decided based on the rating of the switch, after using a rating factor of not more than 50% over the current rating in free air. In any case the minimum size of power wiring shall not be less than 4 sq. mm copper.
- 5.6.3 The size of connection from incomer to horizontal bus-bar and from horizontal bus-bar to bus coupler shall not be less than the size adopted for horizontal bus-bar.
- 5.7 Control Wiring**
- 5.7.1 The switch board shall be completely factory wired and ready for external connections.
- 5.7.2 The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables of 1100 Volt grade. The size of wires shall be as follows:
- |                           |    |            |
|---------------------------|----|------------|
| C.T. Circuit              | -- | 2.5 sq. mm |
| V.T. and Control Circuits | -- | 1.5 sq. mm |
- 5.7.3 All wiring shall be provided with dependent both end marking as per IS: 5578. Numbered ferrules, reading from the terminals outwards, shall be provided at both ends of all wiring for easy identification. These shall be interlocking type plastic ferrules.
- 5.7.4 Control wiring circuits, fed from a supply common to a number of feeders, shall be so protected that failure of a circuit in one feeder does not affect the operation of the other feeders.
- 5.7.5 The wiring to the equipment mounted on the doors shall be carried out with flexible multi strand copper conductor cable and supported so that opening of the door, there is no undue strain on wire leads.
- 5.7.6 The control cables shall be neatly arranged and properly supported.
- 5.8 External Cable Termination**
- 5.8.1 All power and control cables shall enter the distribution board from the bottom. Sufficient space shall be provided for ease of connection and termination of cables.
- 5.8.2 All cables shall be of 1.1 KV grade PVC insulated armoured and PVC sheathed except for single core cable which shall be unarmoured. The number and sizes of cable shall be as indicated in Feeder details.
- 5.8.3 Compression type cable glands along with the cable lugs as required shall be provided for termination of cables.
- 5.8.4 The cable glands shall be of rolled Aluminium heavy duty double compression type and shall be mounted on a removable gland plate, provided at a minimum height of 75 mm from the bottom of the distribution board. Two numbers spare knockouts of size 20 mm shall also be provided on the gland plates for future use.
- 5.8.5 For all power cables crimped type aluminium lugs for aluminium cables and tinned copper lugs for copper cables shall be provided.
- 5.8.6 The terminal blocks shall be pressure clamp type up to 35 sq. mm cable and bolted lug type for higher sizes of cables. These shall be protected type and rated for 1100 Volts service. The minimum current rating of terminal block shall be 16 Amp. The construction shall be such that after the connection of cables by means of lugs, necessary clearance and creepage distance are available.
- 5.8.7 Where more than two cables in parallel are required to be terminated, a system of bus links shall be provided with adequate clearance and spacing.
- 5.8.8 Suitable clamps to support the vertical run of cables shall be provided.
- 5.8.9 The terminal block shall be grouped according to circuit functions and suitably numbered. 20% extra terminals shall be provided in the terminal block.

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5.8.10 For power connections, suitable marking on the terminals shall be provided to identify the phases.

#### 5.9 Feeder Details

5.9.1 The requirements of incomer, bus coupler and outgoing feeders shall be as indicated in the single line diagram, feeder details and corresponding schematic diagram.

5.9.2 The bus coupler shall be so located that it is possible to maintain half of the bus-bars while the other half is still alive. Complete segregation of bus-bar connections to bus coupler shall be provided.

5.9.3 Castle key type mechanical interlocks shall be provided between incomers and bus section modules to avoid paralleling of incomers. In addition padlocking facilities shall be provided in OFF position.

5.9.4 Single phase loads shall be distributed as far as possible on all the three phases.

#### 6.0 COMPONENT DETAILS

The components shall conform to type of co-ordination C as per IS/IEC:60947. Makes of all components shall be subject to owner's / consultant's approval

#### 6.1 Moulded Case Circuit Breakers

6.1.1 The circuit breaker shall conform to IS/IEC:60947 and shall be of P2 category having rupturing capacity as per system requirement.

6.1.2 The circuit breaker shall be provided with spring assisted quick make quick break type manually operated trip free mechanism, mechanical ON/OFF position indicators, thermal tripping devices of inverse characteristics, instantaneous short circuit tripping devices and necessary auxiliary and alarm switches. The MCCB cubicle shall be provided with service, test and isolated position and automatic safety shutter.

6.1.3 The thermal and short circuit tripping device shall be adjustable type.

6.1.4 When used for motor circuit shunt trip devices shall be provided and the let through power of controlling MCCB shall be lower than the respective contactor.

6.1.5 In addition, under voltage trip shall be provided, if specified.

#### 6.2 Switches

6.2.1 The switches shall be Motor duty type AC23 category and shall comply with the requirements laid down in IS/IEC:60947. Switches up to 63 Amps shall be rotary type and those of 100 Amp and above shall be link type.

6.2.2 'ON' and 'OFF' positions of the switches shall be indicated on the panel. Provision shall be made to lock the switch in the 'OFF' position.

6.2.3 The fixed contacts shall be shrouded and the contacts shall be silver plated.

6.2.4 Two Pole switches shall also isolate the neutral circuit along with phase circuit. 4 Pole / 2 Pole switches shall be used for 3 Phase/1 Phase circuits respectively.


#### 6.3 Fuses

The fuses shall be of non-deteriorating HRC cartridge link type and conform to IS: 13703. They shall be suitable for the load and the service required in the circuit.

#### 6.4 Air Break Contactors

6.4.1 The Air Break Contactor shall be of AC3 category unless otherwise specified, conforming to IS/IEC:60947 and flapper type. Gravity operated contactors are not acceptable.

6.4.2 The dropout voltage shall not exceed 65% of rated voltage.

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6.4.3 Each contactor shall be provided with auxiliary contacts as required. The rating of the auxiliary contacts shall be 5 Amps. AC or 1 Amp DC at the specified control voltages. The spare auxiliary contacts shall also be wired terminal block.

#### 6.5 **Bimetal Thermal Overload Relays**

6.5.1 The contactor shall be provided with three pole bimetal thermal overload relays unless otherwise specified. The bimetal relays shall be of suitable range, ambient temperature compensated and shall be separate mounting type. They shall be adjustable through graduated scale and shall be provided with changeover contact.

6.5.2 Bimetal relays shall conform to IS: 3231 and shall have built in single phasing preventor.

6.5.3 The bimetal relays shall be provided with a manual reset device resettable after opening the cubicle door. Auto reset thermal relays are not acceptable.

#### 6.6 **Current Transformers**

6.6.1 The current transformers shall conform to IS: 2705.

6.6.2 Current Transformers shall be Class-F insulated and vacuum impregnated. The Current Transformers shall be rigidly mounted and shall be easily accessible for maintenance and testing.

6.6.3 The Current Transformers shall be of 7.5 VA output. The output shall be adequate for the instrument and metering duties involved with sufficient margin. The Current Transformers shall have the accuracy Class-1 for the metering duty.

6.6.4 All the Current Transformers shall be provided with terminals and shorting links. One of the terminals of C.T. shall be earthed. The polarity of the C.T. shall be clearly marked.

6.6.5 The C.T.s shall be capable of withstanding momentary open-circuit on the secondary side without injurious effects.

#### 6.7 **Instruments and Meters**

6.7.1 All instruments shall be flush mounting type with square face and shall be tropicalized and dust tight.

6.7.2 The size of the instruments shall be 96 mm x 96 mm for full and half size modules and 72 mm x 72 mm for lower size modules.

6.7.3 Dials shall be parallax free with scale marked in black on white background and shall be suitable for direct reading.

6.7.4 Zero adjusters shall be provided for operation from the front of the cases.

6.7.5 All ammeters and voltmeters shall have 0 - 240° scale moving iron spring controlled type and of Class 1.5 accuracy as per IS: 1248. The scale range of the ammeter and voltmeter shall be as indicated in the feeder details.


6.7.6 In case of motor feeders, the ammeter shall be graduated uniformly upto C.T. primary current and with a compressed end scale upto 6 times the C.T. primary current. Red pointer shall be provided, which can be adjusted at site for indicating full load current.

6.7.7 KWH meter shall be 3 phase 4 wire type. These shall conform to the requirements of relevant IS and shall be C.T. operated. The current coil shall be rated for 5 Amp.

6.7.8 All kWh meters shall be provided with test blocks for current and voltage coils for testing them at site without interrupting their recording while in service.

#### 6.8 **Push Button and Control Switches**

6.8.1 The switches and push buttons shall conform to utilization category AC 11/DC 11 as per IS/IEC:60947 . The contact shall be rated to make, break and carry inductive current of 5 Amp. at 415 V AC and 1 Amp at 220 V DC.

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6.8.2 The control switches shall be spring return rotary type unless otherwise specified and provided with pistol grip type handle. The control switches for circuit breakers shall be additionally fitted with lost motion devices and sequencing devices.

6.8.3 The selector switches shall be stay-put rotary type and provided with oval shape handles.

6.8.4 The push buttons shall be of momentary contact spring loaded type with a set of normally close and open contacts. The push button for 'Start' shall be shrouded type and coloured green, stop push button shall be un-shrouded type and coloured red and other push buttons shall be un-shrouded type coloured black. The fixing ring shall be metallic white.

6.8.5 Emergency stop push buttons, if specified, shall be lockable in pushed position.

#### 6.9 **Miniature Circuit Breakers**

6.9.1 The miniature circuit breakers shall conform to IS: 13032 and shall be of duty category M-9.

6.9.2 It shall be provided with overload and short circuit protective devices in a heat resistant housing.

6.9.3 A certificate of short circuit rating and current time tripping curve shall be furnished alongwith the offer.

#### 6.10 **Signal Lamps**

6.10.1 Signal lamps shall be provided to indicate the various circuit conditions as shown in scheme drawings. The colour of the lamps for various functions shall be as follows:

Red	--	Switch/Contactor closed.
Green	--	Switch/Contactor open.

6.10.2 The lamps shall be LED type having lumen output 200 milli candela in axial direction.

6.10.3 It shall be possible to remove the globe from outside for replacement of lamps.

#### 7.0 **ACCESSORIES**

7.1 The supplier shall include the following accessories.

- Fuse Puller.
- Test plug for kWh meters.

#### 7.2 **Space Heater**

Each vertical section shall be provided with a thermostatically controlled space heater, rated for 240 V, 50 Hz and controlled through double pole miniature circuit breaker.

#### 7.3 **Name Plates**

7.3.1 The distribution board shall have large name plate on the top to indicate its name and designation.

7.3.2 Each feeder shall be provided with name plate. Each single front panel shall have name plate both in front and back.

7.3.3 All control switches, push buttons, lamps etc. shall have functional identification labels.


7.3.4 Name plate shall be of black perspex with white engraving and of minimum 3 mm thick.

7.3.5 Any other accessories required, but not specified shall also be supplied to make the distribution board complete in all respects to ensure safe and proper operation.

#### 8.0 **PAINTING**

8.1 The enclosure after degreasing, pickling in acid, cold rinsing phosphatising, passivating etc. shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.



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- 8.2 Epoxy based paint shall be used.
- 8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- 8.4 Unless otherwise specified, the finishing shade shall be light grey Shade No.631 as per IS: 5.
- 8.5 One litre of paint shall be supplied along with each board for touch up at site.

#### **9.0 TESTS AND INSPECTION**

- 9.1 The distribution boards shall be subjected to routine test as per IS: 8623.
- 9.2 Additional tests, wherever specified, shall be carried out.
- 9.3 All the above tests shall be carried out in presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.
- 9.4 These inspections shall however, not absolve the vendor from his responsibility for making good any defect which shall be noticed subsequently.

#### **10.0 DRAWINGS AND DOCUMENTS**

- 10.1 Drawings and documents as per Annexure-I shall be supplied unless otherwise specified.
- 10.2 All drawings and documents shall have the following description written boldly:
- Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description

#### **11.0 SPARES**

- 11.1 Commissioning Spares: Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 11.2 Spare for 2 Years Operation (Mandatory), as specified shall be supplied.
- 11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 11.4 All spare parts shall be identical to the parts used in the equipment.

#### **12.0 PACKING**

- 12.1 The distribution board shall be properly packed before despatch to avoid damage during transport, storage and handling.
- 12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.
- 12.3 A sign to indicate the upright position of the panels to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.

**ANNEXURE - I**



**DOCUMENTATION FOR SHEET STEEL DISTRIBUTION BOARDS**

Sl.No.	Documents	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	Feeder Details	N	Y	Y
4.	General Arrangement and Foundation Drawings	N	Y	Y
5.	Schematic Diagrams with Terminal arrangement drawings	N	Y	Y
6.	Calculation for Bus-bar sizing	N	Y	N
7.	Illustrative and Descriptive literature	N	N	Y
8.	Catalogues for bought out accessories	N	N	Y
9.	Installation, Operation and Maintenance Manual	N	N	Y
10.	Test Certificates			
	-- Type (for MCCB & MCB)	N	N	N
	-- Routine	N	N	Y
11.	Guarantee Certificates	N	N	Y
12.	Spare Parts List	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No

	<b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - LIGHTING SUB DISTRIBUTION</b> <b>BOARDS</b>	<b>PC183-TS-0809</b>	0	
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# TECHNICAL SPECIFICATION

## LIGHTING SUB DISTRIBUTION BOARDS



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ANNEXURE - I	DOCUMENTATION FOR LIGHTING SUB DISTRIBUTION BOARDS

	<b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - LIGHTING SUB DISTRIBUTION</b> <b>BOARDS</b>	PC183-TS-0809	0	
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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well packed condition of lighting sub distribution boards.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy - Electrical.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of the following Indian Standards. Equipment complying with equivalent IEC standards shall also be acceptable

- IS/IEC:60947            - Low voltage switchgear and control gear
- IS: 8623                 - Specification for low voltage switchgear and control gear assemblies

- 2.2 The design and operational features of the equipment offered shall also comply with the provisions of latest issue of the Indian Electricity Rules and other relevant statutory acts and regulations. The supplier shall, wherever necessary, make suitable modification in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy - Electrical.

### 3.2 System Details



These shall be as indicated in Design Philosophy - Electrical.

## 4.0 OPERATING REQUIREMENTS



The lighting sub-distribution boards shall be suitable for operating continuously under the ambient conditions and with the voltage and frequency variations, without exceeding the specified temperature rise and without any detrimental effect on any part.

## 5.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

- 5.1 The lighting sub distribution boards shall be fabricated out of 2.5 mm thick cold rolled sheet steel and shall be suitable for mounting on wall/structure. These shall have dust and vermin proof construction conforming to IP-65 as per IS/IEC:60947. For outdoor installation, the enclosure shall conform to IPW-55. Suitable canopy made out of 2 mm thick Aluminium sheet shall be supplied along with the board.
- 5.2 The miniature circuit breakers shall be so mounted inside the enclosure that their operating knobs project outside for easy operation. The cut-out for the knobs on the enclosure shall be lined with gasket for dust proofness. For further protection against ingress of dust, the portion where the knobs have protruded out, shall be provided with another external front cover, internally hinged at the top, gravity operated and with a knurled knob at the bottom. The external cover shall be flushed with the main cover. Continuous neoprene gasket shall be provided to make the board completely dust and weather proof.
- 5.3 All external hard ware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated.

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- 5.4 The sub-distribution boards to be located indoors shall have top entry arrangement for outgoing cables and bottom entry for incoming cable. However for outdoor locations, all cable entries shall be from the bottom only.
- 5.5 Three phase and neutral bus bar system of adequate size shall be provided to which all outgoing and incoming MCB's shall be connected.
- 5.6 The internal wiring shall be carried out by means of single core PVC insulated 2.5 sq. mm stranded copper conductor cables.
- 5.7 Two earthing terminals outside the board shall be provided.
- 5.8 Suitable label inscription consisting of black perspex with engraving for the board and circuit nos. of all outgoing feeders shall be provided. The label inscription of the board shall contain description and code no. The circuit nos. of outgoing feeders shall be serially indicated as 1L, 2L.....17L, 18L.
- 5.9 The board shall be complete with terminal block, cable glands, cable lugs and other accessories as specified.
- 6.0 SPECIAL FEATURES FOR FLAME PROOF LIGHTING SUB DISTRIBUTION BOARDS**
- 6.1 The enclosure shall be in addition of flame proof execution as per IS: 2148.
- 6.2 The enclosure group and temperature class shall be as indicated in Design Philosophy – Electrical.
- 6.3 The enclosure shall be of cast iron/cast Aluminium alloy (4600 as per IS: 617).
- 6.4 Cables shall enter the terminal chamber through flame proof compression type cable glands. From terminal chamber to the main enclosure connection shall be made through bushings. Direct entry of external cables into the main enclosure shall not be accepted.
- 6.5 The sub-distribution board shall be of 6 way type.
- 6.6 Individual earth terminals shall be provided for the earth conductor of the outgoing cables beside the phase and neutral terminals.
- 6.7 The sub-distribution board must be certified by Central Mining Research Institute, Dhanbad or other statutory authority for use in specified hazardous area.
- 7.0 COMPONENT DETAILS**
- 7.1 The lighting sub-distribution board shall be wired and have components as per SD-8083 (copy attached).
- 7.2 **Miniature Circuit Breaker (MCB)**
- The MCB shall be of duty category M-9 and shall conform to IS/IEC:60898-1:2002. It shall be provided with overload and short circuit protective devices. MCB shall be of C Curve Type.
- 7.2.1 The incoming MCB's or switches shall be of triple pole and switched neutral type and outgoing MCB's of single pole and switched neutral type, single phase earth leakage protection in each phase of the incomer shall be provided.
- 7.3 **Terminal Block**
- Pressure clamp type terminal blocks shall be provided both for incoming and outgoing cables. The rating of the terminal block shall be at least 1.5 times the rating of the MCB.
- 7.4 **Cable Glands**
- Heavy duty double compression type Aluminium cable glands suitable for PVC insulated, armoured and PVC sheathed 1.1 KV grade incoming and outgoing cables shall be provided.

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## 8.0 PAINTING

- 8.1 The enclosure after suitable pre-treatment shall be painted with two coats of anti rust paint followed by two coats or anticorrosive paint.
- 8.2 Epoxy based paint shall be used.
- 8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- 8.4 The finishing shade shall be light grey shade no.631 as per IS: 5.

## 9.0 TESTS AND INSPECTION

- 9.1 All the lighting sub-distribution boards shall be subjected to routine tests as per IS: 8623.
- 9.2 Additional tests, wherever specified, shall be carried out on one lighting sub-distribution board of each type.
- 9.3 The above mentioned tests shall be carried out in the manufacturer's works in the presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection at works and inspection at site for final acceptance.
- 9.4 The purchaser's inspection shall, however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.

## 10.0 DRAWINGS AND DOCUMENTS

- 10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 10.2 All drawings and documents shall have the following description written boldly.
- Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description

## 11.0 SPARES

- 11.1 Commissioning Spares: Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 11.2 Spare for 2 Years Operation (Mandatory), as specified shall be supplied.
- 11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 11.4 All spare parts shall be identical to the parts used in the equipment.

## 12.0 PACKING

- 12.1 The equipment shall be properly packed to safeguard against weather conditions and handling during transit. It shall be wrapped in polythene bags and an additional wrapping of bitumen paper shall also be provided to make it completely water proof before the equipment is packed in wooden crates.
- 12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

### ANNEXURE - I

#### DOCUMENTATION FOR LIGHTING SUB DISTRIBUTION BOARDS

SL.NO.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical particulars	N	Y	Y
3.	General arrangement Drgs.	N	Y	Y
4.	Certificate for flameproofness from statutory testing authority wherever applicable	N	N	Y
5.	Schematic diagram	N	Y	Y
6.	Descriptive literature of Various equipment	N	N	Y
7.	Guarantee certificate	N	N	Y
8.	Test certificate	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



	<b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - INDUCTION MOTOR</b>	<b>PC183-TS-0810</b>	0	
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## TECHNICAL SPECIFICATION INDUCTION MOTOR

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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of medium voltage and high voltage induction motors.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy - Electrical.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of IS-325 and other relevant Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 The design and operational features of the equipment offered shall also comply with the provisions of latest issue of the Indian Electricity Rules and other relevant Statutory Rules & Regulations. The supplier shall, whenever necessary, make suitable modification in the equipment to comply with the above mentioned rules.
- 2.3 Flame proof motors shall, in addition, comply with the requirements laid down in IS: 2148.
- 2.4 Increased safety motors shall, in addition, comply with the requirements laid down in IS: 6381.
- 2.5 Motors with type of protection “n” shall, in addition, comply with the requirements laid down in IS: 9628.
- 2.6 Wherever any requirement laid down in this standard differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

The ambient conditions shall be as indicated in the Design Philosophy - Electrical.


### 3.2 System Details

- 3.2.1 The details of power system to which the motors will be connected shall be as indicated in the Design Philosophy - Electrical.
- 3.2.2 The motors shall be suitable for connection to a power system where transient disturbances are very likely to occur. During the transient disturbances, voltage of the system may completely disappear and return in a short time with the motors still running and connected. Under this condition, the return of voltage may occur at such an instant that the induced e.m.f. in the motor is in phase with the applied voltage giving rise to current surges which may reach a value equal to 1.6 times the starting current and also cause transient torques of large magnitudes.

## 4.0 GENERAL DESIGN FEATURES

### 4.1 Enclosure

- 4.1.1 The enclosure of motors for indoor and outdoor services shall be IP-54 and IPW-55 respectively as per IS/IEC:60529, unless otherwise specified.
- 4.1.2 Motors for outdoor service shall be provided with special seals for the enclosure, joints, bearing housing, terminal boxes etc. so that no extra protective covering for ingress of water shall be required.

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- 4.1.3 Vertical motors for outdoor installation shall be provided with a rain protective hood.
- 4.1.4 All external hardware shall be zinc passivated or cadmium plated.
- 4.1.5 The enclosure shall be provided with threaded metallic plug to permit drainage of condensed water from the inside.

#### 4.2 **Cooling**

- 4.2.1 All motors shall be totally enclosed fan cooled conforming to IC-0141 as per IS: 6362 unless otherwise specified.
- 4.2.2 In case of CACA construction, the same shall conform to IC-0161 as per IS: 6362.
- 4.2.3 In case of CACW construction, the same shall conform to ICW 37A 91 as per IS: 6362.
- 4.2.4 Wherever service conditions are such that corrosive agents are present in the surroundings, the following materials of construction for cooling tubes shall be adopted, unless otherwise specified.

For CACA motor - Aluminium tubes having minimum thickness of 1.6 mm

For CACW motor - Low carbon alloy steel

- 4.2.5 In case of CACW motors, the cooling tubes and flanges shall also be suitable for the cooling water analysis. Trays shall be provided for collection of leaking water with arrangement for its drainage.
- 4.2.6 The cooling fans shall be suitable for bidirectional rotation of motors. These shall be fastened to the motor shaft by means of compensating rings or will be balanced independent of the motor. Guide key or reference points shall be supplied to prevent wrong assembly. The cooling air shall be sucked from the non-driving end.
- 4.2.7 The cooling fans shall be made of non-sparking materials such as cast Aluminium (LM-6 alloy) / cast iron.

#### 4.3 **Direction of Rotation**

- 4.3.1 Motors shall be suitable for both directions of rotation. In case of any design limitation, the same shall be indicated in the offer.
- 4.3.2 In either case, a plate showing the direction of rotation corresponding to the phase terminal markings shall be fitted at the driving end shield of the motors.

#### 4.4 **Stator**

- 4.4.1 The stator laminations shall be made from suitable magnetic sheet iron varnished on both sides. Where ventilation is required, these shall be arranged in suitable packs, each pack being separated by spacers to form ventilating ducts for circulation of air.
- 4.4.2 The slot shall be open type with coils so arranged that the coils can be easily removed for inspection and repair.

#### 4.5 **Rotor**

- 4.5.1 The rotor shall be of squirrel cage construction, unless otherwise specified.
- 4.5.2 For small motors, the squirrel cage shall preferably be of pressure die-cast construction. For large motors, the rotor bars and the end rings shall be of copper or copper alloy. The bars shall be firmly placed in slots to prevent vibration during start up / locked rotor condition. Conductor ends shall be securely fixed to the end rings using the latest brazing techniques. Retaining rings shall be provided for high speed machines for the end rings. The rotor cage shall be designed for the required starting and duty cycles.

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- 4.5.3 Wherever wound rotor is specified, the windings shall have the same features as detailed for the stator windings. The rotor voltage shall not exceed the stator voltage.
- 4.5.4 The rotor shall be dynamically balanced and shall rotate perfectly with no preferential stop points. The rotor shall be constructed such as to allow the removal or addition of material for balancing.
- 4.5.5 The rotor shaft shall be electrically and magnetically so balanced that the induced shaft voltage does not exceed 200 millivolt. Otherwise the bearing housing at non-driving end shall be insulated for 2 KV.
- 4.6 **Windings and Insulation**
- 4.6.1 The motor coils shall be made out of insulated electrolytic grade copper conductor. Successive coils shall be connected by accessible joints, well brazed and finished smooth to prevent damage to insulation.
- 4.6.2 The motors shall be insulated assuming the power system neutral as isolated.
- 4.6.3 All motors shall be insulated with F insulation with tropical and fungicidal treatments.
- 4.6.4 Wherever class F insulation is specified, the windings shall be easily replaceable type and the temperature rise shall not exceed that of class B insulation.
- 4.6.5 The winding coils shall be dried, properly impregnated with suitable varnishes to withstand the site conditions and properly baked. At least two additional impregnations and baking shall be applied to the assembled stator coil, making a total of three impregnations and baking. Finally the windings shall be painted with special anti-acid and anti-alkali paints to withstand the site conditions.
- 4.6.6 The windings shall be well brazed and capable of withstanding thermally and mechanically the transient disturbances specified under clause 3.2.2.
- 4.6.7 Lead-in wire between the windings and the outside terminals shall be made through bushings in H.V. motors. For M.V. motors, heat resistant insulated conductors shall be used as lead-in wire.
- 4.6.8 The windings shall be star connected for high voltage motors and delta connected for medium voltage motors.
- 4.7 **Slip Rings and Brushes**
- 4.7.1 Slip rings shall be located in the non-driving side. The material of construction shall be copper alloy. The slip rings and the brush gear shall be cooled by the motor cooling fan.
- 4.7.2 For explosion proof motors, the slip rings and brush gear shall be housed in a flameproof housing. In case this is not possible, the housing shall be pressurised type with flameproof pressure switch for interlocking with the motor. In either case, glass covers shall be provided for inspection.
- 4.7.3 The starting rheostats shall be designed for intermittent duty and rated for 10 minutes. Where speed regulation is required, the rheostats and the controllers shall be suitable for such duty and be continuously rated. Auxiliary contacts shall be provided on the controllers for connections to the motor supply controls to prevent wrong operations during starting.
- 4.8 **Bearings**
- 4.8.1 All motors shall be provided with bearings suitable for the application. The bearings shall have a smooth operation and a life not shorter than 30,000 hrs.

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- 4.8.2 Where external thrusts are specified, the motors shall be fitted with special roller thrust bearings capable of withstanding the specified thrust. In such cases, the life of the bearings shall not be less than 20,000 hours.
- 4.8.3 The bearing housing shall be effectively sealed against ingress of dust and water and creep age of lubricants along the shaft.
- 4.8.4 The bearing shall be suitable for both directions of rotation of the motor.
- 4.8.5 All motors shall be provided with on-line grease lubrication arrangement for both DE and NDE side bearings except for motors of frame size 112 and less and flange mounted M.V. motors. The arrangement shall be complete with grease nipple and drain plug located at convenient locations.
- 4.8.6 All oil lubricated bearings shall be fitted with oil level indicator and resistance temperature detector/dial type thermometer with alarm and trip contacts.
- 4.8.7 Self cooled bearing system shall be preferred.
- 4.8.8 The manufacturer shall specify the type of lubricant and the time interval of lubrication for the bearings of each motor.
- 4.8.9 The bearing temperature shall not exceed 90°C for grease lubricated bearings and 70°C for oil lubricated bearings.
- 4.8.10 Wherever shaft end-play has been specified, the bearings shall be capable of providing the specified end-play.
- 4.9 **Terminal Box**
- 4.9.1 All the terminal boxes shall have identical degree of protection as that of the motor.
- 4.9.2 The power terminal box shall be mounted on the right hand side of the motor as viewed from the coupling end. For M.V. Motors, design of terminal boxes shall be such that it may be possible to arrange top/bottom/side entry of cables at site.
- 4.9.3 The power terminal boxes shall be as follows:
- a) For H.V. motors - Phase segregated type capable of with standing the system fault level for 0.2 Sec. or more.
  - b) For M.V. motors - Manufacturer's standard box with epoxy or SRBF moulded terminal board.
- 4.9.4 The mounting arrangement of power and neutral side terminal boxes for HV motors shall be identical so that it shall be possible to interchange the boxes at site.
- 4.9.5 In case of H.V. motors, all the six leads of the motors shall be taken out, three on one side and three on the other side to separate terminal boxes. However, neutral shorting link shall be provided on the neutral box for star connection.
- 4.9.6 In case of M.V. motors, all the six leads of the motors shall be taken out to a common terminal box. Shorting links for delta connections shall be provided in the terminal box for motors 112 frame and above.
- 4.9.7 For increased safety motors and for motors with type of protection "n", the terminals shall be provided with positive locking device so that they do not become loose during normal operation.
- 4.9.8 The power terminal boxes shall have adequate clearances in between the terminals and also between the terminals and cable gland for proper termination of cables. Where more than one cable is required to be terminated in parallel, the spacing in the box shall be adequate for easy termination.

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4.9.9 Separate terminal boxes shall be provided for connection of power, control and space heater cables.

4.9.10 All terminal boxes shall be complete with heavy duty double compression type cable glands and lugs/connectors to receive the external cables.

4.9.11 Where cross linked polyethylene cables are specified, the terminal box shall be suitably designed for proper termination of such cables.

4.9.12 The cable lugs shall be of tinned copper and suitable for crimping.

#### 4.10 **Geared Motors**

Where geared motors are specified, the gears shall be oil lubricated, heavy duty as per AGMA class III and capable of transmitting the rated motor power continuously. They shall be capable of withstanding moderate shock loads having a service factor of 2 and the starting duties. They shall be silent and smooth in operation. Inspection glass shall be provided to indicate the oil level in the gear box.

### 5.0 **PERFORMANCE**

#### 5.1 **Starting**

5.1.1 The motors shall be capable of being started direct-on-line, unless otherwise specified.

5.1.2 The starting torque of each motor shall be higher than the initial resisting torque of the driven load throughout the starting period even at a feeding voltage of 85% of the rated voltage for normal purpose motor and 80% of the rated voltage for special purpose motor.

5.1.3 The starting current of 415 V Motors shall not exceed the values indicated in IS: 12615. Also there shall be no further positive tolerance on the values of starting current.

The starting current of 11 KV & 3.3 KV motors shall not exceed 550% of FLC. No positive tolerance is acceptable over 550% FLC.

5.1.4 The motors shall be suitable for the following starting cycle:

- a) With the motor at ambient temperature - 2 successive starts and 3rd start after 5 minutes.
- b) With the motor at steady state load temperature - 1 immediate start and 2nd start after 5 minutes. This sequence shall be repeated in the next hour.

5.1.5 Speed switch shall be provided, wherever required, to fulfil the starting conditions.

#### 5.2 **Locked Rotor Condition**

5.2.1 The locked rotor withstand time ( $t_E$ ), under hot condition at 110% of rated voltage shall be more than the starting time of the motor coupled to the load even at the lowest stipulated starting voltage by 2 secs. for motors, having starting time up to 10 secs. and by 5 secs. for motors, having starting time more than 10 secs.

5.2.2 For increased safety motors,  $t_E$  under hot condition shall not be less than 10 secs. The value of  $t_E$  shall be determined in the presence of purchaser's representative unless test certificate from an independent testing authority is submitted for similar motors. The time  $t_E$  and the locked rotor current shall be stamped on the name plate as well as indicated in the test certificates.

5.2.3 For deciding the time  $t_E$  in all cases, the temperature of the insulated stator and rotor shall not exceed the value stipulated under clause no. 5.4.3.

#### 5.3 **Running**

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- 5.3.1 All motors shall be continuous maximum rated (S1 duty as per IS: 325), unless otherwise specified.
- 5.3.2 The motors shall be capable of delivering the rated output without exceeding the specified temperature rise under the system voltage and frequency variation conditions.
- 5.3.3 The motors shall be suitable for running at the rated load for 5 minutes duration at 80% voltage and for 1 Sec. duration at 70% voltage, without exceeding the specified temperature rise.
- 5.4 **Temperature Rise**
- 5.4.1 The total temperature of the stator winding under full load running condition shall not exceed the values permissible for the specified insulation class. For increased safety motors, the total temperature shall be 10°C less than for normal motors.
- 5.4.2 For explosion proof motors, the maximum surface temperature shall not exceed the values applicable for temperature class of the hazardous gases / vapours present in the surrounding area. However for type 'n' motors, the maximum allowable temperature shall not exceed 200°C.
- 5.4.3 In case of starting and locked rotor conditions stipulated under clause nos. 5.1.4 and 5.2.1 respectively, the maximum temperature in the rotor shall not exceed the following values:
- For squirrel cage rotor - 300°C
  - For wound rotor - As applicable to the insulation class
  - For explosion proof motor - As per temperature class of the hazardous gases / vapours, without exceeding the above temperature as applicable

## 6.0 COUPLING DETAILS

- 6.1 Unless otherwise specified, all motors shall be coupled to the driven equipment through flexible coupling.
- 6.2 Normally the coupling half for the motor shaft shall be supplied by the driven equipment supplier. The coupling half shall be keyed on the shaft with a tapered joint or shrunk with a straight joint. For this purpose, the motor manufacturer shall coordinate all details of the coupling system with the driven equipment manufacturer, wherever required.
- 6.3 Where rigid coupling is specified, the motor shaft shall have the desired class of accuracy.
- 6.4 For all vertical flange mounted motors, the limitations on shaft extension, run out, perpendicularity and eccentricity, as required by the driven machine supplier shall be complied with by the motor supplier.
- 6.5
- i) If the motor is to be coupled to a reciprocating pump or compressor requiring fluctuating torque, the motor supplier shall ensure that the inertia of the driving and driven machine assembly shall be such that the variation in the armature current shall not exceed  $\pm 66\%$  of the rated current while delivering full load.
  - ii) The measurement of armature current shall be done with the oscillograph.
  - iii) The additional fly wheel, if any, shall be assembled at such a distance from the motor so as to allow easy inspection of the windings.
  - iv) All necessary coordination with driven equipment manufacturer shall be carried out by the motor manufacturer.



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- 6.6
- i) Wherever belt drive is specified, the motor supplier shall ensure that the shaft extension and the bearings are suitable for the duty specified.
  - ii) Unless otherwise specified, the slide rails for all belt driven motors shall be supplied by the motor manufacturer.

## 7.0 ACCESSORIES

The motors shall be complete with all the accessories.

### 7.1 Space Heaters

7.1.1 Space heaters rated for 240 V A.C. shall be provided to keep the winding dry for all high and medium voltage motors, except for motors rated below 30 KW which shall be suitable for space heating by connecting 24 V A.C to any of the two motor winding terminals.

7.1.2 The location of the space heaters shall be such as to allow easy access for inspection, maintenance and replacement.

### 7.2 Name Plates

7.2.1 The name plates shall be of stainless steel with letters embossed on them.

7.2.2 The name plate shall contain all the relevant details as per IS: 325 and in addition shall indicate the following:

- i) The description and code no. of motor
- ii) Degree of protection of enclosure
- iii) Temperature rise of windings under running condition
- iv) Designation of bearings
- v) Recommended type of lubricant and interval of lubrication
- vi) Direction of rotation
- vii) Mounting Arrangement

7.2.3 Flameproof motors shall have additional name plate containing relevant particulars as per IS: 2148.

7.2.4 Increased safety motors shall have additional name plate containing relevant particulars as per IS: 6381.

7.2.5 Motors with type of protection “n” shall have additional name plate containing relevant particulars as per IS: 9628.

### 7.3 Embedded Temperature Detectors

7.3.1 All high voltage motors shall be provided with 6 nos. of evenly distributed embedded resistance temperature detectors for measurement of winding temperature. These shall be located in positions at which the highest temperatures are likely to occur.

7.3.2 In addition, the high voltage motors shall be provided with

- i) 1 no. RTD for hot air temperature measurement
- ii) 2 nos. RTDs (1 on each side) for bearing temperature measurement of oil lubricated bearings. For grease lubricated bearings, RTD shall be provided only where specified

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7.3.3 These RTDs shall be of platinum having 100 ohm resistance at 0°C and temperature coefficient as  $3.850 \times 10^{-3}$ .

7.3.4 The RTDs shall be 3 lead type having power frequency insulation level of 2KV.

7.3.5 The RTDs shall comply with the requirements laid down in IS: 2848.

#### 7.4 **Dial Type Thermometers**

7.4.1 In high voltage motors, the measurement of hot air and bearing temperature (of oil lubricated bearings) by dial type thermometers shall be provided wherever specified.

7.4.2 The arrangement shall consist of a dial type of mercury-in-steel thermometer so mounted that its stem shall be located in the maximum temperature region.

7.4.3 The thermometer shall have two potential free contacts for alarm and trip.

7.4.4 All contacts shall be rated for 2 Amps. at 110 V D.C.

7.4.5 For bearing temperature measurement, separate thermometers shall be provided for each bearing.

7.4.6 For grease lubricated bearings, temperature measurement arrangement shall be provided only where specified.

#### 7.5 **Oil Supply System**

7.5.1 For large sized motors, where forced oil lubrication system is considered, a common oil supply system for the motor and the driven equipment shall be provided by the driven equipment manufacturer.

7.5.2 However, the motor supplier shall quote separate price for the complete oil system of the motor.

7.5.3 The system shall be suitable for location near the motor.

7.5.4 The oil supply system for each motor shall include:

- i) 2 Nos. 100% rated motor driven pumps with motors
- ii) 1 No. oil tank complete with oil level gauge and thermometer
- iii) 1 No. oil cooler
- iv) 1 No. oil filter
- v) 1 No. differential pressure switch for filter
- vi) 2 Nos. pressure switches
- vii) Necessary piping
- viii) Necessary control and interlocks

#### 8.0 **VIBRATIONS**

The motor vibrations measured at the bearings must not exceed the limits specified in IS: 12075.

#### 9.0 **NOISE LEVEL**

The motor noise level shall not exceed 85 dB measured at a distance of 1 metre from the motor.

#### 10.0 **PAINTING**

10.1 Enclosures of the motor and its accessories shall be painted with two coats of anti-rust paint and two coats of anti-corrosive paint after suitable pre-treatment.

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- 10.2 Epoxy paint shall be used.
- 10.3 Unless otherwise specified, the finishing shade shall be light grey having shade No. 631 as per IS: 5.

#### **11.0 TESTS AND INSPECTION**

- 11.1 All motors shall be routine tested as per relevant standards.
- 11.2 Additional tests, wherever specified, shall be carried out on one motor of each rating.
- 11.3 For high voltage motors of each rating, polarization index test shall also be carried out.
- 11.4 All the above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the motor shall be subject to stage inspection at works and inspection at site for final acceptance.
- 11.5 These inspections shall, however, not absolve the vendor from their responsibility for making good any defects which may be noticed subsequently.

#### **12.0 PACKING**

- 12.1 The motors shall be properly packed to safeguard against weather conditions and handling during transit.
- 12.2 The shaft shall be properly clamped / supported.
- 12.3 Rust inhibiting agents shall be applied to fittings and sliding surfaces.
- 12.4 All flanges shall be closed with blanking plates to avoid entry of foreign materials.
- 12.5 The loose pieces of the motor / spare parts / Instruments shall be separately wrapped in moisture resistant paper and marked with identification marks and name plate of the corresponding motors.
- 12.6 The packing box / crate shall include a copy of installation, operation and maintenance manual.

#### **13.0 DRAWINGS AND DOCUMENTS**

- 13.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 13.2 All drawings and documents shall have the following descriptions written boldly:
- Name of client
  - Name of consultant
  - Enquiry / order number with plant / project name
  - Motor Code No. and Description

#### **14.0 SPARES**

- 14.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 14.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 14.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 14.4 All spare parts shall be identical to the parts used in the equipment.

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**ANNEXURE - I**  
**DOCUMENTATION FOR INDUCTION MOTORS**

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet and Technical Particulars	N	Y	Y
2.	Dimensional Drawings	N	Y	Y
3.	Drawings and data for air / water heat exchangers, if necessary	N	Y	Y
4.	Drawings and data for oil system, if necessary	N	Y	Y
5.	Characteristic curves			
	a) Thermal withstand curve	N	Y	Y
	b) Load Vs FL current	N	Y	Y
	c) Load Vs Efficiency	N	Y	Y
	d) Load Vs Power factor	N	Y	Y
	e) Load Vs Speed	N	Y	Y
	f) Voltage Vs Thermal Withstand time	N	Y	Y
	g) Starting current Vs Time	N	Y	Y
6.	Connection diagram for RTDs, thermometer etc.	N	Y	Y
7.	Terminal Box drawings	N	Y	Y
8.	Illustrative and Descriptive catalogues	N	N	Y
9.	Catalogues of bought out accessories	N	N	Y
10.	Spare parts list	N	N	Y
11.	Installation, Operation and Maintenance manual	N	N	Y
12.	Test certificates			
	a) Routine	N	N	Y
	b) Type	N	N	Y
	c) For enclosure	N	N	Y
13.	Guarantee Certificates	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



**TALCHER FERTILIZERS LIMITED**  
**TECHNICAL SPECIFICATION - INTERLOCKING SWITCH**  
**SOCKET AND PLUG**

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**TECHNICAL SPECIFICATION**  
**INTERLOCKING SWITCH SOCKET AND PLUG**



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4.0	OPERATING REQUIREMENTS
5.0	GENERAL DESIGN AND CONSTRUCTIONAL FEATURES
6.0	SPECIAL FEATURES FOR FLAME PROOF SWITCH SOCKET AND PLUGS
7.0	COMPONENT DETAILS
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ANNEXURE - I	DOCUMENTATION FOR INTERLOCKING SWITCH SOCKET AND PLUG



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## 1.0 SCOPE

- 1.1 The standard covers the technical requirements of design, manufacture, testing at works and delivery in well packed condition of interlocking switch socket and plug.
- 1.2 The standard shall be read in conjunction with relevant part of Design Philosophy - Electrical.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of IS-4160/ IEC-309 and other relevant Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 The design and operational features of the equipment offered shall also comply with the provisions of latest issue of Indian Electricity Rules and other statutory acts and regulations. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient conditions

These shall be as indicated in Design Philosophy - Electrical.

### 3.2 System details

These shall be as indicated in Design Philosophy - Electrical.

## 4.0 OPERATING REQUIREMENTS

The equipment shall be suitable for operating at the rated capacity continuously without exceeding the specified temperature rise and without any detrimental effect on any part.

## 5.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

- 5.1 The switch socket shall be heavy duty industrial type. The interlocking arrangement shall be such that it is not possible to insert or withdraw the plug with the switch in 'ON' position.
- 5.2 The switch sockets shall have dust, hose and weather proof construction conforming to IPW55 as per IS/IEC:60947 and shall be suitable for outdoor use without any extra protection. All jointing surfaces shall be smoothly machined and of sufficient width to prevent ingress or dust. Further the covers shall be provided with continuous gaskets made of neoprene to prevent ingress of dust and moisture.
- 5.3 The enclosure of switch sockets and plugs shall be of cast aluminium alloy 4600 and suitable for fixing on wall / structure.
- 5.4 The enclosure shall be largely dimensioned in order to avoid temperature rise inside it which may damage the insulating materials and gaskets employed therein.
- 5.5 The insulating materials used shall be non-hygroscopic, mould proof and treated with suitable varnish to withstand the ambient conditions.
- 5.6 All external hardware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm or above shall be of mild steel cadmium plated or zinc passivated.
- 5.7 Suitable arrangement for looping of cables from one switch socket to the other shall be provided. For switch sockets rated above 63A, looping shall be done from busbars and



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for switch sockets rated 63A and below, looping may be done from terminal block. Necessary terminals, cable glands and lugs for looping shall be provided. Also one no. The readed plug for each switch socket shall be supplied loose.

5.8 All the relevant information shall be provided on engraved name plate made of aluminium.

5.9 The enclosure shall be provided with two earthing terminals outside the body.

### **6.0 SPECIAL FEATURES FOR FLAME PROOF SWITCH SOCKET AND PLUGS**

6.1 The enclosure shall be in addition of flame proof execution as per IS: 2148.

6.2 The enclosure group and temperature class shall be as indicated in Design Philosophy - Electrical.

6.3 Cable shall enter the terminal chamber through flame proof compression type cable glands. From the terminal to the main enclosure, the connection shall be made through proper bushings. Direct entry of external cables into the main enclosure shall not be accepted.

6.4 An additional earthing terminal inside the terminal chamber shall be provided.

6.5 Switch socket, plug and cable glands must be certified by the Central Mining Research Institute, Dhanbad or any other statutory authority for use in the specified hazardous area.

6.6 Further interlocking shall be provided so that the contacts cannot be energised when the plug and socket are separated.

### **7.0 COMPONENT DETAILS**

Makes of all components shall be subject to owner's / consultant's approval

#### **7.1 Air Break Switches**

7.1.1 The switches shall be quick make, quick break rotary type and of utilisation category AC-23 as per IS/IEC:60947.

7.1.2 Switches shall be hand operated from outside the cover. The switch handle shall remain fixed to the front cover while removing the front cover.

#### **7.2 H.R.C. Fuses**

7.2.1 The sockets shall be provided with link type HRC fuses.

7.2.2 The fuses shall be capable of withstanding a short circuit current of 50 KA and shall be delayed action type conforming to IS: 13703. These shall be mounted on a shrouded base.

#### **7.3 Socket Outlets**

7.3.1 The socket outlet shall be located in the lower part of the enclosure and shall be provided with a threaded aluminium cover attached to the body with G.I. chain, to protect the socket after extraction of the plug. Spring loaded automatic shutter shall not be acceptable.

7.3.2 The socket contacts shall maintain satisfactory spring pressure and contact with the corresponding plug under normal service conditions.

7.3.3 The socket contacts shall be sunk well below the surface of the socket- outlets so as to make it impossible to be touched unintentionally.

7.3.4 An earthing contact shall be provided in the socket outlet which shall ensure making and breaking respectively of its contact with the earthing pin of the plug before and after making and breaking of the corresponding current carrying contacts.





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#### 7.4 **Plugs**

- 7.4.1 The plugs shall be so constructed so that these can be easily fitted in to the socket outlets.
- 7.4.2 These shall be provided with knurled knob arrangement for screwing on the body of the socket so that it can be securely fixed on the top.
- 7.4.3 The plug base and cover shall be firmly secured to each other and shall be sufficiently robust in construction to withstand normal usage.
- 7.4.4 The plug pins shall preferably be of single part. The earthing pin shall be slotted with a single slot and shall be larger in dimension than other pins.
- 7.4.5 The plug and socket contacts shall be self aligning type with best electrical continuity.
- 7.4.6 The plug shall be provided with dust proof cable entry suitable for receiving TRS flexible heavy duty copper conductor cable of specified size. The arrangement shall be such that the conductors are relieved from strain including twisting where they are connected to the terminals and that the outer surface of the cable at the place of entry is not damaged.
- 7.4.7 Insulating barriers forming an integral part of the plug shall ensure separation of metals and bare flexible conductors at different potentials.

#### 7.5 **Cable Termination**

- 7.5.1 Switch socket shall have cable termination arrangement on the upper part of the housing and shall be provided with side entries, one on either side, through heavy duty double compression type rolled aluminium cable glands suitable for 1.1 KV grade PVC insulated armoured and PVC sheathed cables of size.
- 7.5.2 The terminal blocks shall be pressure clamp type for switch socket rated up to 63A and bolted lug type for higher ratings. The terminals shall be rated for at least 1.5 times the switch rating.

#### 8.0 **PAINTING**

- 8.1 The enclosure after suitable pre-treatment shall be painted with two coats of anti-rust paint followed by two coats of anti-corrosive paint.
- 8.2 Epoxy based paint shall be used.
- 8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- 8.4 The finishing shade shall be light grey shade no.631 as per IS: 5, unless specified otherwise.

#### 9.0 **TESTS AND INSPECTION**

- 9.1 The switch sockets and plugs shall be subjected to routine tests as per IS-4160 and other relevant standards.
- 9.2 Wherever specified, additional tests shall be carried out on one switch socket and plug of each rating.
- 9.3 The tests shall be carried out in the manufacturer's works in the presence of purchaser's representative. In addition to the above tests, the equipment shall be subject to stage inspection at works and inspection at site for final acceptance.
- 9.4 These inspections shall, however, not absolve the vendor from their responsibility for making good any defect which may be noticed subsequently.



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**10.0 DRAWINGS AND DOCUMENTS**

10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

10.2 All drawings and documents shall have the following descriptions written boldly.

- Name of client
- Name of consultant
- Enquiry / Order Number with plant / project name
- Code No. and Description

**11.0 PACKING**

11.1 The switch socket and plug shall be properly packed to safeguard against weather conditions and handling during transit. It shall be wrapped in polythene bags and an additional wrapping of bitumen paper shall also be provided to make it completely water proof before the equipment is packed in wooden crates.

11.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

**12.0 SPARES**

12.1 Commissioning Spares: Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.

12.2 Spare for 2 Years Operation (Mandatory), as specified shall be supplied.

12.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.

12.4 All spare parts shall be identical to the parts used in the equipment.



ANNEXURE – I

DOCUMENTATION FOR INTERLOCKING SWITCH SOCKET AND PLUG

Sl.No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	General arrangement and foundation drawing	N	Y	Y
4.	Schematic / wiring diagram	N	Y	Y
5.	Illustrative and descriptive literature	N	N	Y
6.	Catalogue for bought out accessories	N	N	Y
7.	Installation operation and maintenance manual	N	N	Y
8.	Test Certificates			
	a) Type	N	N	Y
	b) Routine	N	N	Y
9.	Guarantee Certificate	N	N	Y
10.	Certificate of flameproofness from statutory testing authority wherever applicable.	N	N	Y
11.	Spare parts list with identification marks	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



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**TECHNICAL SPECIFICATION - BATTERY CHARGER**

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# **TECHNICAL SPECIFICATION**

## **BATTERY CHARGER**



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ANNEXURE - I	REQUIREMENT OF PROTECTIONS, METERING, CONTROL AND INDICATIONS / ANNUNCIATIONS FOR BATTERY CHARGER
ANNEXURE - II	DOCUMENTATION FOR BATTERY CHARGER



## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well packed condition of Battery Charger Units.
- 1.2 The standard shall be read in conjunction with relevant part of Design Philosophy - Electrical.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this specification shall comply with the latest issue of IS: 8623 Specification for low voltage switchgear and control gear assemblies and other relevant Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 The design and operational features of the equipment shall also comply with provisions of the latest issue of the Indian electricity Rules and other relevant Statutory Acts and Regulations. The supplier shall, wherever necessary, make suitable modifications to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy - Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy - Electrical.

## 4.0 DESIGN AND OPERATIONAL REQUIREMENTS

- 4.1 The Battery Charger Unit and its components shall be suitable for operating at the specified rating continuously with the specified voltage and frequency variations under the ambient conditions without exceeding the temperature rise limits specified in relevant standards and without any detrimental effect on any part.
- 4.2 The battery charger board shall consist of two units as follows:
- (a) Float cum load cum Boost Charger -- To supply continuous load and keep the battery in state in float mode. In Boost mode, for Initial charging of Battery and after power restoration subsequent to failure, to recharge the battery while simultaneously supplying load current.
  - (b) A stand by unit for (a) above.
- 4.3 The rated voltage of the float charger for lead acid battery shall be 2.2 Volt/ Cell and final charging voltage of the boost charger shall be 2.75 Volt/ Cell. The rated voltage of the float charger for Ni-Cd shall be minimum 1.4 Volt/ Cell and final charging voltage of the boost charger shall be minimum 1.7 Volt/ Cell. The rated output voltage of the charger under 4.2 (a) above shall be adjustable by  $\pm 5\%$  of the rated value manually.
- 4.4 Charging unit stated under 4.2 (a) above shall be fully automatic using silicon controlled rectifiers (SCR) common for Float and Boost service. Charger D.C. output voltage shall be maintained within  $\pm 2\%$  irrespective of the input supply variations and load variation of 0 to 100% by closed loop voltage feed back control system. The charger shall be provided with current limit feature.



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- 4.5 The output voltage of the float charger shall be monitored and in case voltage falls below 90% of the rated voltage the stand by charger shall be automatically switched 'ON' with audio-visual alarm and annunciation. Time delay features shall be incorporated to avoid spurious changeover.
- 4.6 Boost charging shall be achieved through the same silicon controlled rectifier (SCR) which shall regulate the charger output automatically by current control closed loop system. Provision for manual adjustment of charger output shall also be made. Charger shall maintain its output current constant at starting rate/ finishing rate of battery charging current irrespective of variation in input supply and battery condition.
- 4.7 Transfer from float charging to boost charging and vice versa shall be automatic as per the battery charge condition.
- 4.8 During boost charging operation, arrangement shall be made so that DC power to load is not interrupted even if AC power fails during this operation. During Boost charge period, battery backup to load shall be arranged by a tapping from suitable point of the battery.
- 4.9 Suitable dropper diodes shall be provided to reduce the voltage across the load to 105% of the rated voltage at rated load current. When power supply to the charger fails, the dropper diodes shall be by-passed automatically through contactor so that full battery output voltage is available to the load.
- 4.10 Provision of suitable filters shall be made so that the ripple in output voltage shall not exceed 3% and 10% for float and boost charger respectively.
- 4.11 It shall be ensured that during boost charging, no over/under charging of cells takes place.
- 4.12 All the automatic features specified above shall also have provision of manual arrangement for control of charging rates and transfer from one charger to others.
- 4.13 Charger unit shall be provided with all required indication, metering, protection, control and alarm annunciation devices for safe and reliable operation and shall include at least as indicated in Annexure-I.
- 5.0 CONSTRUCTIONAL FEATURES**
- 5.1 Each of the charger units shall be housed in separate metal clad cubicles of identical size suitable for floor mounting and arranged to form a compact switchboard.
- 5.2 The complete assembly shall be dust, damp and vermin proof type equivalent to IP-43 as per IS/IEC:60947. In case it is necessary to provide openings for ventilation, these shall be closed from inside by fine wire mesh. Forced ventilated panel shall not be acceptable.
- 5.3 The frame work of cubicles shall be of bolted/welded construction, fabricated out of cold rolled sheet steel of not less than 2 mm thickness. The thickness of base channel shall not be less than 3 mm, suitable reinforcement, wherever necessary, shall be provided.
- 5.4 Hinged doors shall be provided on both the front and back side for easy access. The door hinges shall be concealed type.
- 5.5 The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets. Gaskets without any discontinuity shall be preferred. Gaskets shall be held in position in groove in shaped steel work or these shall be 'U' type. Only one joint per gasket shall be permitted. Adhesive cement, if used, shall be of good quality so that the gaskets do not come off during service.
- 5.6 The mounting of the components shall be such that these are accessible for checking and replacement without the necessity of removing the adjacent ones, at the same time ensuring necessary degree of safety.



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- 5.7 It shall be possible to carry out maintenance of one charger when the other is in operation.
- 5.8 The meters, switches and lamps shall be flush mounted type. All components of one unit shall be mounted on the same unit.
- 5.9 All the live parts shall be insulated. Parts which can not be insulated shall be provided with insulating barriers. These barriers shall provide shielding of all live parts to prevent accidental contact when the door is open. However, for the parts requiring handling normally, such as fuses/lamps etc., separate barriers shall be provided. The barriers in all cases shall cover the cable lug portions and shall be firmly secured, stable and durable. It shall, however, be possible to remove such barriers, if required.
- 5.10 At the equipment termination points, insulated phase barriers, PVC bolt caps, PVC hoses or insulating ribs shall be provided.
- 5.11 The outgoing terminal blocks shall be shrouded type or provided with insulating barriers.
- 5.12 Adequate arrangement for earthing shall be provided to safeguard the Operator or other personnel from electric hazards under all conditions of operation.
- 5.13 **Clearances and Creepage**  
The clearances and creepage distances shall not be lower than the values specified below:
- |      |   |         |
|------|---|---------|
| i)   | Minimum clearance between two live parts      | : 20 mm |
| ii)  | Minimum clearance between a live part & earth | : 20 mm |
| iii) | Minimum creepage distance                     | : 28 mm |
- 5.14 **Insulation**
- 5.14.1 The insulation used shall be non-hygroscopic and may be of porcelain, epoxy resin or glass fibre moulded with plastic. It shall be of adequate electrical and mechanical strength to give trouble free service during normal operation and short circuit conditions.
- 5.14.2 The insulation shall be treated suitably to withstand the tropical conditions and atmospheric pollution as specified.
- 5.15 **Wiring**
- 5.15.1 The switch board shall be completely factory wired and ready for external connections.
- 5.15.2 The wiring shall be complete in all respect so as to ensure proper functioning of control, protection, interlocking and measurement.
- 5.15.3 The wiring shall be carried out with flexible stranded PVC insulated copper conductor cables of 1100 V grade of minimum 1.5 Sq.mm size.
- 5.15.4 All wiring shall be marked with dependent both ends marking as per IS: 5578. Numbered ferrules, reading from the terminals outwards, shall be provided at both ends for easy identification. These shall be interlocking type plastic ferrules.
- 5.15.5 The control cables shall be neatly arranged and properly supported on PVC wiring channel.
- 5.16 **Cable Termination**
- 5.16.1 The boards shall be designed for bottom entry of the power and control cables. Sufficient space shall be provided for ease of connection and termination of cable.
- 5.16.2 Provision for receiving one 415 V, 3 phase 4 wire incoming supply lines, one for each charger shall be made. However, DC output for battery and load shall be looped inside the panel and only one outgoing supply each for battery and load shall be provided.



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- 5.16.3 The termination of cables shall be done through cable glands which shall be suitable for the cables.
- 5.16.4 Heavy duty double compression type rolled Aluminium cable glands shall be provided. The cable glands shall be mounted on a removable gland plate, provided at a minimum height of 75 mm from the bottom of the switchboard. Two spare knockouts of size 20 mm shall also be provided on the gland plate for future addition of control cables.
- 5.16.5 For all power cables, crimped type cable lugs of same material as of conductor shall be provided.
- 5.16.6 The internal power wiring shall be terminated in the terminal blocks for connection to the outgoing cables, These terminal blocks shall be pressure clamp type up to 35 Sq.mm, cable and bolted lug type for higher sizes of cables, These shall be protected type and rated for 1100 V service. The minimum current rating of terminal block shall be 16 Amp. The construction shall be such that after the connection of cables by means of lugs, necessary clearances and creepage distances are available.
- 5.16.7 Not more than two wires shall be connected to any terminal. If necessary a number of terminals shall be jumpered together to provide wiring points.
- 5.16.8 Wherever necessary, suitable clamps to support the vertical run of cables shall be provided.
- 5.16.9 The terminal blocks shall be grouped according to circuit functions and suitably numbered. 20% extra terminals shall be provided in the terminal block.
- 5.16.10 For power connection, suitable marking on the terminals shall be provided to identify the phases.
- 5.17 **Earth Bus**
- 5.17.1 A continuous earth bus of Aluminium of suitable size minimum 32 x 6 mm shall be run all over the length in the lower part of the board with two ends connected to the external earth terminals of the board.
- 6.0 COMPONENT DETAILS**
- 6.1 **Rectifier Transformer**
- This shall be double wound, air cooled, 3 phase type. Class 'F' insulating materials shall be used, with temperature rise limited to Class 'B'. The windings shall be vacuum impregnated.
- 6.2 **Thyristors and Diodes**
- The thyristors and diodes shall be properly selected to have adequate safety margin. A factor of safety of minimum 4 shall be taken for voltage surges and 2 for current ratings. The thyristors and diodes shall be mounted on their respective heat sinks which shall preferably be made of extruded Aluminium properly machined and providing intimate contact with the stud for heat dissipation. Each thyristor/ diode shall be protected with properly designed snubber circuit.
- 6.3 **Air Break Switches**
- The switches shall be heavy duty quick make, quick break type conforming to IS/IEC 60947. Switches shall be snap action rotary type. 'ON'-'OFF' position of the switch shall be boldly indicated. The handle of switches shall remain fastened to the door even when the door is opened after turning the switch 'OFF'. The AC input switch shall not be directly mounted on the door.

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#### 6.4 **Fuses**

For protection of thyristors/ diodes, semi-conductor fuses shall be provided. All other fuses shall be HRC cartridge link type. They shall be suitable for the load and service required.

#### 6.5 **Contactors**

The contactor shall be air break type of category AC-3/ DC-1 as per IS/IEC 60947. DC contactor shall be provided with arc chutes and magnetic blow out coil. The contactors shall not drop out even when the coil voltage drops to 65% of rated voltage.

#### 6.6 **Thermal Overload Relays**

Adjustable bimetal thermal overload relays shall be provided. The bimetal relays shall be ambient temperature compensated. The thermal relays shall be provided with a manual resetting device on the door.

6.7 All ammeters and voltmeters shall be class 1.5 as per IS 1248 and shall be flush mounted type of minimum size 96 x 96 mm. Ammeters and Voltmeters for A.C. service shall be of moving iron type and that for D.C. service shall be moving iron or moving coil type. Zero adjuster shall be provided for operation from the front of the cases.

#### 6.8 **Printed Circuit Boards (PCBs)**

The PCBs shall conform to IS 7405. These shall be of fibre or epoxy glass moulded of minimum thickness 1.5 mm and shall have gold plated contacts and silver or nickel plated tracks. All PCBs shall be of plug-in type contained in a dust proof box. PCBs shall be self diagnostic type and shall be provided with status indication. Metering points shall be provided on each PCB and the PCBs shall be clamped in position so that vibration or long usage does not result in loose contacts.

#### 6.9 **Timers**

The timers shall be electronic, pneumatic or synchronous type conforming to IS: 5834 with manual/auto reset features as per the functional requirements. The repeat accuracy shall be within 5%.

#### 6.10 **Control and Selector Switches**

6.10.1 All the control and selector switches shall be of rotary type with thermal utilization category of AC 11 or DC 11 as per IS/IEC:60947.

6.10.2 The control switches shall be spring return type and provided with pistol grip type handles.

6.10.3 The selector switches shall be stay-put type and provided with oval handle.

#### 6.11 **Signal Lamps**

6.11.1 Signal lamps shall be provided to indicate the various circuit conditions and these shall be placed at a suitable height. The colour of the lamps for various functions shall be as follows:

Red	--	Circuit 'ON'
Green	--	Circuit 'OFF'
Amber	--	Alarm and auto trip.

6.11.2 The lamps shall be LED type having lumen output of 200 millicandella in axial direction.

#### 6.12 **Audio Visual Alarm Annunciation**

6.12.1 A solid state audio-visual alarm annunciation system shall be provided for the board. Audible annunciation shall be provided by means of hooter with provision of remote alarm and acknowledgment. Visual annunciation shall be provided by flashing of the



respective facia window. The facia window shall have translucent glass or plastic cover with inscription in black letters. Each facia window shall be provided with two lamps connected in parallel. The cover plate of the facia window shall be flush with the panel and shall be capable of easy removal to facilitate replacement of lamps.

- 6.12.2 The following operating sequence shall be adopted for audio visual alarm and indication:

System Condition	Visual Signal	Audible Signal
Normal	OFF	OFF
Abnormal	Flashing	ON
Acknowledge	Steady ON	OFF
Return to normal	OFF	OFF
Test	Steady ON	ON

## 7.0 ACCESSORIES

The supply shall include the following accessories:

### 7.1 Space Heater

Each cubicle of the board shall be provided with a thermostatically controlled space heater, rated for 240 V, 50 Hz and controlled through double pole miniature circuit breaker. The space heater supply shall be tapped from incomer power supply.

### 7.2 Name Plates

7.2.1 The board shall have a large name plate on the top to indicate its name and designation.

7.2.2 Each cubicle shall be provided with a name plate.

7.2.3 All control switches, push buttons, lamps etc. shall have function identification labels.

7.2.4 Name plate shall be of black perspex with white engraving of minimum 3 mm thickness.

### 7.3 Fuse Puller

7.4 Any other accessories required but not specified shall also be supplied to make the board complete in all respects and ensure its safe and proper operation.

## 8.0 PAINTING

8.1 The enclosure after suitable pre-treatment shall be painted with two coats of anti-rust paint followed by two coats of anti-corrosive paint.

8.2 Epoxy based paint shall be used.



8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

8.4 Unless otherwise specified the finishing shade shall be light grey having Shade No. 631 as per IS 5.

## 9.0 TESTS AND INSPECTION

9.1 The board shall be subjected to routine tests as per IS 8623 and other relevant standards. Heat run test, if required, shall be carried out.

9.2 Additional tests, wherever specified shall be carried out on one board of each rating.

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9.3 All the above tests shall be carried out in presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and site inspection.

9.4 These inspections shall however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.

**10.0 DRAWINGS AND DOCUMENTS**

10.1 Drawings and documents as per Annexure-II shall be supplied unless otherwise specified.

10.2 All drawings and documents shall have the following description written boldly:

- Name of client
- Name of consultant
- Enquiry / Order Number with plant / project name
- Code No. and Description

**11.0 SPARES**

11.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.

11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.

11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.

11.4 All spare parts shall be identical to the parts used in the equipment.

**12.0 PACKING**

12.1 The board shall be properly packed before despatch to avoid damage during transport, storage and handling.

12.2 The packing box shall contain a copy of the installation, operation and maintenance manual along with one set of drawings.

12.3 A sign to indicate the upright position of the panels to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.



ANNEXURE - I

REQUIREMENT OF PROTECTIONS, METERING, CONTROL AND INDICATIONS /  
ANNUNCIATIONS FOR BATTERY CHARGER

Sl. No.	Description	To be mounted on		
		Float cum Load Charger	Standby Float cum Load Charger	Boost Charger
1	2	3	4	5
1.	<b>A.C. Input Side</b>			
	i) ON/OFF Switch	Yes	Yes	Yes
	ii) HRC Fuses	Yes	Yes	Yes
	iii) Contactor	Yes	Yes	Yes
	iv) Thermal O/L Relay	Yes	Yes	Yes
	v) Single phasing and Phase Reversal	Yes	Yes	Yes
	vi) Voltmeter with SS	Yes	Yes	Yes
	vii) Ammeter with SS	Yes	Yes	Yes
	viii) Signal Lamp (ON/OFF)	Yes	Yes	Yes
2.	<b>Rectifiers</b>			
	i) Semiconductor fuses	Yes	Yes	Yes
	ii) Filters with fuses	Yes	Yes	Yes
	iii) Surge Suppressors	Yes	Yes	Yes
3.	<b>DC Output Side</b>			
	i) ON/OFF Switch	Yes	Yes	Yes
	ii) HRC Fuses	Yes	Yes	Yes
	iii) Blocking Diodes	Yes	Yes	Yes
	iv) Voltmeter	Yes	Yes	Yes
	v) Ammeter	Yes	Yes	Yes
	vi) Signal Lamp (ON/OFF)	Yes	Yes	Yes
	viii) Charging Ammeter (on demand type)	Yes	Yes	Yes

Sl. No.	Description	To be mounted on		
		Float cum Load Charger	Standby Float cum Load Charger	Boost Charger
1	2	3	4	5
4.	<p><b>Common Items</b></p> <p>i) Droper Diodes</p> <p>ii) Solid State facia annunciator for :</p> <p>-- Automatic changeover from one charger to another</p> <p>-- Rectifier fuse failure in float/standby float/boost</p> <p>-- Incoming supply failure float/standby float/boost</p> <p>-- DC output under voltage</p> <p>-- Earth fault</p> <p>-- Single phasing and phase reversal</p> <p>-- Filter fuse failure float/standby float/boost</p> <p>iii) Battery isolating switch and HRC fuses</p> <p>iv) Battery under voltage relay</p> <p>v) Battery earth fault relay</p> <p>vi) DC Contactor</p>	<p>Yes</p> <p>Yes</p>	<p>Yes</p>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>

**NOTE:** Any other components as required for satisfactory operation of the battery charger shall be provided.



**ANNEXURE - II**

**DOCUMENTATION FOR BATTERY CHARGER**

Sl.No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	General arrangement drawings showing overall dimensions of the charger board and mounting details of various equipment inside the charger panel	N	Y	Y
4.	Foundation plan indicating certified dimensions, floor openings, weight, clearance etc.	N	Y	Y
5.	Schematic and Wiring Diagrams	N	Y	Y
6.	Descriptive literature of the charger and various components mounted in the panel.	N	N	Y
7.	Characteristics curves for the charger and all other static and control devices, relays etc.	N	N	Y
8.	Installation, Operation and Maintenance manual	N	N	Y
9.	Guarantee Certificates	N	N	Y
10.	Test Certificates	N	N	Y
11.	Spare parts list with identification marks	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



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**TECHNICAL SPECIFICATION**  
**BATTERY**





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ANNEXURE - I	DOCUMENTATION FOR BATTERY



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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and despatch in well packed condition of batteries and accessories.
- 1.2 This standard shall be read in conjunction with the relevant part of Design Philosophy - Electrical.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the battery shall conform to the latest issue of the following standards:

- IS: 1651 -- Stationary cells & batteries, lead-acid type (with tubular positive plate)
- IS: 1652 -- Stationary cells & batteries, lead-acid type with plante positive plates.
- IS: 10918 -- Vented type nickel cadmium batteries

All accessories shall also conform to the relevant Indian Standard. Equipment complying with equivalent IEC standards shall also be acceptable.

- 2.2 The design and operational features of the equipment offered shall comply with the provisions of the latest issue of the Indian Electricity Rules and other Statutory Acts and Regulations. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy - Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy - Electrical.

## 4.0 OPERATING REQUIREMENTS

The battery shall be able to deliver rated ampere hours when discharged at the 10 hours rate of discharge to a final voltage of 1.85 V per cell for Lead Acid and at the 5 hours rate of discharge to a final voltage of 1.1 V per cell for Ni-Cd battery under the ambient conditions indicated in Design Philosophy - Electrical.

## 5.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

- 5.1 The battery shall be of Ni-Cd type and rated for 110V. Each battery bank shall consist of 90 number of cells.
- 5.2 The battery bank shall be complete with all necessary components such as lids, plugs, separators and buffers, inter-cell connectors, lead coated bolts and nuts, cell insulators etc.
- 5.3 The required quantity of electrolyte plus 10% extra quantity shall be supplied in suitable non-returnable containers along with the battery.

## 6.0 ACCESSORIES

The following accessories shall be supplied with each battery bank:-

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- (a) 1 Set -- Battery Stand constructed out of teak wood without the use of any metal fastenings and coated with 3 coats of anti-acid paint. The stand shall be properly designed so that each cell shall be easily accessible for inspection, topping up etc. However, for Ni-Cd battery mild steel stand with alkali resistant paint may also be accepted
- (b) 1 Set -- Inter-row, inter-tier and inter-stand connectors and takeoffs. These shall be sized suitably to have adequate current carrying capacity and mechanical strength
- (c) 1 Set -- Cell Insulators
- (d) 1 Set -- Stand Insulators
- (e) 1 No. -- Centre zero cell testing voltmeter scaled 3-0-3 volts
- (f) 2 Nos. -- Syringe type Hydrometers for measuring the specific gravity of the electrolyte
- (g) 2 Nos. -- Gravity correction thermometers, mercury-in-glass type
- (h) 1 Set -- Connecting bolt wrenches
- (i) 1 No. -- Rubber syringe for tapping cells
- (j) 1 No. -- Wall mounting type teak wood holder for Hydrometer and Thermometer.
- (k) 1 No. -- Acid/Alkali resisting funnel.
- (l) 1 No. -- Acid/Alkali resisting jug.
- (m) 1 Pair -- Rubber gloves.
- (n) 1 No. -- Rubber Apron.



All other accessories, not specified above, but required for satisfactory operation and maintenance shall also be supplied.

## 7.0 TESTS AND INSPECTION

- 7.1 Type tests shall be carried out as per relevant standards on two cells in the presence of Purchaser's representative.
- 7.2 Acceptance tests shall be carried out as per relevant standards on each cell after installation at site.
- 7.3 In addition, the battery shall be subjected to stage inspection at works and inspection at site for final acceptance.
- 7.4 These inspections shall, however, not absolve the vendor from his responsibilities for making good any defect which may be noticed subsequently.

## 8.0 DRAWINGS AND DOCUMENTS

- 8.1 Drawings and documents as per Annexure-I shall be furnished by the Vendor unless otherwise specified.
- 8.2 All drawings and documents shall have following description written boldly:
- Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description

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## 9.0

### SPARES

- 9.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 9.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 9.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.
- 9.4 All spare parts shall be identical to the parts used in the equipment.

## 10.0

### PACKING

The battery cells and accessories shall be properly packed to safeguard against weather conditions and rough handling. It shall be wrapped in polythene bags with an additional wrapping bitumen paper to make it completely water proof before it is packed in crates. The packing box shall contain a copy of the installation operation and maintenance manual.

ANNEXURE – I



DOCUMENTATION FOR BATTERY

Sl. No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	Dimensional drawings showing the cell arrangement on stand (Plan, front and side elevation) for each type of battery.	N	Y	Y
4.	Illustrative and descriptive literature giving the complete details of construction of battery	N	N	Y
5.	Operation and maintenance instructions	N	N	Y
6.	Test Certificates			
	-- Type	N	N	N
	-- Acceptance	N	N	Y
7.	Guarantee Certificates	N	N	Y
8.	Spare Parts lists	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



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# TECHNICAL SPECIFICATION

## CABLES

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ANNEXURE - I	DOCUMENTATION FOR CABLES

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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and dispatch in well packed condition of power and control cables.
- 1.2 The standard shall be read in conjunction with relevant part of Design Philosophy - Electrical and other relevant references as specified therein.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of cables covered by this standard shall comply with the latest issue of following Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.

- IS: 1554 Part (I) -- PVC insulated (heavy duty) electric cables for working voltages upto and including 1100 volts.
- IS: 1554 Part (II) -- PVC insulated (heavy duty) electric cables for working voltages from 3.3 KV upto and including 11 KV.
- IS: 7098 Part (I) -- Cross linked polyethylene insulated PVC sheathed cables for working voltages upto and including 1100 volts.
- IS: 7098 Part (II) -- Cross linked polyethylene insulated PVC sheathed cables for working voltages from 3.3 KV upto and including 33 KV
- IS: 694 -- PVC insulated cables for working voltages upto and including 1100 volts
- IS: 5831 -- PVC insulation and sheath of electric cables

- 2.2 The design and operational features of the cables offered shall also comply with the provisions of latest issue of the Indian Electricity Rules and other relevant Statutory Rules & Regulations. The supplier shall, whenever necessary, make suitable modification in the cables to comply with the above mentioned rules.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated elsewhere in Design Philosophy - Electrical.

### 3.2 System Details

These shall be as indicated elsewhere in Design Philosophy - Electrical.



## 4.0 OPERATING REQUIREMENTS

The cables shall be suitable for operating continuously at the rated capacity as specified in relevant I.S. under the ambient conditions without exceeding the permissible temperature rise and without any detrimental effect on any part.

## 5.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

- 5.1 The design, manufacture and workmanship of cables shall be in accordance with the latest practice.
- 5.2 All materials to be used shall be new, unused and of the best quality.



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### 5.3 Conductors

The power cables shall be of stranded Aluminium / copper round or shaped conductors and control cables shall be of annealed high conductivity stranded copper round conductors. The conductors shall comply with the requirements of IS: 8130.

### 5.4 Insulation

The conductor insulation shall be XLPE and shall comply with relevant IS.

### 5.5 Fillers

The cables shall have suitable fillers wherever required, laid up with conductors to provide substantially circular cross section before the inner sheath is applied.

### 5.6 Inner Sheath

Inner sheath, wherever applicable shall be ST1/ ST2 type compound applied by extrusion process except for paper cables for which it shall be of lead or lead alloy.

### 5.7 Armouring

All power and control cables shall be armoured. The single core cables shall be armoured with hard drawn Aluminium taps/ wires or any other suitable nonmagnetic material. All other cables shall have galvanized steel wire / strip armouring.

### 5.8 Outer Sheath

The outer sheath shall be ST1/ ST2 type compound applied by extrusion process and suitable to withstand atmospheric pollution, resistance to termites, fire retardant and coloured black.

### 5.9 Screening

Screening over conductor and insulation shall be provided as per relevant standard unless specified otherwise. The screening for control cables if specified shall be of aluminium, mylor or equivalent and provided with tinned drain wire which shall be continuous and permanently connected to the screen.

### 5.10 Identification

The individual cores of cables shall be coloured as per relevant IS. Where it is not possible to distinguish the cores by colour, coloured strip shall be applied on the cores or core nos. shall be marked on each core at regular intervals. All cables shall carry the manufacturer's name or trade mark, the cable size, voltage rating and year of manufacture at intervals not exceeding 100 meters. Running meter markings shall also be provided throughout the length of the cable.

### 5.11 Dimension

The overall dia. and dia. under armour of the cables shall be indicated by the vendor in the technical particulars. These shall be guaranteed with a tolerance of  $\pm 5\%$  but not exceeding 2 mm.



5.12 The cut ends of the cables shall be sealed by means of non-hygroscopic materials.

## 6.0 SPECIAL PURPOSE CABLES

### 6.1 Flame Retardant Low Smoke Cables

Flame retardant low smoke cables shall have outer sheath of PVC having following values.

- Minimum oxygen index - 29%
- Minimum temperature index - 250°C

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- Maximum acid gas generation - 20%
- Maximum smoke density rating - 60%

## 6.2 Heat Resistant Cables

Heat resistant cables shall be of silicon rubber insulated laid circular with asbestos worming and overall glass fibre braided and varnished. Silicon rubber insulating compound shall conform to IS: 6380 and the constructional features shall conform generally to IS: 9968.

## 7.0 CABLE DRUM

- 7.1 The cables shall be supplied in non-returnable wooden drums (or steel drums if specified) of heavy construction. The wood used for construction of the drums shall be properly seasoned, sound and free from defects.
- 7.2 Cables shall be supplied in specified drum lengths. Where no such indication is given, standard drum lengths may be offered.
- 7.3 The tolerance on each drum of cable shall not exceed  $\pm 2.5\%$ . However, no negative tolerance on HV cables is acceptable.
- 7.4 All cable drums shall have stencilled data as per relevant IS as well as the purchaser's order no., item no. & drum no.

## 8.0 TESTS AND INSPECTION

- 8.1 The following tests shall be carried out on the cables as per relevant IS.
- i) Routine Tests - On all cables
  - ii) Acceptance tests - On representative length of each size
  - iii) Type tests - Wherever specified on one cable drum of each size
- 8.2 In addition, the following tests shall be carried out on all fire retardant low smoke cables as per IS or as per the following standards:
- i) Oxygen and temperature index test as per ASTM-D-2863
  - ii) Acid gas emission test as per IEC-754 Part-I
  - iii) Smoke density test as per ASTM-D-2843
  - iv) Flammability test as per IEC-332 Part-I or IS-10810
- 8.3 All the above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the cables shall be subjected to stage inspection at works and inspection at site for final acceptance.
- 8.4 These tests and inspections shall, however, not absolve the vendor from their responsibility for making good any defect which may be noticed subsequently.

## 9.0 DRAWINGS AND DOCUMENTS

- 9.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 9.2 All drawings and documents shall have the following descriptions written boldly.
- Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description


**ANNEXURE - I**  
**DOCUMENTATION FOR CABLES**

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	Illustrative and Descriptive catalogues	N	N	Y
4.	Installation, Termination and Jointing Instructions	N	N	Y
5.	Test certificates			
	a) Routine	N	N	Y
	b) Type	N	N	Y
6.	Guarantee Certificates	N	N	Y

**Note:**



1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No

	<b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - PREFABRICATED LADDER TYPE</b> <b>CABLE RACKS</b>	<b>PC183-TS-0816</b>	0	
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## TECHNICAL SPECIFICATION

### PREFABRICATED LADDER TYPE CABLE RACKS

	<b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - PREFABRICATED LADDER TYPE</b> <b>CABLE RACKS</b>	PC183-TS-0816	0	
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4.0	MARKING
5.0	TESTS AND INSPECTION
6.0	DRAWINGS AND DOCUMENTS
ANNEXURE - I	DOCUMENTATION FOR PREFABRICATED LADDER TYPE CABLE RACKS

	<b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - PREFABRICATED LADDER TYPE</b> <b>CABLE RACKS</b>	<b>PC183-TS-0816</b>	0	
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## 1.0 SCOPE



- 1.1 This standard covers the technical requirements of design, fabrication, testing at works and delivery in well-packed condition of prefabricated ladder type cable racks.
- 1.2 The standard shall be read in conjunction with Drawing Nos. PDS: E 530 to 538 (9 Sheets).

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the cable racks covered by this standard shall comply with the latest issue of following and other relevant Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- IS: 733 -- Wrought aluminium and aluminium alloy bars, rods and sections for general engineering purposes
- IS: 2629 -- Recommended practice for hot dip galvanising on iron and steel
- IS: 4759 -- Hot dip zinc coatings on structural steel and other allied products
- 2.2 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

- 3.1 Ladder type cable racks shall be fabricated as per attached Drawing Nos. PDS: E 530 to PDS: E 538 (9 Sheets).
- 3.2 Cable racks and accessories such as coupler plate, tees, bend, elbows etc. shall be fabricated from 3 mm thick mild steel galvanised sheet or 4 mm thick aluminium 19000 H2 alloy sheet extrusion conforming to designation No. 64430 and condition WP as per IS: 733.
- 3.3 G.I. racks and accessories shall have zinc coating of 800 gm/sq. metre applied by hot dip galvanising process. Galvanising shall be uniform, adherent, smooth and free from defects.
- 3.4 The finished rack and accessories shall be free from sharp edges and corners, burrs and un-evenness. Stepped arrangement of bending is not acceptable. The channel members in the bending shall have uniform curvature and shall be made out of single piece.
- 3.5 The racks shall be supplied in minimum length of 2.4 metre.
- 3.6 Each straight length and bend shall be supplied with two coupling plates fitted at each side channel at one end. The coupling plates shall be supplied with bolts, nuts and washers fitted at the other four holes for fixing to adjoining member.
- 3.7 Coupling plate shall be designed to permit longitudinal adjustment upto  $\pm 10$  mm and skew upto  $10^\circ$ .
- 3.8 Clamping arrangement as per attached drawings shall be provided for fixing the rack with the cross support as required.
- 3.9 All the bends, tees and junctions shall be made sufficiently rigid by providing suitable reinforcement on rungs as required.
- 3.10 The rungs shall be connected to the side channels by continuous welding alongwith three sides of rung. Aluminium rack shall be welded by TIG welding process.
- 3.11 All hard wares such as nuts, bolts, washers and crank bolts shall be cadmium plated.

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3.12 Tolerances in various dimension shall be follows:

Length	--	± 5 mm
Width	--	± 2 mm
Height	--	± 1 mm
Bend	--	± 1 mm
Thickness	--	± 0.2 mm

Positive tolerance on total quantity upto ± 5% is acceptable. However, negative tolerance on total quantity is not acceptable.

#### 4.0 MARKING

The packing shall be clearly marked on the outside (on top side & ends) in indelible ink with the following minimum details:

- Part No.
- Size of Tray (Length x Width x Height)
- No. of Tray / Section, Total Weight
- Material Specification
- Client's Name
- Purchase Order No.
- Manufacturer's Name

#### 5.0 TESTS AND INSPECTION

5.1 Following tests shall be carried out on prefabricated cable racks:



Visual inspection and checking for

- i) Quality and thickness of raw material
- ii) Dimensions as per drawing.
- iii) Quality of welding (before galvanising for G.I. racks)
- iv) Preparation of metal surfaces (for G.I. racks).

5.2 After galvanising, G.I. cable racks shall be subjected to following tests as per IS:4759.

- i) Mass of galvanising coating -- At any location the thickness of zinc coating shall not be less than 90 micron. However, average thickness of zinc coating shall not be less than 113 micron.
- ii) Uniformity of galvanising coating.
- iii) Adhesion of galvanising coating.
- iv) 3 samples from each lot shall be taken for testing.
- v) From each lot and size of rack, measure length of 10 trays and average length to be multiplied by number of trays to arrive for total length.

5.3 All the above tests shall be carried out in the manufacturer's works in the presence of Purchaser's representative. In addition to the above tests, the cable racks and its accessories shall be subjected to stage inspection at works and inspection at site for final acceptance.

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5.4 These tests and the Purchaser's inspection shall, however, not absolve the vendor from their responsibility for making good any defect which may be noticed subsequently.



**6.0 DRAWINGS AND DOCUMENTS**

6.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

6.2 All drawings and documents shall have the following descriptions written boldly.

- Name of client
- Name of consultant
- Enquiry / Order Number with plant / project name
- Code No. and Description



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### ANNEXURE - I

#### DOCUMENTATION FOR PRE-FABRICATED LADDER TYPE CABLE RACKS

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Illustrative and Descriptive catalogues	N	N	Y
2.	Installation, Termination and Jointing Instructions	N	N	Y
3.	General Arrangement Drawings, showing details of rack, coupling pieces, fasteners, etc.	N	Y	Y
4.	Test certificates	N	N	Y
5.	Guarantee Certificates	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



**TALCHER FERTILIZERS LIMITED**  
**TECHNICAL SPECIFICATION - LOCAL CONTROL STATION**

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# **TECHNICAL SPECIFICATION**

## **LOCAL CONTROL STATION**



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4.0	OPERATIONAL REQUIREMENTS
5.0	GENERAL DESIGN & CONSTRUCTIONAL FEATURES
6.0	SPECIAL FEATURES FOR FLAMEPROOF LOCAL CONTROL STATION
7.0	COMPONENT DETAILS
8.0	PAINTING
9.0	TESTS AND INSPECTION
10.0	DRAWINGS AND DOCUMENTS
11.0	SPARES
12.0	PACKING
ANNEXURE - I	DOCUMENTATION FOR LOCAL CONTROL STATIONS



## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of Local Control Stations.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy - Electrical and other relevant references as specified therein.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of IS/IEC:60947 and other relevant Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 The design and operational features of the equipment offered shall also comply with the provisions of latest issue of the Indian Electricity rules and other relevant statutory Acts and Regulations. The supplier shall, wherever necessary, make suitable modification in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

These shall be as indicated elsewhere in Design Philosophy - Electrical.

### 3.2 System Details

These shall be as indicated elsewhere in Design Philosophy - Electrical.

## 4.0 OPERATIONAL REQUIREMENTS

This equipment and associated components shall be suitable for operating satisfactorily under the specified ambient and system conditions.

## 5.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

- 5.1 The Control Stations shall be suitable for control voltage not exceeding 500V, 50 Hz AC or 220V D.C.
- 5.2 The enclosure shall be of die cast Aluminium alloy LM-6. As an alternative to cast Aluminium, fibre glass enclosure is also acceptable.
- 5.3 The equipment shall have dust, hose and weather proof construction equivalent to IPW-55 as per IS/IEC:60947. These shall be suitable for outdoor location without any additional protection or cover.
- 5.4 A rain-hood shall be offered as an additional item. It shall be made of 14 gauge Aluminium sheet bent to shape. In case of fibre glass enclosure, these can be made of fibre glass.
- 5.5 All external hardware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated. For fibre glass enclosure Nylon PVC bolts of diameter 8 mm may be used.
- 5.6 The control station shall preferably be with bolted cover. The bolts for retaining the cover in position shall be provided with 10 mm dia. stainless steel and these shall be so arranged that they do not pierce into the door gasket.
- 5.7 All the components shall be mounted on a base plate inside the enclosure. Necessary actuating system for control switch, push button, non yellowing acrylic/ glass cover for

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ammeter and indication lamps shall be provided on the front cover. No wiring shall be carried out on the front cover.

- 5.8 The layout of components in the control station shall be liberal and standardised.
- 5.9 All mating surfaces shall be smoothly machined and shall be of sufficient width of at least 6 mm. The covers shall be provided with continuous gasket made of neoprene or synthetic rubber to prevent ingress of dust and moisture. The gasket shall be held in position in groove provided in the enclosure and shall be pressed all around uniformly by suitably shaped projection of the door. Gaskets simply glued to the surface are not acceptable.
- 5.10 The enclosure shall be suitable for mounting on wall or on steel structure. 4 Nos. holes suitable for 12 mm bolts shall be provided outside the enclosure for fixing the control stations.
- 5.11 The internal wiring shall be carried by means of single core PVC insulated 1.5 sq. mm stranded copper conductor cable. All termination shall be made with crimping type proper size lugs and shall be properly ferruled.
- 5.12 The control stations shall be completely factory wired and ready for external cable connection.
- 5.13 For easy identification, numbering ferrules shall be provided on all wiring at both ends i.e. equipment end and terminal block end. Terminals for external wiring shall be numbered
- 5.14 The enclosure shall be provided with two earthing terminals with studs of 8 mm. dia. projecting outside the enclosure for connection to earth. These terminals shall not pierce through the enclosure and shall be marked with earthing symbol.
- 5.15 Each control station shall be provided with minimum 2 mm thick stainless steel name plates or consisting of black Perspex with white engraving indicating the code number and description of the equipment controlled by it. Similar labels shall be provided for all indication lamps, push buttons and control switches. The name plate and label shall be fixed with screws only.

## **6.0 SPECIAL FEATURES FOR FLAME PROOF LOCAL CONTROL STATION**

- 6.1 The enclosure shall be in addition, of flameproof execution as per IS: 2148.
- 6.2 The control stations shall be suitable for hazardous area of enclosure group and temperature class as indicated in Design Philosophy - Electrical.
- 6.3 Cables shall enter the terminal box through flame proof cable gland. From the terminal chamber to the main enclosure, the connections shall be made through proper bushings. Direct entry of external cables into the main enclosure shall not be accepted. All entries shall be provided with stainless steel inserts.
- 6.4 An additional earthing terminal inside the terminal chamber shall be provided.
- 6.5 Local control stations and cable gland must be certified by the Central Mining Research Institute, Dhanbad or any other statutory authority for use in the specified hazardous area.

## **7.0 COMPONENT DETAILS**

### **7.1 Trip-Neutral-Close Switch**

TRIP-NEUTRAL-CLOSE switch shall be double pole, 3 position, pistol grip, rotary type having self spring return feature to neutral position. The contacts shall be of phosphor bronze and shall be provided with two breaks in series. Mechanical sequence device to prevent two successive movements to the same position shall be fitted. The switch shall be capable of being padlocked in the 'TRIP' position.

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- 7.2 **‘Auto-Manual’ Switch**  
‘Auto-Manual’ switch shall be single pole stay put type having three positions “AUTO-OFF-MANUAL”. Provision shall be made to padlock the switch in the “OFF” position.
- 7.3 **Selector Switch / Lock Service Switch**  
These shall be single pole stay put type having two position with a pistol grip handle and capable of being padlocked in one of the position.
- 7.4 All the switches shall be rotary type with snap or wiping action contact and having a set of normally open and closed contacts in each position. All switches shall be provided with pistol grip handle.
- 7.5 **‘Off-Auto-On’ Switch**
- 7.5.1 ‘OFF-AUTO-ON’ switch shall be in minimum three stack configuration, each stack having three positions with spring return from ‘ON’ to ‘Auto’ position and lockable in ‘OFF’ position by means of padlock.
- 7.5.2 The switch shall have sliding contact between ‘AUTO’ and ‘ON’ position. In ‘OFF’ position the contact shall be completely broken from ‘AUTO’ position.
- 7.6 **Push Buttons**  
These shall be spring loaded, with a set of normally closed and open contacts. The push buttons for ‘start’ shall be shrouded type and coloured green while ‘stop’ push buttons shall be un-shrouded type and coloured red. Provision shall be made to padlock the ‘stop’ push button in ‘OFF’ position. The fixing ring shall be metallic white. An oil proof rubber cap shall preferably be provided.
- 7.7 The switches and push buttons shall conform to utilization category AC11/ DC11 as per IS/IEC:60947. The contact shall be rated to make, break and carry inductive current of 5 Amp. at 415 V AC and 1 Amp of 220V DC. The contact arrangement shall be as shown in the terminal drawings. Built in locks instead of padlocking are not acceptable.
- 7.8 **Indication Lamps**
- 7.8.1 LED type indication lamps shall be provided to indicate the various circuit conditions as shown in the terminal drawings.
- 7.8.2 The LEDs shall provide good illumination through a viewing angle of 180°. The LEDs shall have lumen output of 200 milli Candella in the axial direction.
- 7.8.3 The colour of the LED indication for various functions shall be as follows:-  
RED : For ‘ON’ Indication  
GREEN : For ‘OFF’ Indication  
WHITE : For “Ready for Service” Indication
- 7.9 **A.C. Ammeters**  
The ammeter shall be flush mounting, moving iron spring controlled type, of accuracy class 1.5 as per IS:1248, with square face of minimum size 72 mm x 72 mm having scale range 0-240°. The ammeter shall be provided with uniform scale up to CT primary current and compressed end scale up to 6 times the CT primary current. Adjustable red pointer shall be provided to indicate the full load current of the motors. Zero adjusters shall be provided for operation from the front of the meter. All ammeters shall be operated through 1Amp. CTs only.

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7.10 **D.C. Ammeters**

The D.C. ammeter shall be shunt operated. These shall be moving coil or moving iron type of accuracy class 1.5 as per IS: 1248.

7.11 **Terminal Blocks**

All control stations shall be provided with terminal blocks. Terminal blocks shall be located at a minimum distance of 50 mm from the bottom of the enclosure. The terminal blocks for the control station shall be suitable for conductor sizes of 2.5 mm<sup>2</sup>. These shall be of pressure clamp type design mounted on the base channel. The minimum rating of terminal block shall be 16 Amp.

7.12 **Cable Glands**

The cables for the external connections, shall enter the terminal chamber through heavy duty double compression type rolled Aluminium cable glands suitable for 2.5 sq. mm PVC insulated, armoured, and PVC sheathed copper conductor 1.1 KV grade cables. The number and cores of control cables shall be as per requirement. The cable gland shall be fitted in a threaded hole.

**8.0 PAINTING**

8.1 The enclosure after suitable pre-treatment shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.

8.2 Epoxy based paint shall be used.

8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

8.4 Unless otherwise specified, the finishing shade shall be of light grey having shade no. 631 as per IS: 5.

**9.0 TESTS AND INSPECTION**

9.1 All equipment shall be routine tested as per relevant standards.

9.2 Additional tests, wherever specified, shall be carried out.

9.3 All the above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection at works and inspection at site for final acceptance.

9.4 These inspections shall, however, not absolve the vendor from their responsibility for making good any defect which may be noticed subsequently.

**10.0 DRAWINGS AND DOCUMENTS**

10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

10.2 All drawings and documents shall have the following descriptions written boldly.

- Name of client
- Name of consultant
- Enquiry / Order Number with plant / project name
- Code No. and Description

**11.0 SPARES**

11.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.

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- 11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 11.4 All spare parts shall be identical to the parts used in the equipment.

**12.0 PACKING**

- 12.1 The local control stations shall be properly packed to safeguard against weather conditions and handling during transit. It shall be wrapped in polythene bags and an additional wrapping of bitumen paper shall also be provided to make it completely water proof before the equipment is packed in wooden crates.
- 12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.





**ANNEXURE - I**

**DOCUMENTATION FOR LOCAL CONTROL STATIONS**

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	General Arrangement Drawings	N	Y	Y
4.	Schematic Diagrams	N	Y	Y
5.	Illustrative and Descriptive catalogues	N	N	Y
6.	Catalogues of bought out accessories	N	N	Y
7.	Spare parts list	N	N	Y
8.	Installation, Operation and Maintenance manual	N	N	Y
9.	Test certificates			
	a) Routine	N	N	Y
	b) Type (only for flameproof equipment)	N	N	Y
	c) For enclosure	N	N	Y
10.	Guarantee Certificates	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No

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# TECHNICAL SPECIFICATION

## JUNCTION BOX

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5.0	SPECIAL FEATURES FOR JUNCTION BOXES FOR HAZARDOUS AREA
6.0	PAINTING
7.0	TESTS & INSPECTION
8.0	PACKING
9.0	DRAWINGS AND DOCUMENTS
10.0	SPARES
ANNEXURE - I	DOCUMENTATION FOR JUNCTION BOXES

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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing and inspection at works and delivery in well packed condition of junction boxes.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy - Electrical and other relevant references as specified their in.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of relevant Indian standards unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 Flameproof & increased safety junction boxes shall in addition, comply with the requirement as laid down in IS: 2148 & IS: 6381 respectively.
- 2.3 The design and constructional features of the junction boxes offered shall also comply with the provision of latest issue of the Indian Electricity Rules and other relevant Statutory Rules & Regulations. The supplier shall, whenever necessary, make suitable modification in the equipment to comply with the above mentioned rules.
- 2.4 Wherever any requirement laid down in this standard differs from that in Indian Standard specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions



These shall be as indicated in Design Philosophy - Electrical.

### 3.2 System Details

The details of power supply system shall be as indicated in Design Philosophy – Electrical.


## 4.0 GENERAL DESIGN & CONSTRUCTIONAL FEATURES

- 4.1 The junction boxes shall be dust and weather proof and suitable for installation outdoors without extra protection. The degree of protection shall be IP-55 as per IS/IEC:60529.
- 4.2 The junction boxes shall be of die cast aluminium alloy LM-6 with domed / suspension covers.
- 4.3 The casting of the junction boxes and their cover shall be pressure die cast. The casting shall be uniform and free from blow holes. All mechanical surfaces shall be free from burrs, dents and internal roughness.
- 4.4 All external hardware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated. For fibre glass enclosure Nylon PVC bolts of diameter 8 mm may be used.
- 4.5 The clearances and creepage distances shall be maintained inside the junction boxes as per relevant Indian standard.
- 4.6 The junction boxes shall be suitable for wall / structure / ceiling mounting and necessary arrangement for mounting the same shall be provided.
- 4.7 The junction boxes shall be provided with continuous gasket made of neoprene or synthetic rubber to prevent ingress of dust. The gasket shall be held in position in groove provided in the enclosure and shall be pressed all around uniformly by suitably shaped projection of the door. Gaskets simply glued to the surface are not acceptable.
- 4.8 The junction boxes housing terminal block shall be moulded type made of DMC / Fibre glass. Threaded terminals shall be made of brass (nickel plated or tinned) and provided

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with two tightening threaded nuts and four washers all made of brass (nickel plated or tinned). The terminals shall have two shorting links each horizontally placed connecting three terminals.

- 4.9 The terminal block shall be fitted with junction boxes base by means of 2 nos. 1/2" long nickel plated brass screws.
- 4.10 The junction boxes shall be provided with two nos. external earthing terminals and 1 no. internal earthing terminal.
- 4.11 All live parts inside the junction boxes shall be insulated and shall withstand a test voltage of 2.5 KV for 1 minute.
- 4.12 The junction boxes shall be provided with heavy duty double compression type rolled Al cable glands to suit the cable entries.
- 4.13 Threaded blanking plugs shall be provided for junction boxes to plug out the entries not in use as indicated in bill of quantities enclosed.
- 4.14 The junction boxes shall be provided with a blank stainless steel tag plate fastened to the junction box top cover with two stainless steel screws. The plate shall be at least 25 mm wide, 100 mm long and 1 mm thick.
- 4.15 For flameproof / increased safety junction boxes, the manufacturer shall submit copies of test certificates from statutory authorities clearly stating that the junction boxes as well as cable glands / blanking plugs are suitable for hazardous area.
- 4.16 **15 Amp. Junction Box**
- 4.16.1 The junction boxes shall be 4 way dome cover type.
- 4.16.2 The dimensions of the junction boxes with their cover and accessories shall be generally as per PDS: E-547.
- 4.16.3 The junction boxes housing terminal block shall be moulded type made of DMC / Fibre glass as per Drg. no. PDS: E-557.
- 4.17 **63 Amp. Junction Box**
- 4.17.1 The junction boxes shall be 3 / 4 way dome cover type.
- 4.17.2 The minimum internal diameter of the box shall be 240 mm.
- 5.0 **SPECIAL FEATURES FOR JUNCTION BOXES FOR HAZARDOUS AREA**
- 5.1 For increased safety junction boxes, the terminals shall be provided with positive locking device against loosening.
- 5.2 The enclosure shall be in addition, of increased safety execution, Exe, as per relevant standard and shall be suitable for installation in classified hazardous area.
- 5.3 The junction boxes shall be liberally dimensioned in order to avoid temperature rise inside the enclosure which may damage the insulating materials or gaskets employed therein.
- 5.4 Cables shall enter the terminal box through increased safety compression type cable glands. From the terminal chamber to the main enclosure, the connections shall be made through proper bushings.
- 5.5 An additional earthing terminal inside the terminal chamber shall be provided.
- 5.6 The junction boxes shall be provided with Brass-Nickel plated shorted links. The terminal block shall be made of non-hygroscopic compound. Bakelite / Hylam shall not acceptable.
- 5.7 All screws / bolts and nuts shall be of stainless steel.

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- 5.8 Junction boxes and cable glands must be certified by Statutory Authorities for use in the specified hazardous area. Equipments certified by overseas authorities shall obtain certificate of compliance / letter of opinion from respective statutory authorities.
- 5.9 Type Test certificates for increased safety type junction boxes and cable glands along with blanking plugs shall be supplied.
- 6.0 **PAINTING**
- 6.1 Epoxy based electrostatic powder coating paint shall be provided on exterior surface while the interior of junction boxes shall be painted with anti-condensate paint. The painting shall be able to withstand corrosive atmosphere.
- 6.2 Unless otherwise specified, the finishing shade shall be grey having shade no. 632 as per IS-5.
- 6.3 The terminal block of junction boxes shall be painted with Red, Yellow, Blue & Black colour for phase indication.
- 7.0 **TESTS AND INSPECTION**
- 7.1 The junction boxes shall be routine tested as per relevant standards.
- 7.2 Additional tests, wherever specified, shall be carried out on one unit of each rating.
- 7.3 The procedure & extent of the physical checks, routine & type test shall be governed by Quality Assurance Plan mutually agreed and approved by Inspection Authority.
- 7.4 All the above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection at works and inspection at site for final acceptance.
- 7.5 These inspections shall, however, not absolve the vendor from their responsibility for making good any defect which may be noticed subsequently.
- 8.0 **PACKING**  
Each junction box and cable gland shall be suitably packed and protected from damage due to transportation, loading and unloading. Threaded fittings shall have plastic caps to protect the threading.
- 9.0 **DRAWINGS AND DOCUMENTS**
- 9.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 9.2 All drawings and documents shall have the following descriptions written boldly:
- Name of client
  - Name of consultant
  - Enquiry / order number with plant / project name
  - Motor Code No. and Description
- 10.0 **SPARES**
- 10.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 10.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 10.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 10.4 All spare parts shall be identical to the parts used in the equipment.



**ANNEXURE - I**  
**DOCUMENTATION FOR JUNCTION BOXES**

Sl. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	Certified dimensional drawing, including mounting details	N	Y	Y
4.	Drawing showing constructional details	N	Y	Y
5.	Illustrative and Descriptive catalogues	N	N	Y
6.	Spare parts list	N	N	Y
7.	FLP/Exe certificates for junction boxes and terminals conforming to IEC/ISS (CMRI, CCE, DGFASLI and BARC for terminals)	N	N	Y
8.	Certificate for weather proof construction for junction boxes as per IPW-55	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No

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## TECHNICAL SPECIFICATION

### ELECTRICALS FOR OVERHEAD CRANES & HOISTS



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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, engineering, manufacture, testing at works, supply at site, erection, site testing and commissioning of the complete electrical equipment and accessories as required for the overhead travelling crane and hoists.
- 1.2 This standard shall be read in conjunction with relevant mechanical specifications, other relevant standards / specifications.
- 1.3 The scope of work shall include but not limited to the following items:
- i) Drive motors
  - ii) Starting resistors (in case of slip ring motors)
  - iii) Power control panel
  - iv) Control stations
  - v) Limit switches
  - vi) Electromagnetic brakes
  - vii) Power and control cables with accessories
  - viii) Earthing of all equipment
  - ix) All other items, not specified but, required for safe and proper operation
- 1.4 The owner shall provide one no. medium voltage feeder for each crane / hoist and terminate the feeder cable in an isolator located at one end of the bay at a height of 1.5 m from the operating floor. The vendor shall indicate the exact power requirement (running and peak) to enable the owner to size and provide the power supply feeder.
- 1.5 Further distribution of power from this isolator onwards shall be in the vendor's scope.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture, testing and installation of the equipment shall comply with the latest issue of IS-6547, IS-807 and other relevant Indian Standard specifications and codes of practices. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 The equipment and installation shall also comply with the provisions of latest issue of Indian Electricity rules and other statutory acts and regulations.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specification, the requirement specified here-in shall prevail.

## 3.0 SERVICE CONDITIONS



### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy - Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy - Electrical.

- 3.3 The owner shall provide only three phase power at the specified medium voltage. For lighting, control and plug supply the vendor shall provide necessary single phase step-down transformers.

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3.4 All the electrical equipment shall be so designed that enable the crane / hoist to operate at its rated capacity and specified duty cycle with the system variation under the ambient conditions without exceeding the permissible temperature rise and without any detrimental effect on any part.

#### 4.0 GENERAL DESIGN AND CONSTRUCTIONAL REQUIREMENTS

4.1 The electrical system and installation shall be designed as per latest practice to provide maximum reliability, flexibility, safety to personnel and equipment and ease of operation and maintenance.

4.2 All equipment shall have adequate and standard ratings as per ISS.

4.3 All electrical equipment to be located in indoor plant area shall be enclosed in dust, damp and vermin proof enclosure equivalent to IP-54 as per IS/IEC:60529.

4.4 Equipment to be located outdoor shall be weather proof and have IPW-55 protection as per IS/IEC:60529 and shall also be provided with canopy as far as practicable.

4.5 The equipment to be located in hazardous area shall have additional protection as follows:

- a) Zone – I All the equipment shall be in flameproof execution.
- b) Zone – II The equipment producing sparks under normal operation shall be in flameproof execution and others shall be in increased safety execution.

The equipment shall be suitable for the enclosure group and temperature class as indicated in Design Philosophy - Electrical. The equipment selected shall conform to relevant Indian Standard Specification and must be certified by Central Mining Research Institute, Dhanbad or any other statutory authority for use in the specified hazardous area.

4.6 The pendant push button shall be light weight enclosure of aluminium/ polypropylene etc. In case of hazardous areas, the loop between the pendant push button and the crane control panel shall be made intrinsically safe by using suitable isolators. Alternatively certified flame proof components and increased safety terminals can be housed in the hose proof aluminium / polypropylene enclosure.

4.7 Special care shall be taken to ensure that the parts to be opened for inspection and maintenance retain their dust tightness even after repeated opening and closing operations.

4.8 All mating surfaces shall be properly machined. Neoprene gaskets shall be used for dust and weather proofing. The gaskets shall be without any discontinuity.



4.9 Only non-hygroscopic materials shall be used for insulation. All insulation shall be specially impregnated to withstand ambient conditions and atmospheric pollution.

4.10 All live parts shall be adequately protected to prevent inadvertent or accidental contact.

4.11 The minimum clearance and creepage distance of M.V. equipment shall be 20 and 28 mm respectively and shall be positively maintained after connections.

4.12 All external hardware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated.

4.13 Earthing terminals complete with sockets and identification marks shall be provided on the enclosure of all electrical equipment. The number of terminals shall be two for equipment rated above 240V and one for those rated 240V and below. Additional internal earthing arrangement shall be provided for flameproof equipment.

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- 4.14 All equipment shall be provided with stainless steel name plates containing the particulars as per relevant IS along with the description and code nos. of equipment
- 4.15 All the electrical equipment shall be provided with separate terminal box, heavy duty double compression type rolled aluminium cable glands, proper crimping lugs and anti-vibration type terminals suitable for the cable sizes required.
- 4.16 Enclosure for limit switches, pendant push button, junction boxes and magnets etc. shall be of cast aluminium. Enclosure for control panel, transformer and resistors may be of sheet steel. The thickness of the sheet steel for the enclosure shall not be less than 2.5 mm. All enclosures shall be suitably painted to withstand atmospheric pollution as mentioned in the Design Philosophy - Electrical.
- 4.17 The doors or inspection covers shall be provided with threaded knobs or butterfly nuts made of plated carbon steel. Copper or copper alloys shall not be used outside the enclosures.
- 4.18 To facilitate maintenance and testing of all electrical equipment:
- a) Disconnecting links shall be provided where necessary.
  - b) All cable lugs and terminals shall be numbered in a permanent form corresponding to the wiring diagram.
  - c) Easy access and adequate working space shall be provided around all motors, panels, limit switches etc. safety railing shall be provided, where necessary.



## 5.0 EQUIPMENT SPECIFICATION

### 5.1 Power Connection

- 5.1.1 The main supply shall be obtained by flexible cable or otherwise as per requirement.
- 5.1.2 In case of overhead bare conductors, they shall be of copper and mounted on side of the crane bridge. Four number of gunmetal type current collector with renewable carbon inserts shall be used for power connection. One end of the bare conductor shall be connected to the owner's isolator by means of fixed cable.
- 5.1.3 In case of flexible cable arrangement, the cable shall be connected at one end of the crane and the other end to owner's isolator. The cable shall be hung at intervals by festooned type arrangement.
- 5.1.4 In either case the power fed to the trolley shall be by means of flexible cables fixed and supported by festooned arrangement.
- 5.1.5 The arrangement of fixing and supporting the flexible cables shall be such that the cable is not damaged due to repeated travelling of the crane and trolley. Supporting G.I. wire shall be provided, wherever required.
- 5.1.6 The collector rollers and shoes shall be designed to avoid sparking.

### 5.2 Power Control Panel

- 5.2.1 The panel shall house all the necessary electrical equipment for distribution of power and control of individual equipment / circuit.
- 5.2.2 The panel shall be totally enclosed, floor mounting, dead front, free standing type in cubicle construction.
- 5.2.3 The panel shall house the following:
- i) For incoming supply
    - Triple pole switch fuse units
    - Supply 'ON' signal lamps (LED Type)

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The above switch shall cut off all power driven and associated equipment on the crane except lighting and plug supply circuits.

- ii) For motors
  - Reversing type starter with necessary contactors and timers.
  - Other controlling relays and devices.
- iii) For lighting, control and plug supply
  - Single phase transformers
  - Isolating switch fuse units on primary and secondary sides.

5.2.4 All switches shall be motor duty type (AC 23) and rated for 1.5 times of the full load current of the circuit. The incoming switch shall be interlocked with the panel door.

5.2.5 All contactors shall be air break type and of AC4 utilization categories. The thermal rating of the contactor shall be 1.5 times the full load current of the circuit.

5.2.6 The power contactors shall be interlocked electrically and mechanically so that there shall be no possibility of simultaneous operation of two contactors for the same motor.

5.2.7 Electrical interlock shall be provided between main hoist and micro hoist motors.

5.2.8 All thermal overload relays shall have in-built single phasing feature and ambient compensated, separately mounting and hand reset type. The reset push bottom for thermal overload relays shall be provided on the cover of the control panel so that it is possible to reset the relay from outside without opening the cover of the panel. Also indication shall be provided for hoisting/travel motors tripping on overload.

5.2.9 The panel shall be installed on properly levelled base frame fabricated out of channels of suitable size.

### 5.3 Motors

5.3.1 The design and specification of all motors shall comply with requirements stated elsewhere in the specifications.

5.3.2 The power rating of the motors shall be 25% higher than the design requirement of the driven equipment, under the specified service and duty conditions.

5.3.3 All motors shall preferably be of squirrel cage type and so designed that smooth acceleration or deceleration of the load is possible without any jerks. Further a maximum displacement of 2 mm when starting and stopping the motor in quick succession shall be guaranteed.

5.3.4 The motors for main hoist and micro hoist shall be suitable for intermittent duty type S4 with 60% C.D.E. and 300 starts / stops per hour. The motors for long travel and cross travel shall be suitable for S2 duty for 60 minutes.



5.3.5 The motors shall be so located that all parts are accessible for inspection and maintenance without affecting normal ventilation.

### 5.4 Brakes

5.4.1 The brakes for each motor shall be suitable for duties as specified below:

- a) Main / Micro hoist S4 duty
- b) Long / cross travel S2 duty

5.4.2 The coil of the brake shall be wound with fibre glass covered annealed copper conductor suitable for class H application. An additional covering with glass taps shall

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be provided over the coil. The maximum temperature of the coil for continuous operation shall be limited to 140° C. The coil shall be vacuum impregnated.

5.4.3 For other design details refer mechanical engineering standard.

#### 5.5 **Limit Switches**

5.5.1 Limit switches of both shunt and series type shall be used in control and power circuit.

5.5.2 These shall be heavy duty type and of sturdy construction in cast aluminium enclosure.

5.5.3 The mode of operation of these limit switches shall be positive and direct acting type.

5.5.4 The contacts shall be rated 50% more than the required current ratings.

5.5.5 The width of the roller of limit switches shall be sufficient to avoid slippage of contact with the striker.

5.5.6 The striker provided for operating these limit switches shall have rubber padding on surface which will make contact with roller to actuate it. The limit switches and its roller should be designed to withstand the frequent impact pressure.

5.5.7 Switches in which the contacts are operated by spring or gravity or both on the withdrawal of a chain or similar devices, shall not be used.

#### 5.6 **Transformers**

5.6.1 These shall be of dry type, class H insulated, air cooled, double wound and mounted inside the panel.

5.6.2 The transformers shall be provided with switch fuse unit on their primary side of suitable rating. One side of secondary windings of the transformers shall be earthed and other shall be provided with fuse of suitable rating.

5.7 The rating of the transformers shall be at least 2.5 times the continuous load.

#### 5.8 **Junction Box**

5.9 Junction boxes shall be of cast aluminium construction and adequately sized to enable easy termination of cables.

#### 5.10 **Hand Lamps**

5.10.1 Provision shall be made in the crane for use of hand lamps by installing 2 nos. 24 volts, 2 pin metal clad switch sockets. One of the sockets shall be on the bridge (outside the panel) and the other on the trolley.

5.10.2 The transformer primary and secondary voltage shall be 250V and 25V respectively.

### 6.0 **CABLES, CABLE TERMINATION AND CONNECTIONS**



6.1 The cables used for fixed wiring shall be 1.1 KV grade PVC insulated armoured and PVC sheathed overall, and shall conform to IS: 1554 Part-I.

6.2 The flexible cable used for power supply to crane and also for interconnection of equipment mounted on moving and fixed part of the crane shall be 1.1 KV grade heavy duty type.

6.3 All cables shall be properly laid and supported with adequately sized aluminium clamps at 500 mm interval.

6.4 Cable entry on all electrical equipment e.g. panels, motors, limit switches, brakes, junction boxes etc. shall be through double compression type rolled aluminium cable glands.

6.5 The internal power wiring of panels shall be carried out by PVC insulated stranded copper flexible cable.

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- 6.6 The wiring shall be arranged in a neat fashion and supported on PVC channel or PVC stand of screw support.
- 6.7 For equipment mounted on the doors, the wiring shall be carried out with flexible stranded copper cables in such a way that no strain is put on the wires and equipment when the door is opened for inspection and maintenance.
- 6.8 External looping of wires shall be done through separate dust tight junction boxes.
- 6.9 The sizes of power cables to be used shall be subject to owner's approval. The minimum size of power and control cables shall be 16 sq. mm (Al) & 2.5 sq. mm (Cu) respectively.

## 7.0 EARTHING



- 7.1 The earthing of all electrical equipment shall be carried out in accordance with IS: 3043.
- 7.2 The enclosures of electrical equipment shall be connected to an aluminium earth ring on the crane which in turn shall have effective electrical connection with the bridge.
- 7.3 The crane bridge shall be earthed through the bridge travel runway rails on both sides which in turn shall be earthed to owner's earth ring located on the ground floor.
- 7.4 Further the power supply cable for the crane shall have an additional conductor for earth connection. Both sides of this conductor shall be earthed.
- 7.5 All earth conductors shall be of aluminium.
- 7.6 This size of earth conductor shall be equal to half the size of the power conductor subject to a minimum size of 10 sq. mm.

## 8.0 CONTROL DESK / CONTROL STATION

- 8.1 The crane shall be controlled either from the floor by means of a pendant control station or from bridge mounted control desk as indicated in the mechanical data sheet.
- 8.2 In either case, the units shall have the following control devices:
- Main off push button with padlocking arrangement.
  - Indication lamps for supply 'ON'
  - Control push buttons, as specified in the mechanical data sheet.
  - All other devices required for safe and proper operation of the crane / hoist.
- 8.3 All push buttons shall be momentary contact type, coloured as per IS: 6875 and have 1 NO and 1 NC contacts.
- 8.4 The bridge mounted control desk, where specified, shall be of totally enclosed and dust tight construction. All controlling equipment shall be mounted on the top. It shall be located at most convenient location to allow movement of the operator. The installation shall be equipped with adjustable chair, fan, light and main isolating switch.
- 8.5 The pendant control station, where specified, shall be in a single enclosure and in totally enclosed dust light execution. The unit shall be suspended and supported from the bridge platform by flexible steel wire rope. The connection shall be made with a multi core flexible copper conductor cable and shall have 20% spare cores. One core shall be provided for earth connection of the circuit.

## 9.0 PAINTING

Enclosures of all electrical equipment shall be painted with two coats of epoxy based primers after suitable pre-treatment. Two coats epoxy based paint of approved colour shall be provided.

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## 10.0 TESTS AND INSPECTION

- 10.1 All equipment shall be routine tested as per relevant Indian Standard Specifications.
- 10.2 Additional tests, wherever specified, shall be carried out on one equipment of each rating.
- 10.3 All the above mentioned tests shall be carried out in presence of owner's representative.
- 10.4 The owner's inspection shall, however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.
- 10.5 Despatch of materials shall be subject to written consent of owner or his representative.

## 11.0 INSTALLATION, TESTING AND COMMISSIONING

- 11.1 The vendor shall undertake installation of all electrical equipment in accordance with latest code of practices, in conformity with recommendation of the respective equipment manufacturer, drawings approved by the owner or owner's representative, direction of Engineer-in-charge, statutory regulations and to the entire satisfaction of the owner.
- 11.2 The vendor shall arrange all the necessary erection tools and tackles, testing and measuring instruments and shall supply the required erection materials including structural steel.
- 11.3 Following tests shall be specifically conducted before commissioning in presence of owner's representative. All the test results shall be recorded and submitted to the owner.
- i) Insulation test.
  - ii) Continuity test.
  - iii) High voltage test.
  - iv) Simulation test.

## 12.0 DRAWINGS AND DOCUMENTS

- 12.1 Drawings and documents as per Annexure-I shall be supplied unless otherwise specified.
- 12.2 All drawings and documents shall have the following description written boldly :
- Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description

## 13.0 SPARES

- 13.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 13.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 13.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 13.4 All spare parts shall be identical to the parts used in the equipment.



**ANNEXURE - I**

**DOCUMENTATION FOR ELECTRICALS FOR OVERHEAD CRANES & HOISTS**


Sl. No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification sheet and technical particulars	N	Y	Y
2.	Composite schematic diagram	N	Y	Y
3.	Dimensional drawing showing the mounting details and general arrangement for the following equipment			
	a) Motors	N	Y	Y
	b) Power control panel	N	Y	Y
	c) Control station	N	Y	Y
	d) Limit switches etc.	N	Y	Y
4.	Down shop lead and power supply arrangement with civil scope.	N	Y	Y
5.	Inter-connection with terminal diagram and cable details	N	Y	Y
6.	Operating and maintenance instruction manual	N	N	Y
7.	Catalogues of bought out items	N	N	Y
8.	Test certificates	N	N	Y

**Note:**

- 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
- 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No

- The tenderer shall also quote for any other spares as deemed necessary to be kept in stock for stipulated time.

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## TECHNICAL SPECIFICATION

### CAPACITOR BANK & ASSOCIATED EQUIPMENT



## CONTENTS

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ANNEXURE - I	DOCUMENTATION FOR CAPACITOR BANK & ASSOCIATED EQUIPMENT

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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in packed condition of “ Indoor type Shunt Capacitor Bank & Associated Equipment” required for system power factor improvement.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy - Electrical.
- 1.3 The capacitor bank and associated equipment shall generally consist of the following.
- i) Basic Star connected capacitor bank
  - ii) Basic capacitor unit with built in fuse
  - iii) Discharge resistor
  - iv) Series reactor
  - v) Residual V. T. for mounting voltage unbalance
  - vi) Set of Raychem make heat insulated sleeved of suitable voltage rating for bus bars.
  - vii) Copper bus bar interconnecting the basic units.
  - viii) Set of supporting insulators
  - ix) Hot dip galvanised Steel stand/racks / cabinets of mounting capacitor units complete with interconnection insulator etc.
  - x) Door limit switch
  - xi) Control panel for automatic operation
  - xii) Any other equipment not specified, but required for safe & proper operation of the system.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture & testing of the equipment covered by this specification shall comply with the latest issues of following Indian standards, unless otherwise specified.

IS: 13925-1,2,3	/IEC	Shunt Capacitor for power system
60871		
IS:5553/IEC60289	/	Series reactors
IEC60076-6/IEC 726		
IEC60186		Voltage Transformers
IEC:593/IS 12672		Internal Fuse for shunt capacitor
IS/IEC:60947		Switch gear and control-gear for voltage up to & including 1000V & 1200V DC
IS/IEC:60947		General requirements for switchgear and control-gear for voltage not exceeding 1000V & 1200V DC
IS :9921		AC Isolator & Earthing switches for voltage above 1000V
IS 2099/ IEC 60137		Bushing for voltage above 1000V
IS 13067		Impregnant For power capacitors
IS 5		Colour of mixed paints
IS 2629		Recommended practice for Hot-Dip Galvanizing of Iron and Steel
IS 4759		Hot-dip zinc coatings on structural steels and other allied products.
IS 60270		High Voltage test technique-Partial Discharge measurements
IS 8084		Interconnecting Bus bars for AC voltage above 1 kV up to and including 36 kV.

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IEEE 1036	Guide for application of shunt power capacitors
IEEE 18	Standard for shunt power capacitors
IE Act	Indian Electricity Act

2.2 The design & operation features of equipment shall also comply with provision of the latest issue of the Indian Electricity Rules & other relevant statutory acts & regulation. The supplier shall, wherever, necessary, make suitable modification in the equipment to comply with the above.

2.3 Wherever, any requirement laid down in this standard differs, from that in Indian standard specification, the requirement specified herein shall prevail. Equipment complying with equivalent IEC standards shall also be acceptable.

### 3.0 SERVICE CODITIONS

#### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy - Electrical.

#### 3.2 System Details

These shall be as indicated in Design Philosophy - Electrical.

### 4.0 OPERATING REQUIRMENTS

4.1 The capacitor bank and associated equipment shall be suitable for operating at the specified rating continuously with the specified voltage and frequency variation under the ambient condition without exceeding the permissible temperature rise and without any detrimental effect on any part of equipment.

4.2 The capacitor bank and associated equipment shall be suitable for parallel switching and withstand the thermal and dynamic stresses caused by transient during switching operations.

### 5.0 GENERAL DESIGN FEATURES

#### 5.1 Capacitor Unit

5.1.1 The capacitor bank / sub bank shall comprise of appropriate number of basic single phase units & which shall be connected in star formation to obtain rated KVAR at rated voltage.

5.1.2 Each unit shall have required number of capacitor elements housed in hermetically sealed, leak proof, sheet steel container. The container shall be provided with suitable brackets, supporting insulators, terminal & bushing for external connections.

5.1.3 Each element of basic units has its own built in fuse which shall isolate the faulty element automatically without affecting the healthy elements.

5.1.4 The capacitor units shall have overload capacity as per IS 13925. The capacitor bank shall be suitable for continuous operation at 110% of rated RMS voltage and at 130% of rated RMS current.

5.1.5 Capacitor units shall be all high grade All Polypropylene type with non-PCB base, bio degradable, non-toxic impregnant. The capacitors offered shall be built from best material and shall develop minimum losses. Capacitor bank losses shall be given at



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45°C. Capacitor shall be compact in size, metal enclosed and hermetically sealed. Internal silver wire fuses shall be provided for protection of each capacitor element.

- 5.1.6 The Capacitor bank and associated equipments shall be suitable for parallel switching and withstand the thermal and dynamic stresses by transient during switching operation.
- 5.1.7 All the fasteners and bolts shall be hot dip galvanized or zinc passivated.
- 5.1.8 Capacitors shall be provided with Overpressure protection as necessary for safety. Overpressure switches shall be fitted to the capacitor units and connected to trip the capacitor bank.
- 5.1.9 Each unit shall have required number of capacitor elements housed in sealed, leak proof, sheet steel container. The container shall be provided with suitable mounting brackets, supporting insulators, terminal & bushing for external connections.
- 5.1.10 The indoor capacitor bank units shall be installed in metallic housing with minimum IP-43 protection.
- 5.1.11 Each capacitor unit shall be mounted so that it can be easily removed from the racks and replaced without removing other units, de-assembling any part of the rack.
- 5.1.12 The outside of the capacitor units and other structures should have smooth and tidy look and should be coated with weather-proof, corrosion resistant epoxy paint of light gray shade, shade no. 631 of IS 5. The structure shall be suitably GI coated. Minimum coating shall not less than 600 micron / sq meters.
- 5.1.13 Each element of basic units has its own built in fuse which shall isolate the faulty element automatically without affecting the healthy elements. In case of one element failure, harmful over voltage shall not be generated across remaining elements and shall not make appreciable change in the operation of capacitor bank. An operation of a single fuse element does not cause cascaded fuse blowing. Permissible over voltages and surges do not cause fuse blowing.
- 5.1.14 The operating & design temperature category of the capacitor unit shall be +5°C as per IS-13925 part-1. Only 5°C temperature rise is permissible above the design temperature of 45°C. So maximum temperature in any case shall not exceed 50° C {i.e. 45°C (design) +5°C (temperature rise)}.
- 5.1.15 The capacitor shall have low value of loss which shall not exceed 0.2 watt per KVAR. The loss value of discharge device/resistor and capacitor unit shall be indicated. The tan delta characteristics of the capacitor units shall be furnished. The losses in watts for each capacitor unit including losses in fuses and discharge resistors forming integral part of the capacitors along with losses for series reactor shall be ensured. If these figures of capacitor losses exceed 0.2 watt per KVAR, the capacitors will be liable for rejection. However owner reserve the right to use the faulty capacitor unit till the same are replaced/ rectified. The loss temperature characteristics, characteristics and insulation resistance temperature characteristics shall also be furnished.
- 5.1.16 The bidder shall furnish calculations for rise in voltage in other units in the event of failure of element(s) of a capacitor unit. The maximum rise in voltage shall not be more than 10% of rated voltage even if the entire capacitor unit failed/short circuited and relevant calculations in support of this shall also be furnished.
- 5.1.17 The bidder shall furnish calculation of voltage drop at rated capacitor unit per phase & losses of the reactor.

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- 5.1.18 For both capacitor and reactor, mounting arrangement and minimum clearance required from live parts shall be indicated clearly and shall be as per Indian Electricity Act/BS162 & IS-13925-Part2 / IEC-60871-2.
- 5.2 **Discharge Device**
- 5.2.1 A suitable discharge resistor of adequate rating shall be permanently connected across the terminals inside the container to discharge the residual voltage to 50V or less within 1 minute for capacitor rated upto 650V and within 5 minute for capacitor rated above 650V.
- 5.3 **PROTECTIVE FUSES**
- 5.3.1 An internal current limiting fuse with high rupturing capacity conforming to relevant IS/IEC and the specific requirements mentioned in IS13925-Part-3/IEC 60871- 3, shall be provided. The characteristics of the fuse shall be such that it shall isolate the faulty unit only, and protect it against mechanical destruction due to internal failure. The fuses shall not melt or deteriorate when subjected to inrush currents which occur during the life of the bank.
- 5.3.2 The fuses shall not make any healthy capacitor element out of circuit, either in course of isolating the faulty element or due to any external fault.
- 5.3.3 The selection of fuse to be done in such a manner that characteristic of fuse shall match suitably with over-current withstand characteristic of associated capacitor unit.
- 5.3.4 The fuses shall be of adequate thermal capacity to cater for the increased heating which may occur due to harmonics and capacitor current fluctuations.
- 5.3.5 The number of externally connected capacitors and the available short-circuit current of the supply system should not affect the current-limiting of internal fuses.
- 5.3.6 It may be noted that provided internal fuses do not lead to case rupture.
- 5.4 **Series Reactor**
- 5.4.1 A suitable series reactor conforming to IS: 5553 to limit the inrush current and suppress the harmonics shall also be provided whenever required.
- 5.4.2 The reactor shall be copper wound, non-magnetically shielded, oil immersed, natural cooled, sealed type and shall be provided with following fittings.
- i) Oil sampling cum drain valves.
  - ii) Filter valves with plugs.
  - iii) Buchholz relay with shut off valves, air release device & alarm and trip contact.
  - iv) Oil temperature indicator with minimum marking.
  - v) Oil level indicator with minimum marking.
  - vi) Oil conservator complete with drain plugs and oil filling hole with cover.
  - vii) Silica gel breather with oil seal & connecting pipes.
  - viii) Explosion vent.
  - ix) Bi-directional rollers.
  - x) Thermometer pocket.
  - xi) Radiator with isolating valves.
  - xii) Marshalling box.
  - xiii) Rating plate, wiring diagram plate & terminal marking plate.
  - xiv) Lifting lugs.
  - xv) Earthing terminals.

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xvi) Air release device.

xvii) Cable termination arrangement for incoming & outgoing device.

5.4.3 Dry type/ Oil filled reactor shall only be offered. Such reactors shall be class F/H insulated.

5.4.4 The reactor shall have linear volt ampere characteristics upto 150% of rated capacitor current.

#### 5.5 Residual voltage transformer

5.5.1 3 phase dry type residual voltage transformer of adequate capacity to facilitate neutral unbalance protection and rapid discharging of capacitor shall be provided.

5.5.2 The primary winding of voltage transformer shall be star connected while the secondary winding shall be in open delta for connection to neutral phase displacement relay.

5.5.3 The accuracy class shall be 3P for protection & 1 for metering.

5.5.4 RVT shall have primary and secondary windings made of copper.

#### 5.6 Door limit switch

5.6.1 A door limit switch suitable for mounting on the door frame of the capacitor room shall be provided for each bank. This door limit switch shall be used to trip the power supply to capacitors with initiation of opening action of the door of the capacitor room.

5.6.2 A door limit switch shall be totally enclosed in the aluminium / cast iron housing, fully oil, water & dust tight and shall conform to utilization category AC11 / DC11 as per IS: 6875. This shall be fast actuation type provided with 6 sets of 1 NO & 1 NC contacts rated for 5 amps at 415V AC and 1A at 220V DC.

#### 5.7 Capacitor control panel

5.7.1 Capacitor control panel for control, protection and automatic switching operation of MV capacitor bank shall be provided.

5.7.2 Capacitor control panel shall be of dust, damp & vermin proof construction having enclosure class IP-51 as per IS/IEC:60947.

5.7.3 The enclosure shall be fabricated out of the cold rolled sheet steel having minimum thickness of 2 mm. the doors shall have concealed hinges & provided with neoprene gaskets.

5.7.4 The panel shall be liberally designed. All the components shall be accessible from the front. It shall be possible to attend any component without the necessary removing adjacent ones. All the relays, meters, push buttons including lamps etc. shall be flush mounted. The mounting height of components requiring operation & observation shall not be lower than 300 mm & higher than 1800 mm.


5.7.5 The capacitor control panel shall control the capacitor bank which in turn shall have a number of sub banks for easy of control & to maintain the desired power factor under varying load conditions.

The owner shall arrange C.T supply to sense the power factor. Necessary C.T., selector switch, power factor meter and power factor correction relay shall be provided in the control panel. In addition, the control panel shall have Photo manual selector switch and P.F. raise lower push buttons for manual operation. These common features shall be located near the incoming unit.




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- 5.7.6 Each control shall be provided with TPN switch, voltmeter with selector switch, Ammeter with selector switch and other auxiliaries, as required to receive the incoming power.
- 5.7.7 No. of out going feeders for the control panel shall be decided as per the no. of sub banks to be controlled by it. Each feeder shall be provided with TP switch, fuses, contacts, "ON"& "OFF" indication lamps and other auxiliaries as required.
- 5.7.8 Required no. and size of heavy duty double compression type Aluminium cable glands suitable for incoming and out going power and control cables shall be mounted on removal gland plate provided at a minimum height of 75 mm from the bottom of the panel. Crimping type Aluminium and copper lugs for aluminium and for copper cable respectively shall be provided for termination of cables.
- 5.7.9 The control panel shall be complete with its base channels, foundation bolt etc.
- 5.7.10 A continuous earth bus of aluminium, running along the entire length of the lower part of the control panel shall be provided with lugs at two ends for connection with external earth grid. The minimum size of earth bus shall be 150 sq. mm.
- 5.7.11 Components Details
- 5.7.11.1 The switches shall be of capacitor duty type rated for 1.5 times the rated capacitor current with a minimum rating of 25 A and shall conform to IS/IEC:60947.
- 5.7.11.2 The fuses shall be of non-deteriorating HRC link type and suitably rated for capacitor switching. These shall conform to IS: 13703.
- 5.7.11.3 All contactors shall be of capacitor duty type rated for 50% higher than rated capacitor current & shall conform to IS/IEC:60947. Control supply voltage shall be 240V single phase AC unless otherwise stated. One set of NO & NC potential free contacts shall be made available as spare.
- 5.7.11.4 Ammeter, Voltmeter & power factor meter shall be of accuracy class 1.5 as per IS: 1248 of minimum 96 sq.mm size & shall have 0-240<sup>0</sup> scale.
- 5.7.11.5 The push buttons & selector switches shall conform to utilisation category AC11/ DC11 as per IS: 6875. Contacts shall be rated for 5A at 415V AC and 1A at 220V DC. The push button shall be of momentary contact spring loaded type with a set of 1 NO & 1 NC contacts. The selector switches shall be stay put type and provided with oval shaped handles.
- 5.7.11.6 The signal lamps shall be LED type. Colour of lamp shall be "Red" for "ON" & "Green" for "OFF" signals.
- 5.7.11.7 Terminal blocks shall be pressure clamp type up to 35 sq. mm. cable and bolted lugs type for higher sizes of cables. The minimum current rating of terminal block shall be 16A. 20% extra terminals shall be provided in the terminal block.
- 5.8 **Bus Bars**
- 5.8.1 All bus bars interconnecting the basic units shall be of copper and shall be fully insulated by using Raychem make heat shrinkable sleeves. All bus bar joints and tap-off connections shall be provided with removable FRP shrouds. The sleeves shall be rated to withstand the system Line-to-Line voltage for 1 minute.
- 5.8.2 The minimum clearances shall be as per relevant standards suitable for the nominal voltage of capacitor banks.
- 5.9 **External cable termination**

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- 5.9.1 Each capacitor bank / sub bank shall be provided with proper termination arrangement where terminal connection from all the three phases shall be brought for connection with external cable. The termination arrangement shall include cable glands, cable lugs, termination kits, supporting arrangements etc. complete in all respect.
- 5.9.2 A cable box for termination of control cables shall be provided on the RVT. The cable boxes shall be provided with adequately sized cable entries and suitable double compression cable glands made of stainless steel. Tinned copper lugs shall be provided for the connection of all cable cores.
- 5.10 **Interlocks**  
All necessary interlocks to ensure correct & safe operation of capacitor banks shall also be provided.
- 5.11 **Earthing**  
Each basic capacitor unit shall be connected to the earth strip provided on the steel racks which in turn shall be connected to the main earth grid through two nos. suitable earth terminals provided on the racks.
- 6.0 **PROTECTIVE SCHEME (PROVIDED BY PURCHASER)**
- 6.1 The vendor shall confirm the adequacy of these protective devices and also suggest the setting and any other additional protective devices required.
- 7.0 **Accessories**  
The supply shall include the following accessories.
- 7.1 **Control panel space heater**  
The control panel shall be provided with a thermostatically controlled space heater, rated for 240V, 50Hz & controlled through double pole miniature circuit breaker.
- 7.2 **Name plate**
- 7.2.1 All the equipment shall be provided with name plates containing all the information's as per relevant standard.
- 7.2.2 All control switches, push buttons, lamps etc. shall have functional identification labels.
- 7.2.3 Name plate of capacitor control panel shall be of black prespex with white engraving and of minimum 3 mm thickness while those on other equipment shall be of stainless steel.
- 7.3 **Warning Plates**
- 7.3.1 Warning plates shall be provided on the door and inside of the equipment, comprising following information:  
CAUTION: HIGH VOLTAGE CAPACITORS.  
AT BLOWN FUSES, CHARGES MAY REMAIN
- 7.3.2 The warning plates shall be UV resistant engraved plastic.
- 7.4 **Steel racks**
- 7.4.1 Sheet steel racks shall be provided to house the capacitor units, residual P. T. etc. in tier formation.
- 7.4.2 The racks shall be suitable for assembly at site. The racks & hardware used for assembly shall be hot dip galvanized.
- 7.4.3 The rack shall be complete with rack insulators, foundation bolts or any other hardware etc. for assembly into complete bank.

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7.4.4 Complete assembly of capacitor bank shall be mounted on a pedestal GI frame, which shall be 300 mm high.

7.4.5 Any other accessories required but not specified, shall be supplied to make the capacitor installation complete in all respect and ensure safe & proper operation.

## 8.0 PAINTING

8.1 The sheet steel enclosure after degreasing, pickling in acid, cold rinsing, phosphatising passivating etc. shall be painted with two coat of anti-rust paints followed by two coats anti corrosive paints.

8.2 Epoxy based paint shall be used.

8.3 All paint shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

8.4 Unless otherwise specified, the finishing shade shall be light gray shade no. 631 as per IS: 5.

## 9.0 TESTS AND INSPECTION

9.1 All capacitor banks and control panel shall be subjected to routine tests as per IS: 2834 and its associated equipment as per relevant standards.

9.2 Additional tests, wherever specified, shall be carried out.

9.3 All the above tests shall be carried out in presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works & site inspection.

9.4 These inspections shall, however, not absolve the vendor from his responsibility for making good any defect which may be noticed subsequently.

## 10.0 DRAWINGS AND DOCUMENTS

10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

10.2 All drawings and documents shall have following description written boldly.

- Name of client
- Name of consultant
- Enquiry / Order Number with plant / project name
- Code No. and Description

## 11.0 SPARES

11.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.

11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.

11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.

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- 11.4 All spare parts shall be identical to the parts used in the equipment
- 12.0 **PACKING**
- 12.1 All the equipment shall be properly packed before despatch to avoid damage during transport, storage & handling.
- 12.2 The packing box shall contain a copy of the installation, operation & maintenance manual.
- 12.3 A sign to indicate the upright position on the position of the package to be placed during transport and storage shall be clearly marked. Also proper arrangement shall be provided to handle the equipment.

### ANNEXURE - I

#### DOCUMENTATION FOR CAPACITOR BANK & ASSOCIATED EQUIPMENT

Sl. No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Y	Y
3.	General Arrangement Drgs. with Overall dimensions of the following equipment. - Capacitor bank - Reactor - Control panel	N	Y	Y
4.	Foundation plan indicating certified dimensions floor opening, weight, clearance etc. - Capacitor bank - Reactor - Control panel	N	Y	Y
5.	Schematic & wiring diagram	N	N	Y
6.	Descriptive literature of Various equipment	N	N	Y
7.	Installation, operation & maintenance manual	N	N	Y
8.	Guarantee certificate	N	N	Y
9.	Test certificate	N	N	Y
10.	Spare parts list with identification marks	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



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## 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and despatch in well packed condition of auxiliary service transformers.
- 1.2 This standard shall be applicable for 3 phase / single phase, separate winding transformers of rating below 315 KVA used for Auxiliary services such as lighting, control, Instrument supply etc.
- 1.3 This standard shall be read in conjunction with the relevant specification sheet.

## 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of following Indian Standards. Equipment complying with equivalent IEC standards shall also be acceptable.
- |                       |    |   |
|-----------------------|----|---|
| IS: 1180 Part - 1 & 2 | -- | Outdoor type 3 phase distribution transformers up to and including 100 KVA, 11 KV |
| IS: 2026              | -- | Power transformers  |
| IS: 2026 part 11      | -- | Dry type power transformers   |
- 2.2 The design and operational features of the equipment offered shall comply with the provisions of the latest issue of the Indian Electricity Rules and other relevant statutory acts and regulations. The supplier shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

## 3.0 SERVICE CONDITIONS

- 3.1 Ambient Conditions  
These shall be as indicated in Design Philosophy – Electrical.
- 3.2 System Details  
These shall be as indicated in Design Philosophy – Electrical.

## 4.0 OPERATING REQUIREMENTS

- 4.1 The transformer shall be suitable for operating at the rated capacity continuously at any of the taps, under the ambient conditions and with the voltage and frequency variations as indicated in specification sheet without exceeding the permissible temperature and without any detrimental effect on any part.

## 5.0 GENERAL DESIGN FEATURES

- 5.1 Rated voltage and frequency  
These shall be as indicated in Design Philosophy – Electrical.
- 5.2 **Phase connections**
- 5.2.1 Three phase transformer  
The primary winding shall be connected in delta and secondary winding in star with neutral point earthed (Vector group Dyn-11)
- 5.2.2 Single phase transformer  
Primary winding shall be connected between two phases of a 3 phase system or to the three phases in open delta execution as specified in specification sheet and secondary





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single phase winding shall have one terminal earthed with the tank through link inside the secondary terminal box.

### 5.3 Tapping

5.3.1 The transformers shall be provided with off circuit tap changer with tapping of  $\pm 2.5\%$  and  $\pm 5\%$ .

5.3.2 For transformers having primary 3.3 KV and above, tap changing shall be effected with an externally operated handle, capable of being padlocked in any position on the primary side.

5.3.3 For transformers having primary 415V and below, tap changing shall be effected by means of links in the terminal chamber on the primary side.

### 5.4 Impedance voltage

The impedance voltage of the transformer at 75°C shall be 4% unless indicated otherwise in specification sheet.

#### 5.4.1 Losses

The losses shall be indicated by the vendor and shall be guaranteed, within tolerable limits specified in IS: 2026 at rated voltage and frequency.

#### 5.4.2 Terminal Arrangement

The primary and secondary side terminals shall be brought outside the tank through porcelain bushing in dust and weather proof terminal boxes, with links for tap changing where required and suitable heavy duty double compression type aluminium cable glands and cable lugs for receiving cables as indicated in specification sheet. The neutral point of the secondary winding shall be brought out separately and earthed to the transformer body through test link. Terminal board for the primary and the secondary winding shall be amply sized and made of SRBP/ FRP materials.

#### 5.4.3 Resistance to short circuit

The transformers shall be able to with stand electrodynamic stresses due to terminal short circuit of the secondary assuming primary side fed from the infinite bus.

#### 5.4.4 Cooling System

Transformers rated up to 50 KVA shall be natural air cooled type and above 50 KVA shall be natural oil cooled / natural air cooled type as indicated in specification sheet.

## 6.0 CONSTRUCTIONAL FEATURES



### 6.1 Core

The transformer core shall be of high grade non ageing electrical silicon cold rolled magnetic sheet steel of low hysteresis loss and high permeability. The maximum flux density in any part of the core and yoke at rated voltage and frequency shall not exceed 1.7 Tesla for oil cooled transformers and 1.3 Tesla for air cooled transformers.

6.1.1 The tank for oil cooled transformer shall be made of mild steel plate of adequate thickness. Cooling tubes, where necessary, shall be provided.

6.1.2 Air cooled transformer shall be sheet steel enclosed having minimum thickness of 2.0 mm and shall be provided with suitable reinforcement as required. The minimum degree of protection for the enclosure shall be IP: 31. Ventilating louvers, if provided, shall be covered by fine wire mesh.

6.1.3 All external hardware shall be cadmium plated.

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## 6.2 Windings

- 6.2.1 Coil shall be made out of electrolytic grade copper conductor.
- 6.2.2 Class-F / class-H insulating material shall be used for air cooled transformers.
- 6.2.3 For oil cooled transformer class-A insulating material shall be used. Mineral oil shall comply with IS: 325. 10% extra oil shall be supplied along with transformer in non-returnable drums.
- 6.2.4 Winding assembly shall be dried and impregnated in vacuum with tested insulating oil / varnish.

## 6.3 Bushing

The bushing insulators shall be rated for the maximum system voltage and shall comply with the requirement laid down in IS: 2099 / IS: 7421. The minimum current rating shall be 250A.

## 7.0 FITTINGS

7.1 Following fittings shall be provided for air cooled transformers.

- i) Rating and diagram plate
- ii) Lifting lug
- iii) Primary and secondary cable boxes with heavy duty double compression type aluminium cable glands and lugs.
- iv) Earthing terminals
- v) Rollers (for 25 KVA and above)

7.2 In addition to the above following fittings shall be provided for oil cooled transformer.

- i) Oil conservator complete with drain plug, oil filling hole with cover and oil level indicator with minimum marking.
- ii) Silica gel breather
- iii) Dial type thermometer
- iv) Oil sampling cum drain valve
- v) Explosion vent
- vi) Air release plug

7.3 Any other fittings which may be necessary for satisfactory operation of the transformer shall also be provided.

7.4 All fittings shall conform to relevant Indian Standards.

## 8.0 PAINTING

8.1 The surface shall be painted after removing all dust, scale and foreign adhering matter. All traces of oil and greases should be removed by suitable treatment.

8.2 All steel surfaces in contact with insulating oil shall be painted with heat resistant oil insoluble insulating varnish.

8.3 All steel surfaces exposed to outside shall be painted with suitable anti rust and anti corrosive paints. Epoxy paints shall be used, if indicated in specification sheet.

8.4 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.

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8.5 Unless otherwise specified, the finishing shade shall be light grey shade no. 631 as per IS: 5.

8.6 1 litre paint per air / oil cooled transformer shall be supplied for touch up at site.

### 9.0 TESTS AND INSPECTION

9.1 All transformers shall be routine tested as per IS: 2026.

9.2 Additional tests, wherever specified, shall be carried out on one transformer of each rating.

9.3 All the above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the transformer shall be subjected to stage inspection at works and inspection at site for final acceptance.

9.4 These inspections shall, however, not absolve the vendor from his responsibility for making good any defect which may be noticed subsequently.

### 10.0 DRAWINGS AND DOCUMENTS

10.1 The drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.

10.2 All drawings and documents shall have the following descriptions written boldly.

- Name of client
- Name of Consultant
- Enquiry / Order No. with plant / project name
- Equipment Code no. and Description

### 11.0 SPARES

11.1 Commissioning Spares : Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.

11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.

11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.

11.4 All spare parts shall be identical to the parts used in the equipment.

### 12.0 PACKING

12.1 The transformers shall be suitably packed in wooden crates to avoid damage in transit. Oil cooled transformers shall be properly sealed so as to completely exclude oxygen and moisture from coming in contact with oil.

12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

### ANNEXURE – I

#### DOCUMENTATION FOR AUXILIARY SERVICE TRANSFORMERS

Sl.No.	Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet, duly completed	N	Y	Y
2.	Technical Particulars, duly filled-in	N	Y	Y
3.	Dimensional drawing with terminal arrangement details	N	Y	Y
4.	Illustrative and descriptive literature	N	N	Y
5.	Installation, Operation and maintenance manual	N	N	Y
6.	Test Certificates	N	N	Y
7.	Guarantee certificate	N	N	Y
8.	Spare parts list with identification marks	N	N	Y

**Note :**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in Pendrive shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

Y - Yes, N - No



**TALCHER FERTILIZERS LIMITED**  
**TECHNICAL SPECIFICATION - AIR PRESSURIZATION**  
**SYSTEM**

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**TECHNICAL SPECIFICATION**  
**FOR**  
**AIR PRESSURIZATION SYSTEM**

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6.0	EQUIPMENT SPECIFICATION
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9.0	TESTS AND INSPECTION
10.0	ERECTION, TESTING & COMMISSIONING
11.0	DRAWINGS AND DOCUMENTS
12.0	SPARES
13.0	MAKE OF EQUIPMENT
ANNEXURE - I	SPECIFICATION SHEET (PRESSURISATION SYSTEM)
	TECHNICAL PARTICULARS (PRESSURISATION SYSTEM)
	DOCUMENTATION FOR AIR PRESSURISATION SYSTEM



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## 1.0 SCOPE

- 1.1. The scope covers technical requirements of design, engineering, manufacture, testing before despatch, delivery to respective sites in well packed condition of Air Pressurisation System for Substation as per specification and unloading/storage at site, fabrication, assembly of ducts, erection, testing, commissioning and handing over of Air Pressurisation System for Substation by Air Pressurization System manufacturer.
- 1.2. The ventilation system consist of Inlet Air Duct, Air Filters, Centrifugal type Fans, Air Distribution Ducts, Grills, Dampers, Air Washer System including Pumps, Nozzles, Piping, Motor with base Frame, LCS, Mist Eliminator, Filters, Valves, Pressure Gauge, Vibration Pads, Water Tank, Water Pipe & Fittings, Water drainage System etc.
- 1.3. All other items not specifically mentioned, but required for the completeness of the system shall be supplied.
- 1.4. Redundant Air Blower shall be provided.
- 1.5. This standard shall be read in conjunction with relevant specification sheet.
- 1.6. The DOL starter feeders for each blower motor and centrifugal pump motor shall be provided.
- 1.7. For control of all the motors in the bidder's scope, local control stations shall be provided near the motors.
- 1.8. Supply, laying & termination of power, control cables up to motors and local control stations shall be in contractor's scope.
- 1.9. In case of any fire, air supply shall be cut off. Suitable provision shall be made by vendor to fulfil this requirement, required input shall be taken from fire alarm system vendor.
- 1.10. The Contractor shall carry out all major jobs i.e. preparation of civil foundations for fan, pumps, motor etc. However, grouting of the fan, motor, pump, pipe support etc. shall be done by the vendor. Similarly opening of ducting exhaust grills shall be done by the owner. However, sealing of duct opening after passing of duct and giving finishing touch etc. shall be done by the vendor including supply of all required erection materials.
- 1.11. The vendor shall supply the civil scope drawings (good for construction) and necessary documents as per the schedule. The vendor shall submit foundation drawing & ducting layout for timely making the equipment foundation & wall opening .
- 1.12. If the civil data and drawing furnished by the vendor require any modification after the execution of the civil work, the same has to be carried out by the vendor free of cost after having the modification approved by the owner.
- 1.13. The system shall be installed indoor & the location of blower, pumps & pressurization room shall be on ground floor as shown in the attached sub-station equipment layout & vendor shall accommodate all equipments in the space provided. Iron Door for Pressurization Room shall be provided by the vendor.

## 2.0 CODES & STANDARDS

- 2.1. The design, manufacture and testing of the equipments and their standard shall comply with the latest issue of relevant Indian Standard Specification, Codes and Regulatory requirements.

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- 2.2. The design and operational features of the equipment and their installation shall also comply with the provisions of the latest issue of the Indian Electricity Rules and other Statutory Acts and Regulations. The vendor shall, wherever necessary, make suitable modifications in the equipment to comply with the above.
- 2.3. Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specification, the requirement specified herein shall prevail. Equipment complying with equivalent IEC standards shall also be acceptable.

### **3.0 INSTRUCTION TO THE VENDOR**

- 3.1. Vendor shall furnish the electrical load list for the offered pressurisation system with the bid.
- 3.2. Heat dissipation from electrical equipment installed inside the substation shall be taken from the contractor.
- 3.3. Vendor to calculate no. of air change per hour to maintain 5 deg. less than the ambient temperature inside the substation. Bidder to submit the calculation for the same with the bid.
- 3.4. Signal to fire alarm system shall be provided for alarm and trip of the system.
- 3.5. All electrical equipment shall be designed for 50°C ambient.

### **4.0 SERVICE CONDITIONS**

#### **4.1. Ambient Conditions**

These shall be as indicated in specification sheet.



#### **4.2. System Details**

These shall be as indicated in specification sheet.

### **5.0 DESIGN AND OPERATING REQUIREMENTS**

- 5.1. The ventilation system and installation shall be designed as per latest practice to provide maximum reliability, flexibility, safety to personnel & equipment and ease of operation & maintenance.
- 5.2. All the equipment shall be suitable for operating at their rated capacity continuously, under the ambient conditions and voltage & frequency variations indicated without exceeding the temperature rise limits specified in relevant standards and without any detrimental effect on it.
- 5.3. All the equipment shall have adequate and standardised ratings.
- 5.4. The system design and selection of equipment ratings as well as their installation shall ensure adequate fresh air throughout the ventilated plant area for personnel comfort and proper functioning of the plant equipment.
- 5.5. For the main ventilation equipment, the location has to be reviewed and suitably marked on respective drawings attached. The location for ventilation blower etc. shall be on the ground floor.
- 5.6. The washer unit & the washer spraying set shall be of reputed make.
- 5.7. The ventilation equipment shall be designed to effect the required number of air changes per hour and supply fresh air to the areas indicated in specification sheet. Bidder shall indicate the minimum number of required air changes per hour.



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- 5.8. Two numbers (1+1) of blowers shall be provided and each rated for 100%. The discharge of each blower shall be connected to a common duct and an isolation valve shall be provided on discharge side of each blower.
- 5.9. A positive pressure of 5 mm of water gauge shall be maintained within the area to be ventilated.
- 5.10. The concentration of the dust in the area is expected to be in milligrams and the size of dust particles will be 25 microns.
- 5.11. Discharge velocity of the air should be within comfortable limits and uniform distribution of air shall be achieved.
- 5.12. Every precautions shall be taken to reduce the sound level from the blowers to a minimum of 85 dB (A) at 1 metre distance. If required, silencers may be fitted to bring down the sound level.
- 5.13. Vibration pads shall be used so that no vibration is transmitted to the buildings.
- 5.14. All safety regulations must be taken into consideration in the design and equipment layout. All moving and rotating parts shall be suitably guarded against accidental contacts by working personnel.
- 5.15. Each air washer system unit shall have adequate water drainage system.
- 5.16. Water connection shall be taken from tap water within 10 mtrs. of air washer unit.

## **6.0 EQUIPMENT SPECIFICATION**

### **6.1 Air Filters**

- 6.1.1. The dry type air filters shall be provided at the air intake side for filtering dust particles of the air.
- 6.1.2. The filter shall be capable of removing dust particles of about 10 micron and above, the efficiency of the filter shall not be less than 99%. If considered necessary, double filter may be provided.
- 6.1.3. The velocity of air inside the filter shall not exceed 3 m/s.
- 6.1.4. The air filter shall be of robust construction fabricated out of 14 gauge sheet metal work.
- 6.1.5. The filters shall be suitable for capable of reuse after cleaning. Each filter shall be mounted in such a way that the removal and re-fixing after cleaning and maintenance is easier.
- 6.1.6. Pre filter with efficiency rating of 90% down to dust particles size of 10 micron of HDPE wire mesh configuration supported on Aluminium expanded metal mesh at its back.



Fine filter with efficiency rating of 99% down to dust particles size of 5 micron of non-woven synthetic fibre supported on Aluminium expanded metal mesh at its back.

Top covering will be of HDPE wire mesh. Filter housing/casing shall be of 16 SWG Aluminium.

- 6.1.7. Where filters are supplied in dismantled condition, assembly drawing shall be furnished by manufacturer.

### **6.2 Air supply blower**



- 6.2.1. The blowers shall be in conformity with IS: 4894.
- 6.2.2. Blowers shall be centrifugal type, double width, double inlet type and shall have non overloading type characteristics.

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- 6.2.3. The blowers shall be heavy duty type suitable for uninterrupted and trouble free service.
- 6.2.4. The blowers shall have end suction and upward/downward/inclined discharge as per requirement.
- 6.2.5. The blowers shall be designed to operate within 9% and 25% of system throttling line.
- 6.2.6. The first critical speed of the rotating assembly shall be at least 25% above the operating speed.
- 6.2.7. Blower bearing shall be of grease lubricated type. All antifriction bearings shall be of SKF make only with metal cage construction. Blower bearing shall have on line lubricator.
- 6.2.8. The blowers shall be complete with all required accessories.
- 6.2.9. The blowers shall be coupled to the motors by pulley and V-belt arrangement.
- 6.2.10. The casing shall be of welded construction and complete with inlet and outlet flanges, inspection holes, mounting legs and fittings lugs. The casing shall be reinforced with suitable angles to minimize vibration.
- 6.2.11. Suction side of blower shall be provided with a permanent mesh to prevent accidental contact to moving part.
- 6.2.12. Manometer to be provided for measuring pressure inside the Substation.

### 6.3. Ducting

- 6.3.1. GI ducting material for distribution of air shall be sheet steel (Class – viii) having galvanising thickness of 150 micron. The thickness of GI sheet shall be - 1.2 mm.
- 6.3.2. The following principles shall be adopted in the selection of duct sizing.
- Velocity of air inside main ducts shall be 10–11 m/s. and in branch ducts this shall be 7–8 m/s.
  - While changing the cross sections, the air velocity should not change abruptly.
  - Bends shall be minimum wherever required; the bending radius should be more than 1.5 times the width of the ducts.
  - Right angle bends shall have deflectors to reduce the pressure loss.
  - The cross section of the ducts shall be preferably of square type.
  - Interior shall be smooth and free from obstruction.
  - The duct section shall be cross broken type.
- 6.3.3. Flexible bellows shall be provided for connecting the duct and the blowers to isolate the vibrations.
- 6.3.4. All longitudinal joints of the various sections of the ducts shall be either rivetted by slip joints or bolted by angle ring joints. The centre distance of rivets/bolts shall not exceed 150 mm for sheets and 75 mm for structural steels.
- 6.3.5. All joints shall be properly sealed to prevent leakage of air by suitable sealing compounds.
- 6.3.6. The ducts shall be provided with continuous transverse bracing by angle irons. Longitudinal seams shall be provided for reinforcement, wherever required.
- 6.3.7. Along the main ducts, access doors shall be provided. Such doors shall be provided with sponge rubber gaskets for leak proof ness.

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6.3.8. Detailed measurement sheets shall be submitted for duct and acoustic insulation after completion of erection work.

#### 6.4. Hanger and supports

6.4.1. The duct work shall be either hanged from the ceiling or supported on the sides of the column as the case may be. They shall be fixed to the ceiling/column by anchor bolts or welding. Anchor fastener shall be of minimum 1 T capacity.

6.4.2. The hangers/supports shall be adequate in number and size to prevent sagging, buckling or vibration. All hangers shall be of trapezoid type constructed out of 40x40x6 mm angle iron and suspended from two steel rods of 10 mm dia.

6.4.3. While crossing the floors, the ducts shall be supported by suitable collars fabricated out of angle iron. The opening left out after the erection of ducts and collars shall be filled up with bitumen compound of superior quality.

6.4.4. The fixing and support intervals shall not be more than 2 metres.

6.4.5. The complete supporting arrangement shall be subject to the approval of the purchaser before their installation.

#### 6.5. Grills/Dampers

6.5.1. The air ducts shall be provided with grills having air turning devices, manually adjustable multi-louver dampers of contra-rotating type for discharge of fresh air.

6.5.2. Fresh air intake louver shall be in GI Construction with mesh net for avoiding entry of birds & shall also have the provision of rain protection.

6.5.3. The controlling device for the dampers shall have provision to keep the damper in one position.

6.5.4. Thick wire netting guards shall be provided in the grills.

6.5.5. The mouth of the grills shall be downward having an angle of inclination of 30°.

6.5.6. The numbers, size and material of construction of discharge nozzles to be provided as per purchaser's approval.

6.5.7. Fire dampers are to be provided at the inlet of the duct coming inside the switchgear room.

6.5.8. Air filter housing, louvers and nozzles shall be made of SS 304.

6.5.9. Minimum 02 nos. louvers on the walls of switchgear room shall be supplied and installed to avoid over pressure.



#### 6.6. Motors

6.6.1. The motors shall be squirrel cage induction, totally enclosed fan cooled having IP-55 degree of protection complying with IS-325.



6.6.2. The motor (frame sizes from 71 up to and including 315L) shall be energy efficient type having efficiency class of 'IE3' as per IS 12615: 2011 and high power factor type.

6.6.3. The insulation of the motors shall be class F as indicated in specification sheet. For class 'F' insulated motors, the temperature rise shall be limited to that of class B.

6.6.4. The rating and frame sizes of the motors shall be IS.

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- 6.6.5. The motors shall be suitable for 3 successive starts from cold and 2 successive starts from hot when coupled to the driven equipment. The temperature of the rotor shall not exceed 300°C.
- 6.6.6. The motors shall be suitable for D.O.L starting even at a terminal voltage of 80%. The starting current shall not exceed the value indicated in IS:12615 without any positive tolerance when full voltage is applied.
- 6.6.7. All the six leads shall be brought out to the terminal box where suitable connection shall be made through shorting links.
- 6.6.8. The terminal box shall be amply sized and provided with terminal block of non cracking, non inflammable, non-hygroscopic and mould proof material.
- 6.6.9. All motors shall preferably be coupled to the driven equipment through flexible coupling.
- 6.6.10. In place of geared motors, motors with separate gear boxes between the motor and the driven equipment shall be preferred.
- 6.6.11. All motors shall be complete with on-line greasing facility and complete with required accessories such as name plate, lifting eye bolt, drain plug, earthing terminals, cable glands, slide rails etc.
- 6.6.12. All motors rated 30 KW and above shall be provided with space heater along with separate terminal box.
- 6.6.13. Rating of the motor shall be 15% higher than the driven load requirement and duty cycle shall match the requirement of driven machine.
- 6.6.14. Motors shall be fed from LT board located in same substation.
- 6.7. Local Control Station**
- 6.7.1. For control of all the motors in the bidder's scope, local control stations shall be provided near the motors.
- 6.7.2. Local Control Stations shall also conform to the Specification Sheet attached with this specification.
- 6.7.3. The enclosure for LCS shall be of die cast aluminium alloy shall be weatherproof construction. The enclosure shall be suitable for mounting on wall. 4 Nos. holes suitable for 12 mm bolts shall be provided outside the enclosure for fixing the control stations.
- 6.7.4. Each LCS shall have provisions as indicated in specification sheet of LCS attached with this specification.
- 6.7.5. Local control stations for breaker controlled HV and LV motors shall be provided with T-N-C switch, Ready to Start Indication, ON indication, Space Heater ON Indication, Trip Indication, Local-OFF-Remote Control switch and ammeter. Moreover, space heater ON indication lamp, trip indication lamp shall also be provided at the switchgear panel.
- 6.7.6. Local control stations for contactor controlled LV motors shall be provided with start/stop push buttons, ammeters and Space Heater ON Indication (for motor rated 30KW and above), ON indication, Local-Remote switch (as required) for the motors having rating 5.5 KW and above. If required from process point of view, ammeter shall be provided for motors below 5.5 KW also.
- 6.7.7. The ammeter shall be flush mounting, moving iron spring controlled type, of accuracy class 1.5 as per IS:1248, with square face of minimum size 72 mm x 72 mm having scale range 0-240°. The ammeter for motor shall be provided with uniform scale up to CT primary current and compressed

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end scale up to the 6 times the C.T. primary current. Adjustable red pointer shall be provided to indicate the full load current of the motors. Zero adjusters shall be provided for operation from the front of the meter. All ammeters shall be operated through 1 Amp. CTs only. Bidder shall indicate the CT ratio and full load current in the specification sheet attached.

- 6.7.8. Indication lamp shall be LED type having good illumination in all direction with lumen output of minimum 200 milli Candela.
- 6.7.9. All the components shall be mounted on a base plate inside the enclosure. Necessary actuating system for control switches, non-yellowing acrylic/glass cover for ammeter and indication lamps shall be provided on the front cover. No wiring shall be carried out on the front cover.
- 6.7.10. Each control station shall be provided with minimum 2 mm thick stainless steel nameplates indicating the code number and description of the equipment controlled by it. Similar labels shall be provided for all indication lamps, push buttons, control switches. The nameplate and label shall be fixed with screws only.
- 6.7.11. The enclosure shall be provided with two external earthing terminals with studs of 8 mm. dia. and shall be marked with earthing symbol.
- 6.7.12. LCS shall be painted with epoxy paint to shade 631 as per IS : 5.

## 7.0 PAINTING



- 7.1. The surfaces to be painted shall be pre-treated to remove all dust, scale and foreign adhering matter by suitable method.
- 7.2. All steel surfaces shall be painted with suitable anti-rust and anti-corrosive paints. Epoxy paints shall be used as indicated in the specification sheet.
- 7.3. All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- 7.4. Unless otherwise specified, the finishing shade shall be light grey shade no. 631 as per IS: 5.

## 8.0 CO-ORDINATION WITH OTHER CONTRACTORS

- 8.1. The vendor shall co-ordinate with owner's other vendors and shall freely exchange all technical information required for this purpose.
- 8.2. The vendor shall ensure that the variation in estimated quantities for ducting and acoustic insulation during quotation stage and quantities of actual execution at site shall be maximum  $\pm 10\%$ . Beyond this limit, their extra claim at any stage of the contractual period, if any, shall not be entertained.

## 9.0 TESTS AND INSPECTION

- 9.1. All equipment shall be routine tested as per relevant Indian Standard Specification.
- 9.2. Additional tests, wherever specified, shall be carried out on one equipment of each rating.
- 9.3. The above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection during process of manufacture at works and inspection at site for final acceptance.
- 9.4. The owner's inspection shall, however, not absolve the vendor from his responsibility for making good any defect which may be noticed subsequently.

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## 10.0 ERECTION, TESTING AND COMMISSIONING

- 10.1. The vendor shall undertake installation of all equipment in accordance with code of practices in conformity with statutory regulations and to the entire satisfaction of the owner.
- 10.2. The vendor shall arrange all the necessary erection tools and tackles, testing and measuring instruments and shall supply the required erection materials.
- 10.3. Package vendor shall demonstrate the guaranteed performance data, like discharge capacity, outlet velocity, static pressure developed and noise level inside the room before handing over ventilation system.
- 10.4. Following tests shall be specifically conducted before commissioning in presence of owner's representative. All the test results shall be recorded and submitted to the owner.
  - Insulation test.
  - Continuity test.
  - High voltage test.
  - Simulation test.

## 11.0 DRAWINGS AND DOCUMENTS

- 11.1. The drawings and documents as per Annexure-I shall be furnished.
- 11.2. All drawings and documents shall have the following descriptions written boldly.
  - Name of client
  - Name of consultant.
  - Order number with plant / project name
  - Equipment code no. and description
- 11.3. At the time of handing over the installation, the vendor shall supply as built drawings taking into consideration the actual execution carried out at site.
- 11.4. The vendor shall furnish a Bill of Material covered in his scope. However, this shall be treated for information only and shall not absolve him from his obligation to supply the required items and quantities for making the plant complete as per intent of the specification.
- 11.5. All documents shall be supplied in hard copies as well as soft copies in CD formats in place of reproducible(R).



## 12.0 SPARES

- 12.1. Spares for 2 years of operation (Mandatory) shall be provided as per the SOR.
- 12.2. Commissioning spares as required shall be supplied with the main equipment without any price implication to owner. Item wise list of recommended commissioning spares shall be furnished for information.
- 12.3. Recommend Spares (other than Mandatory Spares) alongwith recommended quantity shall be furnished.
- 12.4. All spare parts shall be identical to the parts used in the equipments.

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### 13.0 MAKE OF EQUIPMENT

13.1. The make of all the electrical equipments shall be as indicated in specification sheet. The vendor shall supply the equipment of specified make only.

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### SPECIFICATION SHEET PRESSURIZATION SYSTEM

PROJECT: Coal Based Fertilizer Plant		PLANT: Dyke & Associated Facility			
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>		
<b>GENERAL</b>					
Item No. :		Ref. Stds.: IS / IEC			
Quantity : Refer SOR		Encl. Docs. :			
Description : AIR PRESSURISATION SYSTEM		Vendor :			
Code No. :		Vendor Ref. No. :			
TESTS : Routine <input checked="" type="checkbox"/>		Type <input type="checkbox"/>	Others <input type="checkbox"/>		
<b>SCOPE</b>					
Drive motors <input checked="" type="checkbox"/>	Exhaust fans <input type="checkbox"/>				
Motor control center <input type="checkbox"/>	Blowers <input checked="" type="checkbox"/>				
Local control stations <input checked="" type="checkbox"/>	Air filters <input checked="" type="checkbox"/>				
Cable racks & risers <input type="checkbox"/>	Air Washer Units <input checked="" type="checkbox"/>				
Cabling <input type="checkbox"/>	Moisture Eliminator <input checked="" type="checkbox"/>				
Earthing <input type="checkbox"/>	Ducting <input checked="" type="checkbox"/>				
Other Required Accessories <input checked="" type="checkbox"/>	Air Dampers <input checked="" type="checkbox"/>				
Minor Civil Works <input checked="" type="checkbox"/>	Louvers <input checked="" type="checkbox"/>				
Hardwares and Tools <input checked="" type="checkbox"/>	Vibration Isolation pads <input checked="" type="checkbox"/>				
Erection <input checked="" type="checkbox"/>	Motor pump set for water spraying <input checked="" type="checkbox"/>				
Testing & Commissioning <input checked="" type="checkbox"/>	Water piping within the battery limit of Air Pressurisation System <input checked="" type="checkbox"/>				
Other Required Accessories <input checked="" type="checkbox"/>					
<b>OWNER'S SERVICES</b>					
Civil works <input checked="" type="checkbox"/>	Motor Starter Panel <input checked="" type="checkbox"/>				
Plate Inserts <input checked="" type="checkbox"/>	Cabling <input checked="" type="checkbox"/>				
Lighting <input checked="" type="checkbox"/>	Earthing <input checked="" type="checkbox"/>				
<b>SERVICE CONDITIONS</b>					
<b>POWER SUPPLY SYSTEM</b>		<b>AMBIENT CONDITIONS</b>			
Rated Voltage With $\pm$ % : 415V $\pm$ 10%		Max / Min Temp : 46/1/50°C			
Rated Freq With $\pm$ % : 50Hz $\pm$ 5%		Design Ref. : 50°C			
Combined V & F Variation : $\pm$ 10 %		Relative Humidity : 100 % Max.			
Fault Level : 36 MVA		Altitude Above Sea Level : < 1000 M			
Earthing Mode : Solidly Earthed		<b>Atmospheric Pollution</b>	Dusts : Coal Dust & Urea Dust		
No. of Phases & Wires : 3 Ph. & 4 Wires			Vapour : Ammonia & Highly Corrosive		
Insulation Level : 2.5 KV		<b>Cooling Water Data</b>	Inlet Pressure Kg/M <sup>2</sup>		
<b>AUXILIARY POWER</b> AC : 240 V DC : 220 V			Temp. Inlet / Outlet °C		
		Fouling Factor			
<b>SPARE PARTS</b>		<b>PAINTING</b>			
Required <input checked="" type="checkbox"/>	Duration 2 years	Type: Epoxy Based	Shade No. 631 as per IS: 5		
<b>POWER REQUIREMENT</b>					
Normal	KW	at	V		
Peak	KW	at	V		
<b>VENTILATION REQUIREMENT</b>					
Sl. No.	Area	No. of Air Changes per Hr.	Discharge Pressure	Occupancy	Remarks
1.	Substation (Refer attached Equipment Layout)	Bidder to indicate	--	4	--
<b>MAKE OF COMPONENTS</b>					
<b>Motor</b>	Refer Vendor List				
<b>LCS</b>	Refer Vendor List				
<b>Blower</b>	ABB Flakt India Ltd., Aeroto Boldrocchi India Pvt. Ltd., Aerovent Projects Pvt. Ltd., Air Conditioning Corporation Ltd., Air Control & Chemicals Engg. Co. Ltd., Bharat Heavy Electricals Ltd., Thermax Babcock & Wilcox Ltd., TLT Engineering India Pvt. Ltd.				

- NOTE: All unfilled data shall be filled by the Contractor. Completely filled in Specification Sheet duly stamped & signed by the Contractor shall be submitted after award of order.





**TALCHER FERTILIZERS LIMITED**  
**TECHNICAL SPECIFICATION - AIR PRESSURIZATION**  
**SYSTEM**

PC183-TS-0839

0

Document No.



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**TECHNICAL PARTICULARS**  
**PRESSURIZATION SYSTEM**


PROJECT: Coal Based Fertilizer Plant		PLANT: Dyke & Associated Facility	
ISSUED FOR : PROPOSAL <input type="checkbox"/>		ENQUIRY <input checked="" type="checkbox"/>	
ORDER <input type="checkbox"/>		FINAL <input type="checkbox"/>	
<b>FANS &amp; BLOWER</b>			
Item no.			
Rating / Voltage			
Make			
Maker's Type			
<b>OPERATING CODITION</b>			
Fluid Handled		Kg / Cm <sup>2</sup>	
Suction Pressure		Kg / Cm <sup>2</sup>	
Rated Temperature (T)		°C	
Temperature Min. / Max.		°C	
Static Pressure at T		MMWG	
Rated Flow at T		M <sup>3</sup> / HR	
<b>PERFORMANCE</b>			
Efficiency		%	
Speed		RPM	
Absorbed Power at Normal Flow		KW	
Rated Absorbed Power		KW	
Design Suction Pressure		Kg / Cm <sup>2</sup>	
Moment of inertia of Rotating Parts		MMWG	
Full Load Torque		Kg / M <sup>2</sup>	
Starting Torque ( % of full Load Torque)		Kg / M <sup>2</sup>	
<b>CONSTRUCTION</b>			
Vendor's Type			
Size			
Single Width / Double Width			
Type of Blade		Radial <input type="checkbox"/> B / W Curved <input type="checkbox"/> F / W Curved <input type="checkbox"/>	
No. of Impeller		One <input type="checkbox"/> Two <input type="checkbox"/>	
Impeller Diameter		MM	
Impeller Dip Velocity		M / S	
Drive		Direct <input type="checkbox"/> Geared <input type="checkbox"/> V-Belt <input type="checkbox"/>	
Coupling Mfr. Type			
Bearing Mfr. Type			
Bearing Lubrication		Grease <input type="checkbox"/> Ring <input type="checkbox"/> Press. <input type="checkbox"/>	
Shaft Sealing System			
V-Belts Mfr.		Type No.	
Diameter		Driven Pulley mm   Driving Pulley mm	
Gear Drive		Mfr. Type	
Rotating Facing Coupling End		CW <input type="checkbox"/> CCW <input type="checkbox"/>	
<b>MATERIAL OF CONSTRUCTION</b>			
Casing			
Liner			
Impeller			
Shaft			
Bearings			
Packing / Seals			
Cage Plate			
<b>DRIVE MOTOR</b>			
Driver To Be Supplied By		Purchaser <input type="checkbox"/> Fan Manufacturer <input type="checkbox"/>	
Motor		KW RPM	
Common Baseplate		Yes <input type="checkbox"/> No <input type="checkbox"/>	
Coupling / V-belt / Gear Drive			
Companion Flanges			
Foundation Bolts			
Shaft Seal			

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Vibration Isolating Pad	
<b>GENERAL INFORMATION</b>	
Suction Filter	
Capacity Control Arrangement at Suction / Discharge	
Inspection Door	
Drain Plug	
Net Weight	
Tests	
Inspection	
Performance Curve No.	
Overall dimension drawing	
Spare and Accessories	
Materials Used As Filter Media	
Materials of the Casing	
<b>AIR FILTER</b>	
Item no.	
Rating / Voltage	
Make	
Maker's Type	
<b>OPERATING CONDITION</b>	
Rated Capacity	M <sup>3</sup> / HR
Velocity of Air Inside The Filter	M / Sec.
Size of The Dust Particles To Be Removed	
<b>PERFORMANCE</b>	
Efficiency at Normal Capacity	
Recommended Final Pressure Drop	
Pressure Drop When Clear	
<b>AIR DUCT</b>	
Material of Construction	
Thickness of Material of Air Duct	
Cross-section of Air Duct considered	
Velocity of Air in Air Duct	
Pressure of operation	
<b>OTHER INFORMATION</b>	
Noise Level of the Pressurisation Room	
Number of Air-outlets Provided	
Total Discharge Capacity of Installation	
Static Pressure in the Pressurisation Room	
No. of Air Change per Hour	

**NOTE:**

- Completely filled in Technical Particulars Sheet in line with NIT/Contract, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - AIR PRESSURIZATION</b> <b>SYSTEM</b>	PC183-TS-0839	0	
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### ANNEXURE – I

#### DOCUMENTATION FOR AIR PRESSURISATION SYSTEM

Sl.No.	Description	Documents Required (Y / N)		
		With Bid	For approval	Final
1.	Equipment Layout Drgs.	N	Y	Y
2.	Civil Scope Drgs. (Good for Construction)	N	Y	Y
3.	Duct Layout Drg.	N	Y	Y
4.	Filled in specification sheet	N	Y	Y
5.	Technical Particulars	N	Y	Y
6.	Cross sectional drawing of Blower	N	Y	Y
7.	Bill of Material	N	Y	Y
8.	Catalogues of Bought out items	N	N	Y
9.	I.O.M. Material	N	N	Y
10.	Spare Parts List	N	N	Y
11.	Test certificates	N	N	Y
12.	Guarantee Certificate	N	N	Y

**Note:**

1. 4 hard copies & 1 soft copy shall be supplied for approval after order within 4 weeks from the date of LOI.
2. 8 hard copies & 2 soft copies in CD shall be submitted as final documents prior to despatch of the equipment. These shall be made in sets and supplied in fine plastic coated folder.

**Y - Yes, N - No**



**PROJECTS & DEVELOPMENT INDIA LTD**

**ES:8028**

**0**

DOCUMENT NO

REV

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## ENGINEERING STANDARD

## ELECTRICAL ERECTION, TESTING & COMMISSIONING

REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD
0	20.01.07	01.02.07	ISSUED FOR IMPLEMENTATION	AV	BKC / SC	BB

	<b>ENGINEERING STANDARD</b> <b>ELECTRICAL</b> <b>ERECTION, TESTING &amp; COMMISSIONING</b>	<b>ES: 8028</b>	0
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**CONTENTS**

SECTION NUMBER	DESCRIPTION
1.0	Scope
2.0	Codes and Standards
3.0	Equipment Specification
4.0	General Procedure for Erection
5.0	Specification for Electrical Erection
6.0	General Procedure for Testing & Commissioning
7.0	Testing & Commissioning Specifications
8.0	Documentation
9.0	Handing over to Owner
10.0	Obligations & Responsibilities of Contractor
11.0	Terms and Conditions
12.0	Measurement
13.0	Prior Approval of the material to be supplied by Contractor
14.0	Recovery Against Owner's Un-reconciled Materials
15.0	Statutory Approvals
16.0	Guidelines for Safety Measures

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## 1.0 SCOPE

1.1 This standard covers the technical requirements of erection, testing and commissioning of all Electrical equipments at site.

1.2 This standard shall be read in conjunction with the relevant technical specifications and other references specified therein.

### 1.3 Scope of Work

1.3.1 The scope of work shall generally include supply (wherever specified), handling, transportation, unpacking, checking, reporting of damages/defects, storage, assembling, erection, installation, including fabrication, alignment, levelling, grouting, welding, bolting, painting, etc., testing and commissioning of various electrical equipments and machineries, illumination system, earthing system, lightning protection and fabrication & installation of steel structural etc. required for the complete electrical system as per drawings & documents, specifications, standards & codes, prevalent rules & regulations and best engineering practices.

1.3.2 Detailed Scope of Work (Supply and Erection) shall be as indicated in project specific Technical Specifications.

1.3.3 The entire electrical installation work shall be carried out in accordance with the following:

- a) Indian Electricity Rules & all applicable Statutory Acts & Regulations
- b) This specification
- c) The latest issue of approved drawings of vendors / consultant
- d) The recommendation of the manufacturers
- e) Latest issue of Relevant IS
- f) The direction of the site engineers

Any additional revision made to the drawings at a later stage, which in the opinion of the consultant / owner is necessary, will be binding on the contractor and shall have to be carried out.

1.3.4 The contractor shall be responsible for:

- a) Obtaining approval from the Electrical Inspector / Factory inspector or any other Statutory Authority for equipment, plant design / drawings and complete installation work.
- b) Carrying out modifications in the equipment & installation as required to comply with the above.
- c) Submitting installation certificates on completion of installation to Electrical Inspector & obtaining certificates of approval of the installation.

These jobs shall be carried at the contractor's own cost and the work shall be deemed to have not completed unless the approved certificates mentioned under (c) are submitted to the owner.

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- 1.3.5 No erection material shall be supplied by the owner. All materials like clamps and tags for cable/ conduit and earthing including hardware material, all tools and tackles required for erection, testing and commissioning such as, but not limited to jacks, welding sets, oxygen/ acetylene gas, cutting set, drilling machines, grinders, pipe bending machine, dies for pipe threading, scaffolding materials, cables, switches for erection power supply and workshops, temporary lightning protection, cable jointing tools, megger, earth tester, primary and secondary injection test sets, substandard meters for calibration of ammeters & voltmeters etc. and any other tools required shall have to be arranged by the contractor.
- 1.3.6 Consumable materials required for the erection jobs such as, but not limited to kerosene, cotton waste, jute, duster shims for alignment & levelling, cement, concrete, bricks, welding electrodes, paints, carbon tetrachloride, unleaded petrol, solder, flux, raul-plug, phill-plug, nylon-plug, anti corrosive grease for copper, aluminium contacts etc. shall also have to be arranged by the contractor.
- 1.3.7 Cleaning of site after completion of erection as well as regular clearance of unwanted material from site, returning of all packing materials, & excess of other material supplied by owner back to owner's stores shall also be covered under the scope of work.
- 1.3.8 All equipments and instruments shall be inscribed with proper number, nomenclature, cautionary signals & other instructions as may be necessary.
- 1.3.9 The contractor shall supply and touch-up any surface of switchgear and other electrical equipments which are scratched and / or damaged during transportation and erection. The paint used shall match exactly the surface being touched up.
- 1.3.10 Major civil engineering works pertaining to electrical equipment like foundation and plate inserts etc., if excluded from the scope of work, the contractor shall check their correctness as per latest manufacturer's drawing and carry out minor civil jobs such as, but not to limited to, grouting of base plates, channels, supports and foundation bolts, cutting holes in wall and ceiling, chipping of floor and ceiling, sealing of cable entries and making good the same after installation of the equipment, levelling and any other minor similar civil works advised by site engineer has to be carried out by the contractor with out any extra charges.
- 1.3.11 The contractor shall furnish all supervision, labour, tools, rigging material and incidental material such as bolts, welding electrodes, anchors etc. required to install, test and adjust the equipment.
- 1.3.12 The contractor shall employ all skilled, semi-skilled and non-skilled labourers for erection, installation & testing as required. All Electricians, cable jointers, wiremen, welder and other employed shall be suitably qualified possessing valid certificates/ licenses recognized by the complement authorities. The owner at its own discretion, put any electrician, wireman, cable jointer to test about competency of technician concerned and the contractor shall have to replace any such staff found incompetent in the opinion of the owner, to execute the job as per the requirement.

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- 1.3.13 The contractor shall also furnish a list of Engineers / Supervisors and staff employed by him for erection and installation jobs giving in brief qualification and experience of such staff and indicating whether they hold such competency certificates / licences to supervise the electrical installation jobs as required under Indian Electricity Rules & State Electrical Inspectorate Rules.
- 1.3.14 The contractor shall set up his own work-shop and other facilities at site allocated place to undertake fabrication jobs, pipe bending, threading etc.
- 1.3.15 The contractor shall be responsible for recording of all readings and observations during erection, testing and commissioning in registers or on prescribed Performa. These shall be carried out in the presence of owner's representative. All such test data and records shall be duly signed by the contractor's Engineer / Owner's representative and shall be submitted to owner in triplicate.
- 1.3.16 The contractor shall hand over completed job. Minor details not specifically mentioned in the scope or schedule of quantities but required for completeness of the job shall have to be carried out by the contractor with out any extra cost.
- 1.3.17 The contractor shall commission all Electrical equipments and carry out all tests inclusive of load test as per the performance guarantee and will be responsible for final adjustment of relays, instruments, meters, breakers etc.
- 1.3.18 The specifications given under Cl. Nos. 5 & 7 are only guidelines and doesn't give the details entirely. It shall be the responsibility of the contractor to execute the work without any extra cost to owner, in accordance with the standard code of practices, the relevant manufacturer's drawings, owner's drawings, consultant's drawings and as per Site engineer's directions. Further, the stipulations of general conditions of the contract shall prevail over all other conditions stipulated in this specification.

#### 1.4 **Exclusion of Work**

- 1.4.1 Detailed Exclusion of Work shall be as indicated in project specific Technical Specifications.

### 2.0 **CODES AND STANDARDS**

- 2.1 The erection, testing & commissioning of the equipment shall comply with the latest issues of all relevant Indian Standards and Codes of practices. Design, manufacture, testing & installation of supply items shall also comply with the relevant standards. Equipments complying with equivalent IEC standards shall also be acceptable.

- 2.2 Some of the relevant Indian Standards are as follows:

IS: 10028(Part-2)	Code of practice for selection, installation and maintenance of transformers
IS: 6600	Guide for loading of oil immersed transformers.



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IS: 10118(Part-3)	Code of practice for selection, installation and maintenance of Switchgear and controlgear
IS: 11039	Requirements for mounting on rails in switchgear and controlgear installations.
IS: 1255	Code of practice for installation and maintenance of power cables upto and including 33 KV rating
IS: 14782	Code of practice for maintenance and testing of large lead-acid batteries for generating systems and substations
IS: 2309	Code of practice for protection of buildings and allied structures against lightning
IS: 2551	Danger notice plates
IS: 3043	Code of practice for Earthing
IS: 5216	Recommendations on safety procedures and practices in electrical work
IS: 8437	Guide on effects of current passing through human body
IS: 14786	High voltage / Low voltage prefabricated substations
IS: 900	Code of practice for installation and maintenance of induction motors
IS: 15429	Storage, installation and maintenance of DC motors – Code of practice
IS: 13408	Code of practice for the selection, installation & maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining application or explosive process manufacture)
IS: 14665(Part 2)	Electric Traction Lifts: Code of practice for installation, operation and maintenance

2.3 The contractor shall observe safety rules and take all necessary safety precautions to carry out the work in the plant.

### **3.0 EQUIPMENT SPECIFICATION**

3.1 All equipments shall conform to the relevant specifications indicated in project specific Technical Specifications. They shall be suitable for specified site & climatic conditions.

3.2 Make of equipments shall be as per project specific requirements. Make of equipment not specified shall be as indicated and shall be subject to Owner / Consultant's approval.

3.3 Drawings and documents for various equipments shall be submitted as per Documentation Schedule indicated in relevant specifications.

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3.4 Spares as specified / recommended spares for 2 years operation and commissioning shall be supplied for all equipments.

#### 4.0 GENERAL PROCEDURE FOR ERECTION

The general procedure governing "Transfer of equipment and materials to Contractor", erection and Final acceptance of Owner/ Consultant are given below:

##### 4.1 Drawal of Equipment from Owner's stores

All equipment and materials, excepting, equipment / erection materials included in Contractor's scope of supply, shall be issued from Owner's store. Contractor shall arrange to draw the necessary equipment / material in the sequence required for erection and transports the same to contractor's store or directly to erection point.

##### 4.2 Contractor's inspection at Owner's stores / Site

On receipt of any material (supplied by the owner) at site, before removing any issued item, contractor shall fully unpack and inspect all equipment received for completeness, signs of damages, defect etc. in the presence of owner's representative and shall get all discrepancies (damage / short supply) duly recorded by owner's/ consultant's authorised representative on the issue note, failing which, no claim by the contractor shall be entertained at a later date and he shall be required to make good/replace/repair the defective/ damaged items at no extra cost.

##### 4.3 Handling and cleaning

4.3.1 Contractor shall be responsible for proper handling and cleaning of all materials / equipment drawn / supplied by him until Owner / Consultant finally accepts the erected equipment.

4.3.2 Equipment shall be handled with care by experienced riggers under guidance of competent supervisors and as per rigging marks given on cases. Dragging on floor shall be avoided and crane/suitable rollers shall be used for moving the equipment at any times.

4.3.3 The contractor shall be fully responsible for the safe keeping of equipment issued to him till these are erected, tested, commissioned by him and accepted by owner/ consultant.

##### 4.4 Transportation

This involves transportation of various electrical equipments / materials from owner's stores / store siding to erection site / Contractor's stores & Contractor's Stores to erection site. When transporting the equipment, it shall be loaded on suitable trailer / trucks as per capacity and size of equipment, and shall be properly supported on the trailers / trucks by means of ropes / stoppers to avoid

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damage or tilting due to heavy jerks and vibration. Precautions, if any, displayed on equipment shall be strictly observed.

#### 4.5 **Storage**

Whenever materials are required to be stored by the Contractor in his own stores at site, the contractor shall strictly observe the following requirements: -

- 4.5.1 The contractor shall keep a proper record of the materials handed over to him by owner / consultant at the initial start of the work and the materials drawn by him and kept in his stores.
- 4.5.2 All equipment and materials shall be properly stored by the contractor at site in the designated storage area provided by the owner.
- 4.5.3 The contractor shall ensure that all the materials drawn / supplied by him are stored indoor / under shade. However, if a package is temporarily stocked outdoor due to unavoidable reasons, this shall be ensured that the storage area is dry, hard and well-drained area.
- 4.5.4 Goods must not be placed directly on the floor / ground but shall be kept on blocks, 60 mm to 120 mm above the floor level such that the bottom is well ventilated.
- 4.5.5 In case of outdoor storage, the contractor at his own cost shall provide waterproof PVC sheets / tarpaulin to cover all goods so as to protect them from rain etc. These sheets / tarpaulin shall be removed for inspection once in a week and if found moist or mouldy, shall be dried in direct sunlight.
- 4.5.6 In addition to the above, the equipment manufacturer's storage instructions, if any, shall be strictly followed.

#### 4.6 **Erection Requirements**

- 4.6.1 All work shall be carried out as per drawings supplied. Placing of equipment on foundation, aligning, grouting, connecting, fixing danger notice plate / board on equipment shall be done as specified. Meggering, labelling and painting shall form part of erection requirements.
- 4.6.2 Fixing of supporting frames / pedestals, grouting, cutting and dressing holes in walls / ceiling and any other minor civil work necessary for installation and levelling of electrical equipment are included in electrical erection scope.
- 4.6.3 The scope of erection also includes cable dressing/ clamping/ minor rerouting, minor relocation of fittings, internal cleaning of equipment, overhauling and minor repairs.
- 4.6.4 Fabrication of clamps from the materials specified and clamping of cables on racks, trays etc. fixing of single core cables in tri-foil formation in aluminium

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clamps, earthing of cable armour and lead sheath, wherever necessary (and as per the details given by Consultant) fall under erection scope of work.

- 4.6.5 Marking of cables by fixing / grouting the cable marks / number tags for every 25 meters along entire route of cables is included in the scope of work. The tags shall be made of Aluminium Strips.
- 4.6.6 The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged / scratched during handling, erection or repair. The paint used shall match exactly the painted surface of the equipment on which touch-up is done, and shall be epoxy based.
- 4.6.7 The descriptions given above are only to give a preliminary idea about the scope of work and they do not limit the entire scope to these descriptions only. Hence all other parts of the tender document shall be read in conjunction with the referred standards, associated drawings, specification sheets and schedule of materials & services to assess actual scope of work.
- 4.6.8 The contractor shall undertake erection of all equipment specified herein in accordance with good engineering practices in conformity with statutory regulations and Code of Practice and to the entire satisfaction of the purchaser/ owner.
- 4.6.9 The contractor shall arrange all the necessary erection tools, tackles, testing and measuring instruments and shall supply all erection materials as required.

#### 4.7 **Services of Suppliers' Erectors**

For guiding / supervising erection of sophisticated equipment, services of main equipment supplier's engineers / erectors may be made available free of cost to Contractor as per discretion of Owner/ Consultant. However, this will not absolve the contractor from his responsibility nor his obligation to provide his own supervisors or technical personnel.

The contractor shall comply with all the directions, drawings etc. issued to him within the scope of his contract by Supplier's Engineer / Erector.

#### 4.8 **Installation Certificate**

On completion of work the contractor shall submit installation certificates in prescribed Performa as required under prevailing Electricity Act/ Rules to Electrical Inspector or other competent statutory body and obtain certificates of acceptance/ approval of Electrical Installation carried out by him.

### 5.0 **SPECIFICATION FOR ELECTRICAL ERECTION**

#### 5.1 **General**

- 5.1.1 These specifications lay down the erection procedures to be followed for each type of equipment, over and above the general "Erection Requirements".

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5.1.2 The contractor shall also follow manufacturer's instructions and any other instructions of consultant / owner / Statutory bodies during erection.

5.1.3 Suggestive Erection Drawings shall be supplied to the successful bidder for Lighting, Earthing, Cable Tray Routing, etc. These drawings may be suitably modified, if required, to suit site requirement with the approval of owner / consultant.

5.1.4 As-Built Drawings shall be prepared by the Erection Contractor and supplied to owner / consultant.

## 5.2 Prefabricated Sub-Stations

5.2.1 New emerging technologies for Electrical Power Distribution Systems have brought in the concept of Modular / Transportable Sub-Stations instead of conventional RCC Sub-Stations.

5.2.2 Transportable Sub-Stations shall comprise of pre-fabricated transportable modules made of galvanized steel, duly installed with electrical equipment like HV & LV switchboards, distribution boards, lighting transformers, battery, battery chargers, I/O racks, etc. and complete with air conditioning system, illumination, earthing & lightning protection, fire protection & management system, communication system, interconnecting cabling and cable tray support system, etc. within itself.

5.2.3 Most of the work shall be completed and tested at works. After testing, for safe delivery to site, the battery electrolyte shall be removed and all equipments shall be secured.

5.2.4 Due to local transport restrictions, some of the pre-fabricated buildings may be required to be split into units / modules of suitable size for delivery. Splitting shall be done by providing several units placed side by side, each unit complete in itself or a large sub-station split in modules with false walls in between modules for transportation, which shall be removed at the time of assembly at site.

5.2.5 The modules / units shall be assembled at site to complete an Electrical Sub-Station with minimum work required to be done at site. Following work shall be carried out at site:

- a) Transportable building shall be put on prepared foundations and anchored.
- b) Transportation fixtures and temporary walls shall be removed.
- c) Different sections of the transportable buildings shall be joined together.
- d) Staircases shall be assembled and placed in position.
- e) Cable Trays shall be fixed.
- f) Re-connection of fire protection & internal lighting system.

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- g) Internal wiring between sections of the transportable buildings shall be connected.
- h) Connection to ground & lightning protection system.
- i) Installation of panels within transportable building, if supplied by Owner.
- j) Re-testing & commissioning of all the installed panels.

5.2.6 The installation works shall be carried out as per manufacturer's instructions.

### 5.3 Transformers

#### 5.3.1 Contractor's inspection

Particular attention is to be paid to the following while inspecting / examining the transformers for any sign of damage:

- a) Tank side and cooling tubes dented
- b) Cooling Tubes damaged
- c) Any sight glasses broken (including explosion vents)
- d) Bushings cracked / broken
- e) Bolts loose
- f) Oil leakage (particularly along welds)
- g) If gas filled, whether gas pressure O.K.
- h) Valves leakage
- i) Any other damage

#### 5.3.2 Handling

- a) Lift the transformers by lugs or shackles provided for the purpose.
- b) Use lugs and shackles to avoid unbalance while lifting.
- c) Lifting chains not to interfere with any part of the transformer.
- d) Check cover bolts for tightness. Tighten fully (if found loose) before handling. Care shall be taken that the bolt does not rotate to avoid damage of the gasket.
- e) In case use of jacks is necessary, use jacks only on jacking pads provided for the purpose. (Jacks shall never be used under valves or radiator tubes).
- f) Do not keep transformer on bare ground. Where it is not possible, unload transformer directly on the foundation. This can be done with the permission of consultant/ Owner.
- g) Never leave the transformer without putting stoppers of the wheels.

#### 5.3.3 Erection

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- a) Foundation of the transformer shall be prepared and checked for its level as per Drg. before shifting / transferring the transformers from the stores.
- b) Transformer shall be placed on the prepared foundation only.
- c) For transformers of high rating (above 1000 KVA) place the transformer on foundation (channels / rails already grouted on the foundation) as per drawing. Proper time shall be given for curing the level of rails. Rails must be checked and adjusted.
- d) Wheels shall be fixed before placing of the transformer in position. Wheels of the transformers shall be checked for its proper/ free movement on the rails / plates. Greasing shall also be done on the shaft of wheel before placing the wheels in position. Split pins must be used / placed in position before its rolling. It shall also be levelled & aligned with the bus ducts, if bus ducts are to be connected on the LT side of the transformer.
- e) Clamp stoppers to the transformer wheels, immediately after alignment to prevent any movement.
- f) Clean all the accessories like radiators, cooling fans, valves, conservator tanks, explosion vent pipe, bushing and other accessories.
- g) Flush the radiators with hot oil before assembly.
- h) Cloth only shall be used for cleaning purposes (CAUTION: While working on the transformers with hand-holes or bushing holes, take care that no tools or any other foreign matters are dropped into the tanks. All the loose tools shall be properly tied and secured).
- i) Assemble all accessories such as radiators, conservator, valves, explosion vents, Buchholz relay, HV and LV bushings, cable-end termination boxes, marshalling kiosk/box, instruments, capillary tubes, silica gel breathers with dried silica gel, fans etc. as per vendor's drawings and instructions.
- j) Prior to topping up of oil, check for proper tightness of all gaskets joints and operation of shut-off valves. Also fix thermometers.
- k) Test oil samples from each drum for dielectric strength before topping. (Do not fill oil from the drums, which cannot with stand 40 KV for 1 minute).
- l) Filter oil before filling.
- m) Oil shall be filled through filtering machine using metallic hose.
- n) Fill oil to the transformer tank through bottom drain valve to prevent aeration in oil.
- o) Ensure during oil filling operation that no air pockets are left in the tank, and that no dust or moisture enters the oil. Open all air vents. Reduce oil flow rate when oil level is almost up to the bottom of the main cover to prevent internal pressure from rupturing the diaphragm of pressure relief pipe. Allow sufficient time for all air bubbles to escape. Release any air bubble accumulated in Buchholz relay. Close vent plugs.
- p) In case of gas filled transformers, the oil to be filled up under vacuum as per manufacturer's instructions.

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- q) Connect cables to HV terminals and cables/ bus duct to LV terminals of transformer.
- r) Connect control cables / power cables to the marshalling box. Connect Stop push button mounted on the wall of transformer room to trip the transformer.
- s) Transformer body, HV cable box and MV / LV cable box to be earthed at 2 separate points to the main earthing grid.
- t) Transformer neutral to be earthed to separate and distinct neutral earth pits (through Neutral Earthing Resister, where applicable) as per design and drawings.
- u) Provide danger notice board conforming to IS: 2551 and IE Rules 1956 on enclosure or door of the enclosure.
- v) Earth Transformer Room's door / enclosures as per IE Rules, 1956.
- w) Provide Safety items i.e. fire extinguishers, shock treatment chart, fire buckets with screened sand etc.

## 5.4 Switch Boards

### 5.4.1 Handling

- a) As far as possible lifting of switchboards is to be done by making use of eyebolts provided. Ensure that before lifting, all eyebolts are fully tightened and that panel supports, nuts and bolts are in tact and tight.
- b) If lifting arrangement is not provided / not feasible and final positioning by sliding is unavoidable, retain packing base as long as possible and rolled on suitable pipes. Avoid sliding / dragging panel directly on floor by crowbars.
- c) Maximum care shall be taken to avoid any damage to insulator, bushings, meters and protective equipment.

### 5.4.2 Erection

- a) Check the foundation according to the drawings. Ensure that all pockets have been rightly made. Fix the datum level, and level the foundation by chipping in such a way that the prescribed point of cubicle base plate is flush with finished floor.
- b) Check the individual cubicle for any deformity and ensure that all faces are straight. Any dent on sheet steel frame is rectified before placing on foundation.
- c) Wherever separate base frames are supplied level and the foundation in both directions (lateral and transverse) and ensure that these have been correctly levelled throughout. In case of runner rails, check the rails for level in both the directions and ensure that they are parallel to each other.

Wherever base frame is fixed to cubicle, place the cubicle on foundation ensuring that holding down bolts are directly over the foundation pockets.

- d) Obtain correct level of panel with respect to floor / existing bus-bar by putting shims below base frame (as per drawing). Shims are to be supplied



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by the contractor. Measure the level of each frame with reference to datum and ensure that level difference between the two ends of the switchboard base frame is within  $\pm 2$  mm.

Owner shall provide a level benchmark in each sub-station. All levels shall be checked with this mark by Theodolite and the Contractor shall keep a record.

- e) Cubicle shall be so adjusted that front face of all the panels are in one plane, all sides are plumb and corresponding horizontals on all panel faces (e.g. minimum lines, door edges, inter cubicle joints) line up in the same horizontal line(s). Match the cubicles and adjust properly. Provide gasket between edges, if required, so that no inter-panel gaps are seen.
- f) Bolt adjacent cubicles and base frame together. (Drill new holes where corresponding holes of cubicles do not match after levelling, if found necessary).
- g) Grout the foundation bolts with mortar. Also run grouting mixture under base of the cubicle frame and ram to ensure solidity. After grout has set properly, tighten the foundation bolts.
- h) Fix bushing/ insulators of bus-bars as per drawing if these have been despatched loose.

In case of extension panels for existing boards, this must be done before step (d).

#### 5.4.3 Bus Connections and Installation of Loose items

- a) Fix bus bar links and inter panel bus-bar connections with coupling bolts/ supporting insulators. Clean the contact surface of bus bars and links and smear with contact grease before bolting.
- b) Wherever recommended, fix shroud on the joints and fill compound, or compound may be put on joint to form smooth homogenous & spherical shaped mass and then wrapped with tape. Simple taping of joints may also be done. Recommendation of manufacturer/ consultant/ owner shall be followed in this respect.
- c) In case of misalignment of bus bars, adjustments may be necessary. The connecting pieces may have to be re-drilled or re-fabricated.
- d) Check tightness of bus bars bolts connections with torque wrench. Follow vendor's recommendations in this regard.
- e) Install all loose relays, instruments, cable boxes, metering and protective CTs, PTs etc. Before fixing the relays, make sure that they are cleaned and all packing materials have been removed from them and proper operation. Clean the contacts.
- f) Connect all inter-panel bus wiring. Connections of relays and instruments shall be done as per drawings. Check the wiring according to wiring diagram.
- g) Connect all earthing bus bar between the cubicles and it shall be connected at two points by Al/ GI strip or cable to the main earthing ring. Fix all glands

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for incoming and outgoing and control cable connections on the holes provided for the purpose, as per drawings.

- h) Drill holes for fixing cable glands/ cable boxes as per drawings, if such holes are not provided. All spare holes, gaps etc. shall be blanked as per instructions of Owner/ Consultant.

#### 5.4.4 Cleaning

After erection is complete all cubicles, switches, starters, CTs, PT Chambers, Bus Bar Chambers etc. shall be cleaned by blowing air (preferably hot air). Surface of the insulation shall be cleaned with cloth soaked in CTC/ Benzene.

#### 5.4.5 Circuit Breaker installation

##### 5.4.5.1 Air Circuit Breaker

- a) Clean the contacts properly with both soaked in CTC/ Benzene etc. Clean and lubricate the operating mechanism, check and rectify the main insulating contacts and bushings and also secondary contact for any damage/ misalignment. Check the locking mechanism.
- b) Manually close and trip the breaker several times and check contact alignment and pressure. Adjustment, if required, shall be done according to the manufacturer's instruction. The arc chute if despatched separately shall be fixed properly, only after checking of contact alignment etc. After fixing the Arc Chute, operate manually the breaker and check the contacts make properly. Measure contact resistance with ductor. Check the operation of OFF-ON indicator.

##### 5.4.5.2 Vacuum Circuit Breaker / SF6 Circuit Breaker

- a) Check the breaker frame for any damage. In case of vertical isolation type, raise and lower the breaker several times and ensure that breaker moves freely on guide, lubricate the mechanism.
- b) Check the operation of locking mechanism. Check the secondary isolating contacts for any deformity. Check HT bushings for any damage and repair if it is minor.
- c) Manually close and trip the breaker several times. Adjust the mechanism as per manufacturer's instruction. Measure the contact resistance with ductor. Check the oil level in the chamber. If level is low, due to leakages, rectify and fill up as per manufacturer's instruction. Check the operation of ON-OFF Indicator.
- d) Check that safety shutter open and close smoothly. Remove the lock if provided before racking in the circuit breakers. Put the circuit breaker inside the cubicles. If cubicle is aligned properly, the circuit breaker shall go smoothly inside the cubicle.
- e) In case of horizontal isolation type circuit breaker, engage the racking mechanism and put the interlock mechanism operates smoothly and

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adjustment if required shall be done. Slowly rack in the breaker to service position. While racking in, ensure that safety shutters open smoothly. Check the mechanical interlock mechanism. Also check that the main and secondary isolating contacts mesh properly. Conduct this operation a few times to ensure proper functioning and alignment of all mechanism.

- f) For vertical isolation type circuit breaker, put it first at the test position and check interlock mechanism and also the secondary isolating contacts engaged properly. Put it at service position, and slowly raise it to fully raised position. Ensure that main isolating contact bushings enter bush bars spouts smoothly and contacts mesh properly. Conduct the raising/ lowering operation several times to ensure a smooth functioning of all mechanism. Any other allied work thought necessary for completion of the erection will have to be done by the Contractor.

#### 5.4.5.3 Oil Circuit Breaker

- a) Check the breaker frame for any damage. In case of vertical isolation type, rise and lower the breaker several times and ensure that breaker moves freely on guide, lubricate the mechanism.
- b) Check the operation of locking mechanism; check the secondary isolating contacts for any deformity. Check HT bushings for any damage and repair if it is minor.
- c) After detaching tank, slowly close the breaker manually and check that moving and fixed contacts match properly. Adjustments, if required, shall be done according to manufacturer's instruction. Since contact movements and alignment etc. are adjusted at manufacturer's work, any further adjustment shall be done very carefully.

Do not operate the breaker when there is no oil in the tank. Measure the contact resistance with doctor. While operating the CB manually, check the operation of ON-Off indicator.

- d) Oil filling-Detach the tank and thoroughly clean tank inside with cloth and then with the insulating oil. Fill the tank with insulating oil upon the level. The dielectric strength of oil shall be as per latest IS. In case of supplied in drum not withstanding the dielectric strength as per IS, filter it before filling in the tank. Secure the tank with bolt the top place to ensure good joint.

#### 5.4.6 General Checks

- a) Ensure that all gaskets are in position, replace the same if found damaged.
- b) All opening covers and rear doors shall be bolted with required number of bolts. Take care that no bolt/ nut/ washer gets lost during handling and erection.
- c) Check inter-changeability of breakers of same rating.

### 5.5 Motor Control Centre / Power & Motor Control Centre (MCC / PMCC)

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Erection of MCC / PMCC, if required, is to be carried in accordance with Cl. No. 5.4 above. In addition, the following points are to be observed:

- a) Cable glands shall be fixed in cable gland plates/ cable alloys (Drilling of holes in gland plates are to be done at site as required).
- b) Cable entries are to be made vermin proof.

## 5.6 Panelled Equipment

These include AC/ DC Distribution Boards, Thyristor Control Panels, Inverters etc. In addition to the procedure laid down in Clause Nos. 4.0 & 5.3, any other instruction given by the manufacturer shall also be followed.

## 5.7 Storage Batteries

- a) Installation work for storage battery cells on steel / wooden racks shall be done strictly as per supplier's drawings and instructions.
- b) Steel / wooden racks shall be installed in the battery room on support insulators. The racks shall be plumbed and aligned properly.
- c) Each cell shall be inspected for any damage of its positive, negative plates, containers etc. Cell shall be cleaned properly and all packing materials removed as per manufacturer's instructions.
- d) The cells after assembling the plates, indicators etc. shall be placed on cell insulators over racks and interconnected to each other so as to avoid strain on cell-terminals.
- e) The electrolyte shall be prepared in large glass/ PVC or special jars as per manufacturer's instructions. The jars shall be cleaned with distilled water. The concentrated sulphuric acid shall be added to the distilled water slowly (never add water to sulphuric acid) and electrolyte stirred constantly with PVC rod. Temperature and specific gravity of electrolyte shall be as per manufacturer's instruction.
- f) All necessary safety precautions shall be taken while preparing the electrolyte i.e. goggles, rubber apron, and gloves etc. shall be used.
- g) No foreign materials, dust or dirt etc. shall be allowed to fall in the electrolyte and it shall be kept duly covered.
- h) Connection to the battery charger shall be made.
- i) Prepared electrolyte shall be filled in cells up to mark level of at least 10 mm above upper edge of the plates in a manner approved by manufacturer. Electrolyte shall be allowed to cool down.
- j) While giving initial charges to the cells, instructions of the manufacturer's regarding rate of charging shall be strictly followed and care taken that charging unit is not over loaded more than the rated capacity. During the period of charging, the cells must be topped up as often as necessary to prevent the electrolyte falling below the required level. Distilled water to be used for topping purposes and quantity of distilled water used for topping up of the cells shall be noted.

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- k) After initial charging battery shall be discharged at specified rate. Thereafter battery shall be recharged.
- l) Record all battery voltage of each cell, specific gravity, temperature, charging current during charging/discharging and shall be kept in Performa supplied by the supplier or in a form approved by the consultant/Owner. Discharging and recharging operations shall be done as recommended. After final charging the battery shall be put on float charge.
- m) No naked flame or sunlight shall be permitted in battery room and smoking shall be strictly prohibited.
- n) During initial charging and discharging battery shall not be left unattended.
- o) It is to be assured that battery room is properly ventilated with an exhaust fan / blower.

## 5.8 Cable Installation

### 5.8.1 General

- a) Fabrication of chequered plates for trench covers, cutting of all types of Al / GI Cable trays to desired length, laying, spacing, fixing etc. of all types of cables, trays, supports, hangars etc. shall be according to the drawings or according to the instructions given by consultant / owner.
- b) Contractor shall keep accurate record of cable drums issued to him, the drum nos. and actual length of cable taken out of each drum. Each cable length shall be cut from a specific drum as per approved schedule of cable. Length of cable runs shown in the cable schedules is the calculated length only and the actual lengths shall be measured at site before laying and cutting the cable. The contractor shall take extreme care to adjust cable runs from drums so that joints in the cable are avoided and wastage reduced to minimum.
- c) For purpose of measurement of cable run for payment the length of cable between and terminations only will be considered.

### 5.8.2 Laying

- a) The cable drums shall be properly mounted on jack / on a cable wheel. Make sure that the spindle is suitable for carrying weight of the drum without bending. Check that spindle is laying horizontal on the bearing so as to prevent the drum creeping to one side or to the other while rotating.
- b) Unroll the cables from the drum in correct direction. Rotate drum only as per arrow mark given in the cable drum. Ensure that the end protection box attached to the flange of the drum is removed and securing rope cut to allow cable and move freely. Rotate the cable drum and simultaneously pull cable steadily and with even pulls and not with unnecessary jerk or strain. In no case the cable shall be allowed to twist or kink since this is likely to spring the armour and fracture the insulation and outer serving of the cable.
- c) Do not drag the cable on floor or hard surface. Use only wooden / steel cable rollers for this purpose.

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- d) Cable shall not be bent sharply to a small radius. The cable bending radius shall be as large as possible and will not be less than 12 times the outside diameter for paper insulated cables, 8 times for PVC cables and 15 times for XLPE cables. At joint termination, the individual core of cable shall not be bent with bending radius of less than 15 times the diameter over the insulation.
- e) Where cables are laid on the MS racks, trays etc. ensure that trays / racks / supports are fixed properly in an approved manner or according to the drawings. Check from drawings that for horizontal runs of cable, bracket, risers, supports and angles are grouted or fixed in formation as required.
- f) In sub-station where large no. of cables rise to panels / switchboards, it shall be ensured that these risers and rising cables do not interfere with cables on racks and rising cables do not cross the other cables in horizontal runs. Risers are to be properly supported so that weight of cable does not fall on terminations. All cable crossings shall be avoided. Cable cross section / power layout drawings shall be followed.
- g) Cable laid in trenches shall be sealed at the entry to hazardous area/non-hazardous area as per details given by Consultant / Owner / Engineer-in-charge.
- h) Openings in substation / MCC rooms and floors for entry of cables shall be sealed after the cables are laid.
- i) Cables shall be clamped as shown in the drawings Care to be taken to space clamps to such intervals as to prevent buckling of cables.
- j) Cables are laid in concrete trenches built by Consultant / Owner having covers of concrete of slabs or chequered plates. The laying of the cable on the racks shall be done in an approved manner and according to the drawings supplied.
- k) Where cables are laid in open concrete trenches / slits, the trench / slits after laying cables shall be filled with sand & lean cement mixture and plastered so that surface flushes with top of trench / slit.
- l) Care shall be taken that cables are not laid in waterlogged area as far as practicable. When laid above ground, cables shall be properly supported on rigid poles at least 2M high. At road crossing, minimum head clearance of 6M shall be provided.

### 5.8.3 Laying of Cables in underground pipes

- a) Laying of cables in underground pipes shall include excavation of earth along the cable route, laying of pipes, back-filling, ramming and removing extra earth including supply of bricks and sand.
- b) Ground trenches which shall be dug for laying of pipes such as to ensure that depth of the top of the pipe below the ground level shall be 600 mm min. Bottom of the trench shall be properly levelled up and all odd and sharp materials removed. HDPVC / GI pipe shall be laid in the trenches. Proper bends & pull boxes wherever required shall be provided.

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- c) After laying of pipes, fill up earth in trench and ram properly. Remove all extra earth from the sides.
- d) Lay the cables as per drawings and instructions of site engineer.
- e) Fix cable markers at 100 M apart and at joints on the entire route length of the cables. The cable markers shall be made of pre-cast concrete block of 300 x 350 x 350 mm size with letter HT Cable, LT Cable, depth of the cable, arrow marks etc. inscribed. These shall have to be supplied by contractor at no extra cost and fixed as per the directions of the Consultant / Owner. The top of the above concrete slab shall have a smooth finish with cement only.
- f) Laying of cables under road crossing shall be avoided to the extent possible. If required, it shall be done in pipes. When a larger number of pipes are laid across the road, manholes shall be built on either side to terminate the surface of road. Backfilled soil shall be rammed thoroughly to prevent road surface cracking due to settlement of loose soil.
- g) Railway Crossing

Where the cable is laid under railway track, it shall be laid through cast iron pipe or spun concrete pipe of suitable diameter and strength. The pipe shall be laid not less than 1 M below the surface of the formation level. Pipes shall be laid with the gradient to facilitate drainage of water. Pipes shall be laid up to a minimum distance of 3 M from the centre of the end tracks on either side. The work shall have to be carried out in accordance with the rules and regulations of railways for cable crossings.

Where number of pipes is to be laid along road / rail crossing, these shall be laid in horizontal formation.

Masonry pipes to be constructed at both ends of road / railway crossing pipe and specified notice to be erected at crossing as per railway rules.

#### 5.8.4 Directly buried Cables

- a) Laying of underground cables shall include excavation of earth along the cable route, laying of cables, back-filling, ramming and removing extra earth including supply of bricks and sand.
- b) Where cables are laid directly into ground trenches which shall be dug up for laying cables such as to ensure that depth of the top of the entire cable below the ground level shall be 750 mm min. for medium and low voltage, 900 mm min. for cables from 3.3 KV to 11 KV grade, 1050 mm min. for cables from 22 KV to 33 KV grade and 1000 mm min. for cables at road crossing and at railway level crossing respectively.
- c) Bottom of the trench shall be properly levelled up and all odd and sharp materials removed. Trench bottom shall then be bedded with a 75 mm thick layer of sand. Before laying the cable over this bed, approval of consultant / owner for preparation of bed shall be taken. Cable shall be laid in the trenches in straight run, care shall be taken that any kinks or bend are not formed. After laying the cables, bricks shall be placed lengthwise on both the sides of the cable along the entire length to form through.
- d) Fill up space between bricks with sand to height of the bricks.

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- e) Place bricks closely width wise on the top of the sand filled through. Fill up earth in trench and ram properly. Remove all extra earth from side. Do not use broken bricks. Only Class-I (of relevant IS) bricks shall be used.
- f) If new cables are to be laid crossing existing cables, the new cables will be laid under existing cable at depth of not less than 200 mm from the existing cable. Ensure that the approach of the new cable to the crossing is uniform and gradually sloped.
- g) Lay the cables as per drawings and instructions of site engineer.
- h) Fix cable markers at 100 M apart and at joints on the entire route length of the cables. The cable markers shall be made of pre-cast concrete block of 300 x 350 x 350 mm size with letter HT Cable, LT Cable, depth of the cable, arrow marks etc. inscribed. These shall have to be supplied by contractor at no extra cost and fixed as per the directions of the consultant / owner. The top of the above concrete slab shall have a smooth finish with cement only.

#### 5.8.5 Laying in Trenches

- a) RCC slabs and chequered plates lifted from trenches for laying cables shall be put back in position at close of work every day to avoid accident & damage to cables in the trench.
- b) When cables pass through pipes, ends shall be sealed by pouring bitumen compound or any other approved compound as required.
- c) Pipes shall be provided for protection of the cables entering from the floor, trench etc. in the switchgears, MCCs, and pipes shall be sealed against water ingress.

5.8.6 Laying of single core HT un-armoured cables shall be done in manner stated hereunder. Cables shall be arranged in trefoil formation and clamped with suitable clamps. The clamps shall be fixed on cable hanger, racks etc. The cables shall be laid with extreme care without causing any damage to the sheathing cables in trefoil formation shall be bounded at a regular interval and earthed. Where necessary the bounding on trefoil groups shall be interconnected. The cables shall in no case be drawn through metallic pipe, ducts etc.

### 5.9 Cable Joining & Termination

#### 5.9.1 General

The scope of work includes:

- a) Soldering / crimping of sockets / ferrules and connections at all joints / terminations as per specifications. Sockets shall be provided at all terminations except where pressure clamp type terminals are provided.
- b) Glanding of cable and fixing of cable boxes.

#### 5.9.2 Specifications

- a) All PVC cables shall be terminated in conventional type cable boxes, fitted with wiping gland / compression type gland / clamps with rubber bush. For



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outdoor terminations double compression type gland and for indoor terminations single compression cable gland shall be used. Boxes may be filled with bituminous compound, epoxy M-seal, as and where specified.

- b) For XLPE cables, special termination kits (heat shrink type) shall be used.
- c) All paper-insulated cables shall be terminated in compound filled type cable boxes using conventional compound filling methods or in special cases resin oil filled or epoxy M-seal cable boxes. Wiping gland / clamp with rubber bush are fitted to the cable box.
- d) All LT and control cables shall be terminated through compression type gland.
- e) In explosion proof equipment sealing accessories, where provided in cable box, are to be used for sealing the cable entry to the box and termination.
- f) All lighting and control cables shall be provided with crimped Al / Cu Sockets before termination in junction boxes.
- g) In case of LT cables, armours shall be suitably earthed in compression type glands. For HT cables, this shall be done either in glands or by any other suitable means like bonding the armour with suitable wire and connecting same to the earth terminals inside cable box.

#### 5.9.3 Crimping

All cable lugs for Cu conductor's sizes up to 400 sq. mm shall be of crimped type solder less Cu lugs, which shall be crimped by special hand / hydraulic crimping tools. Cable lugs for conductor sizes exceeding above shall be conventional soldering type, heavy duty. All the control cables, which shall be of copper conductor, shall be terminated without any additional lugs in screwed type terminals provided in various equipments. Before crimping the socket inhibiting grease shall be smeared over the conductor. Conductor shall be shaped properly before sliding the socket over it. Crimping shall be done in an approved manner.

#### 5.9.4 Jointing

- a) The jointing shall be done in an approved manner with proper jointing kits. Care shall be taken not to damage the insulation when opening the cable for jointing. Taped / temporary joints shall be avoided.
- b) In case of LT PVCA cables, armours shall be suitably earthed in compression type glands. For HT cables, this may be done either in glands or by any other suitable means, like bounding the armour with suitable wire and connecting same to the earth terminals inside cable box.
- c) Before commencing soldering of the socket, conductor shall be thoroughly cleaned and insulation protected. The ferrules shall be thoroughly cleaned. Ferrule and each strand of the cable shall be thoroughly sweated with solder to completely tin them and fill the conductor gaps and to remove all air pockets. Soldering materials of approved quality as per IES practice shall be used. Taping of the conductors shall be done in an approved manner after crimping / soldering.

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- d) Filling up compounds and sealing the cable box, shall never be done in one operation. After the first pouring of compound, it shall be topped up again with compound and then sealed.
- e) Straight through Joints
- Jointing of XLPE & PVC / HRPVC cables shall be done with extreme care and manufacturer's instructions shall be strictly followed. Soldering of ferrules shall be done with extreme care as stated earlier.
- Earth continuity wire shall be plumbed and or clamped. Compound shall be filled according to the instruction of manufacturer of terminating kit / cable. Joints made inside trench or racks shall be properly supported. Wherever, joints are made inside the ground, brick masonry work shall be done around the joint box and filled with sand and thereafter covered with earth at no extra cost.
- f) A tent shall be used in all circumstances where jointing work is being done outdoor for protection against rain and to prevent dust from being blown into exposed joint and jointing materials. Extreme care shall be taken to maintain proper phase sequence while terminating at equipment ends. Record of connection details shall be maintained. Conductor shall be shaped properly while terminating and no sharp bend shall be given. Where numbers of cables are connected in parallel, proper tests shall be done before connecting so that no cross connection is made. No phase crossing shall be allowed for making the connection.
- g) Cables shall be supported adequately at the entry to cable box / equipment so that load of cable does not come on cable gland.
- h) All cables shall be meggered (checked for insulation resistance) before and after jointing and insulation resistance values recorded.
- i) While terminating at equipment end, each core shall be properly tagged with numbering ferrules as per nomenclature given in the drawings. Wires shall be dressed and clamped neatly. Bolting shall be done properly.

## 5.10 Earthing

### 5.10.1 General

- a) Painting of all earth strip joints with anti-corrosive paint shall be carried out as per details given in the respective drawings / specifications and instructions of owner / Engineer-in-Charge.
- b) All electrical equipment rated 415V and above shall be connected to earth bus by two separate and distinct earth connections. All equipment rated 240V and below shall be earthed with single earth conductor.

### 5.10.2 Specifications

- a) Earthing conductor above ground shall be of aluminium / copper wire bare or insulated or strip. Earthing conductor buried in ground shall be of G.I. or PVC insulated aluminium / copper cables. Sizes of earthing conductors shall be according to specified drawings. All earthing installations shall conform to **IS: 3043 and other relevant standards.**

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- b) The earthing wires or strips shall be laid along the cable racks, cable trenches, risers and supports. Underground conductors shall run at a depth of 600 mm below ground level. Where these conductors run along with cables, they shall be laid at the same depth as cables. Where conductors run on wall, ceilings, they shall be laid on clamps or brackets made out of Al/ GI strips.
- c) Wherever earthing conductor is passing through floor, walls etc., the conductor shall be taken through PVC / GI pipes.
- d) All paints, enamel etc. shall be removed from point of contact before making connections.
- e) Connections between Al/ GI strips shall be done by welding for connecting Al/ Cu/ GI wire. For connecting Al/ Cu/ GI wires, tinned Cu Socket shall be crimped on the wire. At the equipment end, connections shall be done by bolting. However, connections between GI strips shall be done by welding. Connection between Al/ Cu & GI shall be done by bolting. Graphite grease shall be applied on contact surfaces.
- f) Epoxy resin paint or bitumen shall be applied on welded or bolted joints to prevent corrosion and taping done as indicated in the drawing. Connections between Al / Cu wires shall be done by crimping weak back Al / Cu ferrules.
- g) Earth electrodes shall be provided as per drawings / specifications. Work includes excavation of earth, installation of electrodes and test links etc. supply and filling of charcoal and common salt, back filling of earth and removal of extra earth. It also includes making brick wall around the electrode and cover according to drawings / specifications. The testing links shall be grouted on brick wall and connections with earth electrode and conductors shall be made. Distance between two electrodes shall not be less than 10 meters and may be located 4 M away from building foundation.
- h) Earth pits for equipment earthing, transformers neutral earthing and lightning protection shall be separate. However, these pits shall be inter-connected.

## 5.11 Lightning Protection

- 5.11.1 Air termination rod shall be installed as indicated in drawings.
- 5.11.2 Fixing of termination rod on roof with Al sheet shall be done with crank bolt and watertight compound provided.
- 5.11.3 Laying of down conductors and connection shall be done as per drawings. Lightning Protection installations shall conform to relevant IS.
- 5.11.4 Earthing of static equipment like vessels, chimneys etc. where no termination rod and down conductor is provided, shall be done by connecting the equipment base to earth pit by GI / Al strip or PVC insulated Al / Cu wire. Clamps shall be bolted or welded to the base of the equipment.

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- 5.11.5 Structures for the storage, protection or use of highly inflammable solids, vapour or gases or in which highly inflammable or explosive dusts or vapour may be present shall be protected against lightning. Such protection is to be carried out as per prevailing Indian / IEC Standards. The following shall be taken care of:
- a) All major members of metallic structure shall be bonded together and connected to the lightning protective system. Such connections shall be made at least in 2 places.
  - b) Metallic pipe, electrical cable sheath, steel ropes, rails etc. entering the structure but not in electrical contact with earth, shall be bonded to the lightning protective system.
  - c) All metal forming part of the structure, its reinforcement or its equipment shall be bonded or welded together and connected in two places with the lightning protective system.
  - d) The bonding ring conductor shall be run externally about 0.5 M above ground level in order to provide a convenient point for the connection. The ring conductor shall be visible throughout its length. The arrangement of bonding shall be such as to avoid possible sparking.

## 5.12 **Plant Lighting**

- 5.12.1 The electrical installation covered by this specification shall conform to relevant Indian Standards and Codes of practices.
- 5.12.2 Where a number of cables are run together inside or outside the plant, the wiring shall be supported on GI / Al trays / steel structures.
- 5.12.3 Erection of light fittings, plug sockets etc. - Fabrication of supports for lighting fittings, sockets, junction boxes shall be done as per the relevant drawings / instructions given by the consultant / owner and same shall be grouted to walls, ceiling or welded to insert plates, steel structures etc. Insert plates on ceilings shall normally be provided. However, if required, the contractor shall, under instruction of the consultant / owner weld such supports to the reinforcement rods after exposing by chipping off concrete at no extra cost. Installation of lighting fittings includes control boxes, where supplied separately, and shall be done as per drawings. Before installation, checking of internal parts, assembly of accessories shall be done as per manufacturer's instruction / drawings.
- 5.12.4 The explosion-proof fittings shall be earthed through third core of the cable used for wiring. The third pin and body of 15 amps switch sockets shall be earthed similarly.
- 5.12.5 Installation of explosion proof equipment shall be done strictly following manufacturer's instruction or relevant Standards. Cable termination shall be done as per relevant drawings. No drilling of holes or any change in construction of equipment or part thereof shall be done.
- 5.12.6 Wiring for AC supply light and plugs may be fixed in the same brackets but wiring for emergency DC supply lights will be fixed separately. In a circuit controlled by one switch in Group Control Switchboard, there will be a number of points.

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Drawings for lighting layout give only tentative location of fittings and wiring route shall be decided in consultation with consultant / owner. Wiring of circuit shall be bunched together to the extent possible in the same route.

- 5.12.7 For wiring and laying of cables, Cl. 5.8 shall be referred. Cable for wiring, light points, socket outlets, shall normally be laid along wall, ceilings and structures on suitable brackets made out of M.S. / Al sheets or strips. Connections to the points in one circuit shall be taken through junction boxes. Junction boxes shall be suitably located for branching off from the circuit to the individual point. Wherever indicated, cables may be laid directly on walls, ceilings etc. by clamping on saddles.
- 5.12.8 Terminations shall be done in a manner as detailed in Cl. 5.9. Wherever indicated, the wire can be drawn through PVC bushings provided in the fittings. Relevant drawings may also be referred to.
- 5.12.9 Lamps shall be installed after installation of fittings and wirings.
- 5.12.10 All light fittings and corresponding control switches shall be numbered in a permanent way as instructed by consultant / owner / engineer-in-charge.

### 5.13 **Street Lighting**

In addition to the requirements stated in Clause No. 5.12, the following are also involved:

- 5.13.1 Excavation of earth, pouring of concrete foundations, erecting, aligning and grouting of poles.
- 5.13.2 Assembly of arms, fixing of lighting fittings, accessories like fuse carrier, control box etc.
- 5.13.3 Laying of cables directly underground as per Cl. 5.8 and connecting to Junction boxes and lighting fittings as per Cl. 5.9.

### 5.14 **Installation of Cable Trays / Risers / Supports**

- 5.14.1 The fabrication work shall be done as per drawings / specifications / sketches in an approved manner and to the complete satisfaction of consultant / owner / engineer-in-charge. The contractor shall take necessary care to avoid wastages. Scrap shall never exceed the permissible limit.
- 5.14.2 Erection of fabricated racks, risers, cable supports etc.
- a) Erection of racks and risers for cable supports shall be done along the cable routes as indicated in the drawings. The contractor before erection shall check the route for any obstruction like process pipelines, structures, equipment etc. In case obstructions are noticed, the matter shall be brought to the notice of consultant/ Owner in writing and racks shall be re-routed as per his instructions.

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- b) As and where indicated in the drawings, supports for racks, risers etc. shall be clamped/ welded on the steel structure, such as MS beams, pipe trestles, insert plates provided in the RCC column etc. for erection of racks.
- c) Wherever indicated, supports for racks, risers, shall be grouted on walls. Racks & risers shall be installed on such supports and these shall be welded properly.
- d) Opening on walls / floors shall be provided where racks / risers are crossing floors / walls.
- e) Heavy channels, risers may also be grouted on the floors in addition to supports provided from walls, ceilings and steel structures.
- f) As indicated in the drawings, racks and risers shall be erected either in multi-tier or single-tier formation.

#### 5.14.3 Erection of supports in Trench

- a) Supports and Hangers shall be grouted with rag bolts on the walls of prepared concrete trench. Insert plates shall be supplied by owner / consultant.
- b) Pockets on walls, floors for erection of racks, etc. shall be provided where such racks, risers are crossing floors and walls. In prepared trench wall, pockets shall be provided for grouting rag bolts. But if needed the contractor shall arrange to make suitable pockets or modify pockets already provided for grouting the cable supports and/ or erection of riser, racks etc. at no extra costs.
- c) Wherever insert plates are not provided, but required for support of cable rack, the contractor shall weld such plates to the reinforcement MS rods. This shall be done by chipping the concrete for exposing the reinforcement MS rods and thereafter welding the plates and making good the concrete chipping by plastering.

5.14.4 The pipes will have to be bent (wherever required) and fixed / embedded in floor, wall and ground for laying the cables. Neoprene bushes shall have to be fixed at the end of such pipes.

5.14.5 GI / AI trays of different sizes shall be cut in size and fixed on racks and risers. Supports for the main cable racks shall be provided by the owner. However, supports for small branch cable racks & risers may have to be fabricated by the contractor. Fixing of trays shall only be done after erection / welding / painting of the supports as required.

5.14.6 Erection of support frames for miscellaneous equipments, base channels for transformers and switchboards etc. shall be carried out at no extra cost.

5.14.7 Dismantling of steel fabrication and re-erecting as required by consultant/ owner/ engineer-in-charge shall have to be carried out.

5.14.8 Dismantling of cable racks and re-erecting shall have to be carried out.

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## 6.0 GENERAL PROCEDURE FOR TESTING & COMMISSIONING

6.1 Before proceeding with the work, contractor shall fully inspect all installed Electrical Equipment for completeness, signs of damages, defects etc. and shall get all discrepancies duly recorded by Owner / Consultant, failing which no claims by the contractor shall be entertained at a later date and shall be required to make good / repair / replace the damaged components at no extra cost.

### 6.2 Cleaning and Regular Maintenance

Till the commissioned equipment is finally accepted by Owner / Consultant / Engineer-in-Charge, Contractor shall be responsible for regular cleaning and maintenance of all electrical equipment. The maintenance job is to be done in consultation with or on advice from the Owner / Consultant.

### 6.3 Testing & Commissioning Requirements

6.3.1 All works shall be carried out in accordance with the drawings, suppliers' instructions / manuals for equipment and as per relevant standards and codes of practices.

6.3.2 Before conducting test on any equipment, the contractor shall obtain permission from Owner / Consultant / engineer-in-charge and all tests shall be conducted in their presence.

6.3.3 Records / results of each test shall be recorded by the contractor immediately after the test on approved Performa and counter signed by both the contractor and the owner's authorised representative.

6.3.4 Copies of the record shall be handed over to Owner / Consultant / engineer-in-charge.

6.3.5 The contractor shall commission all electrical equipment and carry out all pre-commissioning / commissioning tests inclusive of no-load and on-load tests on motors / generators and shall be responsible for final adjustments of relays, motors, instruments, starters, breakers etc. as per operational data supplied and as per directions of Engineer-in-Charge.

#### 6.3.6 Painting

The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged/ scratched during testing and commissioning work. The paint used shall match exactly painted surface of the equipment on which touch up is done.

6.3.7 All terminations, cable joints, which are opened for testing purposes shall be re-terminated and re-insulated to restore their original state.

## 7.0 TESTING & COMMISSIONING SPECIFICATIONS

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7.1 These specifications lay down the testing and commissioning procedures to be followed for each type of equipment, over and above the general requirements laid down in specifications for erection. Manufacturer's instructions and any other instructions of consultant / owner / Statutory bodies shall also be followed by the contractor during testing and commissioning.

The contractor shall maintain and furnish the records of all equipments i.e. HT/LT panels, motors, transformers, CT, PT, relays etc. including any special test as per manufacturer's manual.

**7.2 Transformers**

7.2.1 The final testing shall be done in cold condition after drying out (Disconnect H.V. and L.V. side cables by removing links in disconnecting chamber, bus ducts or cables and also earth connections to neutral).

7.2.2 The insulation between windings and between winding and earth shall be measured with a motorized 2500/1100V megger. Compare the test result with the manufacturer's Test Certificates (for 11 KV windings, polarisation index to be noted). Auxiliary power cables and control wiring shall be tested with 500V megger and values shall be preferably more than 2 MΩ.

Polarization Index shall be recorded as below to determine whether drying is necessary or not:-

$$PI = \frac{IR\ 10\ Min}{IR\ 1\ Min}$$

Evaluation of insulation condition based	Base on PI	Drying on PI
-----	-----	-----
Hazardous	< 1	Mandatory
Bad	1-1.5	Mandatory
Doubtful	1.5 - 2	Recommended
Adequate	2 - 3	No
Good	3 - 4	No
Excellent	> 4	No

**7.2.3 Oil Tests**

Crackle test: Cleaned Iron piece shall be heated red hot and put in the oil taken in a pot. In case of crackle sound, presence of moisture is indicated.

Dielectric strength test: It shall be carried out as prescribed in Appendix 'C' of IS: 335. The oil should withstand minimum of 40 KV for 1 minute.

Even if the oil condition after final topping up is found to be satisfactory, it is advisable that as an additional precaution, the transformers shall be dried out as per following procedures.

**7.2.4 Drying out**



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Drying out of the transformers shall be carried out in accordance with IS: 10028 and other relevant standards / manufacturer's recommendation or as advised by consultant / owner.

- a) Before drying out, check for the following:
  - Any oil leakage through bushings and radiators.
  - Transformer tank is connected to earth.
  - Temperature indicators are suitably calibrated.
  - Capillary tube connections made to respective temperature indicators.
  - MOG, if provided, is working properly.
- b) Precautions when drying
  - i) Use only Alcoholic type thermometers for temperature measurement. Mercury Thermometers shall only be used where pockets are provided for this purpose.
  - ii) Maximum sustained temperature shall not be more than 80°C. Do not leave the transformer unattended during drying out period. Watch the transformer during drying out process and record carefully all observations viz. oil temperature winding temperature and insulation resistance of H.V. and L.V. windings.
  - iii) Drying out to be continued till the insulation resistance value is steady prescribed in standard code of practice and IS: 10028 Part-II and that the steady value remains constant for 12 hours. Within the above period, several samples of oil are to be tested to ascertain dielectric strength. Record all readings (hourly / half hourly as advised by consultant / owner) of insulation resistance and temperature of oil & winding. Collect samples of oil from transformers from bottom only after the oil has been allowed to settle for at least 24 hours (collection of oil will be done in accordance with code of practice).
  - iv) It may be desirable that transformer oil shall be filtered by using filtration machine and Breakdown Voltage shall be measured before and after the filtration. The minimum Breakdown Voltage shall be 45KV for one minute.
  - v) In case the insulation resistance does not improve by the above method, it may be desirable to run the transformer for few hours on short circuit applying low voltage, approximately equal to impedance voltage, to the HV side after short-circuiting the LV side. During this process take regular readings of insulation resistance of the winding to earth, winding to winding and temperature against time and record.
  - vi) If found necessary/ depending upon the manufacturer's recommendations, a vacuum pressure of 635 mm of mercury shall be applied for the removal of air bubbles.
  - vii) After drying out process, release hot air by opening vent cocks / screws. Close vent cocks and screws after release of air.

#### 7.2.5 Ratio Test

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Apply 3 phase 415 V supply on H.V. side for every tap position. Measure the voltage at L.V. side at all tap positions. Switch off supply before changing tap in case of off-load tap changer for every tap changing.

#### 7.2.6 Polarity Test

Apply 3 phase 415 V supply to H.V. side. Join one terminal of H.V. side to corresponding terminal of L.V. side, say A-a, Measure voltage across A-a, A-b, A-c, B-a, B-b, B-c, C-a, C-b, C-c, N-a, N-b, N-c. Ascertain vector group from above test.

#### 7.2.7 Magnetizing Current

Apply 3 phase 415 V supply to H.V. side and simultaneously measure the current readings of the three phases using low range A.C. ammeters of the same accuracy class.

#### 7.2.8 Phasing of Transformers (for paralleling)

Connect two transformers in parallel on primary side. Connect secondary terminal 'a' to the bus bar which corresponds to the equivalent terminal of second transformer. Ensure that both transformers are at same tap. Then apply 415V 3-phase supply on the primary side. Close circuit breaker of second transformer. Measure voltage between corresponding secondary terminals of two transformers a1-a2, b1-b2, c1-c2. This voltage shall be zero in case both the transformers are of same polarity and phase displacement.

Use voltmeter having range double the reading of secondary voltage under test conditions.

In case of star connected secondary windings having star point earthed, secondary terminals need not be connected as stated earlier.

#### 7.2.9 Buchholz relay testing

Insert air pressure through petcock gently till alarm contacts make. Pressurise further till trip contacts make. Check whether trip contacts make in case of low oil level.

#### 7.2.10 Temperature indicators

Calibrate temperature indicator and test whether alarm contacts make properly.

#### 7.2.11 Checks before commissioning

Before commissioning transformers, the following points shall be checked and ensured for safe energising of the transformer.

##### a) General Inspection

- i) Check assembly with reference to accessories and mountings according to relevant drawing.
- ii) Check tightness of all cover bolts, flange connections etc.
- iii) Check oil leakage through bushings, valves etc.
- iv) Check shut off/open marking of radiator valves.

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- b) Oil Level
  - i) Check for correct level in conservators.
  - ii) Check for oil level in disconnecting chamber & pockets for thermometers.
- c) Buchholz relay
  - i) Check that floats are at normal position and unlocked.
  - ii) Check shut off valve between relay and conservator is open.
- d) Breather
  - i) Check that protective cover on air passage removed.
  - ii) Check oil level in seal chamber and condition of silica gel.
- e) Explosion vent
  - i) Check diaphragm is intact and no oil visible in gauge glass.
  - ii) Check equaliser pipe valve between vent and conservator open.
- f) Radiator
  - i) Check that all valves between banks and main tank open.
- g) Thermometer
  - i) Check CT and Heater element connection for winding temperature indicator.
- h) Wiring
  - i) Check wiring from instruments to Marshalling Kiosk & to switchboard / control panel.
  - ii) Check wiring of driving mechanism and control gears for tap-changer.
  - iii) Check wiring of cooling fans & pump circuits.
- i) HV and LV bushing & Connections
  - i) Clean bushing and check connections with incoming / outgoing lines etc.
  - ii) Check oil level in bushings (in case oil filled & HV bushings) and release air.
  - iii) Check & adjust gap of arcing horn (HV bushings).
- j) Check & release air through screwed petcocks, cocks etc. from Main tank, Radiator banks, Buchholz relays etc.
- k) Check & release air through screwed petcocks, cocks etc. from Main tank, Radiator banks, Buchholz relays etc.
- l) After all checking is found O.K., the breaker for incoming of transformer shall be made ON for charging the transformer. It shall be watched for at 24 hours without load. Then it can be loaded after finding every thing O.K.

### 7.3 Switch Boards

#### 7.3.1 General Checks

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- a) Check all auxiliary contacts of breakers for proper make-break operation.
- b) If necessary, make minor adjustments to circuit breakers mechanism, auxiliary contacts etc. for proper operation of circuit breakers. Proper greasing and lubrication or mechanism must also be done before final commissioning.
- c) Check for termination of control circuit wiring as per drawing and ensure that the terminals at equivalent and panel are mechanically sound.
- d) Ensure proper operation of all test operation switches and push button.
- e) Check wiring of all space heaters, indication lamps bells, buzzers etc.

#### 7.3.2 Insulation resistance test

- a) Measure the insulation resistance of main bus-bars (Phase to phase & Phase to earth) with 5000 V, 2500 V and 1000 V Megger (IR values shall generally be not less than 100 M $\Omega$ , 50 M $\Omega$  and 10 M $\Omega$  respectively in case of 11 KV, 6.6 / 3.3 KV & 415 V).
- b) Insulation resistance of circuit breaker shall be measured with 1000 V Megger.
- c) Control wiring shall be tested with 500 V Megger (IR values shall not be less than 2 M $\Omega$ ).

#### 7.3.3 High voltage Test

The test shall be conducted on switchgear rated 3.3 KV and above. Test voltage shall be as per relevant Indian Standard. However, for AC High voltage test, the value shall be twice the working voltage of the switchgear plus 1000 V. This voltage shall be maintained for one minute. Each phase shall be tested in turn, with remaining phases earthed. After high voltage test, a further Megger test shall be made to make sure that insulation resistance to earth has not altered appreciably. The reading of second megger test shall be consistent with that of the first.

AC test voltage for 1 minute duration shall be as follows:

24 KV for 11 KV panel, 15 KV for 6.6 KV panel and 8 KV for 3.3 KV panel

#### 7.3.4 Testing of current transformer

- a) Insulation resistance to earth of secondary winding shall be tested with 500V megger (remove earth connection before test).
- b) Check the polarity of C.T. – Connect zero centre voltmeter in the secondary winding, connect 6 V batteries with switch in the primary. Close the switch and from the kick of the voltmeter, ascertain the polarity.
- c) Ratio test shall be carried out by injecting current in the primary and subsequently secondary side current shall be checked.

#### 7.3.5 Testing of P.T. Insulation.

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Testing of HT & LT side of PT shall be done with 1000 V & 500 V megger respectively (the value shall not be less than 100 M $\Omega$ , 50 M $\Omega$  & 10  $\Omega$ , respectively for the voltage rating 11KV, 6.6KV & 400V).

#### 7.3.6 Testing of Relays

a) Checking of wiring shall be done according to Manufacturer's drawings. Check relay continuity at all taps also ensure plug bridge contact satisfactory.

b) Secondary injection test.

Use secondary injection test set incorporating timer. Testing of all protective relays such as but not limited to over current, earth fault differential, motor protection, directional feeder protection, under voltage relays etc. shall be done as per the procedure set by the manufacturers of the relays. All time delay relays shall be tested to verify their characteristics for IDMT and instantaneous relay pick up and drop off values shall be noted at various taps. Relays shall be tested at all taps. Errors shall be calculated and compared with permissible limits specified by manufacturers. Adjustment, such as in establishing circuit, shall be done as recommended by manufacturer. After testing, relays shall be set at values given by Consultant.

c) Timer relay shall be tested and calibrated and set properly.

d) All auxiliary relays shall be tested for proper operation.

#### 7.3.7 Testing of Instruments

All indicating and recording instruments like Ammeter, Voltage meter, KWh meter etc. shall be calibrated. Zero error of each instrument shall be corrected.

#### 7.3.8 Operational Tests

Conduct the following operational tests after putting the circuit breaker at test and service position. Check that the fuses of proper rating are put in control circuit as per wiring diagram.

a) Close and trip the circuit breaker several times with power or manually. In case of motor operated spring charged closing mechanism, check the operation of charging motor. Ensure that it cuts in / off properly.

b) Check the indication scheme: 'ON', 'OFF', trip circuit healthy, auto-trip indication etc.

c) Trip the breaker by operating the protective relays (operate contact manually).

d) Check the trip free feature.

e) Check the anti-pumping feature.

f) Check operation of voltage selector relay scheme for supply.

g) Check annunciation scheme for AC/DC power supply failure.

### 7.4 **Motor Control Centres / Power & Motor Control Centres**

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In addition to checks and tests (wherever applicable) detailed under Clause No. 7.3 above, the following shall also be carried out:

- 7.4.1 Insulation resistance test of the main bus bars, starter units control wiring etc. shall be done with 500 V megger.
- 7.4.2 Each motor starter shall be tested for correct operation. All operational tests to verify sequence of operation, inter-locking and alarm indication schemes (by simulating the connection) shall be done.
- 7.4.3 Bi-metallic type thermal over load relay shall be tested at different settings. Current shall be injected through the thermal elements (three elements can be connected in series) at twice and thrice the set value and tripping time shall be noted. The values shall be compared with the data supplied by manufacturer.
- 7.4.4 Single-phase prevention relays shall be tested for proper operation.
- 7.4.5 Check that fuses of specified ratings are put in various outlets.
- 7.5 **Soft Starter Panel**

In addition to the procedure laid above in Clause Nos. 7.3 & 7.4, any other instruction given by the manufacturer shall also be followed.

#### 7.6 **Panelled Equipments**

These include relay and alarm panels, Rectifier panels, Battery charger panels DC / AC distribution boards, conveyors / control cum power supply panels, UPS, inverter static power supply, Variable Frequency Drive and PLC. Details shall be indicated in project specific Schedule of Rates.

- 7.6.1 Test insulation resistance with 500 V megger.
- 7.6.2 All operational tests to verify function of each component like relays, switches etc. and sequence of operation, interlock, alarm system as per circuit diagram.
- 7.6.3 Invertors / Thyristor controlled panels, static power supply system units, Variable Frequency Drive and PLC panels shall be tested as per the instructions of manufacturer.

#### 7.7 **Cables**

- 7.7.1 All HT (11KV, 6.6KV & 3.3KV) cables shall be tested for insulation resistance with 5KV / 2.5KV motorized meggers and LT cables shall be tested for insulation resistance with 1000 V megger before and after termination. IR shall be measured between phases and between phase and earth. The voltage shall be applied for 1 minute.

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7.7.2 All the 3.3KV, 6.6 KV and 11 KV cable joints shall be tested on high voltage as per IS: 1255 after making all termination and joints followed by IR test.

## 7.8 Lighting

7.8.1 Before energising any lighting circuit, the IR values (phase/ phase and phase/ earth) shall be recorded for entire wiring installation. The testing shall be done with 500 V megger. After switching on the power supply, load of each circuit shall be measured.

7.8.2 Illumination levels shall be tested and same shall not be less than the levels mentioned below for specific areas, unless otherwise specified elsewhere:

a) Control room, Laboratory	:	500 Lux
b) Office area / operators / UPS room	:	300 Lux
c) Switchgear room	:	200 Lux
d) Cable cellar	:	70 Lux
e) General process area	:	60 Lux
f) Cooling tower	:	60 Lux
g) Battery room	:	150 Lux
h) Compressor area	:	150 Lux
i) Pump house, sheds	:	100 Lux
j) Loading areas and staircases	:	60 Lux
k) Roads and tank farm	:	10 Lux

## 7.9 Earthing

The continuity of earthing and resistance of each earth pit and grid shall be measured with earth megger. The resistance of grid connecting all earth pits shall be less than one ohm.

## 7.10 Miscellaneous Equipment

Under this are included, exhaust fans, blowers, limit switches, vibrators, electro-magnets, air pressurisation unit etc. The following tests shall be conducted:

7.10.1 Measurement of insulation resistance

7.10.2 Check up the direction of rotation.

7.10.3 Operational test

## 7.11 Motors / Generators

7.11.1 General Checks

a) Check the alignment of motor/generator with the driven equipment/prime mover.

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- b) Check and calibrate motors/generators, safety switches, bearings/ air temperature indicators, winding temperature indicators, water flow/ air flow pressure meters, lubricating oil pump motors.
- c) Check operation of space heaters.
- d) For motor/generator standing idle for a long time, carry out overhauling, re greasing and drying.

7.11.2 Check the condition of grease in bearings and if required replace completely with fresh grease after proper cleaning of bearings. This work shall preferably be taken up before final alignment of motor with driven equipment.

7.11.3 In case of oil lubricated bearings, the bearing housing shall be flushed with oil and then filled up to the specified level. Check that oil ring rotates freely along with motor. In case of pedestal type journal bearing, it may be necessary to open the top cover, and check the bearings.

7.11.4 Fix up all accessories like techno-generators, water pressure relay, temperature detectors and any other safety switches after calibration.

7.11.5 Check that the shaft rotates freely. This shall be done after decoupling the motor from driven equipment.

7.11.6 Check air gap between rotor and stator (wherever possible) at three places at 120° apart on both sides of drive and verify with the figures furnished by the manufacturers. The variation shall not exceed 10% of average value.

7.11.7 Check the tightness of foundation bolts. Ensure pins are fitted before commissioning of motor.

7.11.8 Check that power and control cables are properly connected and tightened. All earth connections of the machine shall be checked.

7.11.9 In case of forced ventilated motor, clean the ventilation duct. Ensure that recommended flow and pressure of air is available to produce the required cooling effect. If the motor is provided with air to water heat exchanger, check for the adequate flow of water. If necessary, clean the exchanger to remove any obstruction to water flow. Check that there is no leakage from water cooler, pipe connections.

7.11.10 Check the space heater circuit. Space heaters shall be provided on all HT and special type LT motors. Switch on spare heater supply at least one week before the commissioning of motor. Wherever drain plugs are provided in motor body, open and check for water accumulation inside motor.

7.11.11 Testing

- a) Insulation Resistance Test

The insulation resistance of LT motors shall be measured between the winding of the machine and its frame by means of 500 / 1000V megger. A minimum value of 1 MΩ for 400 V motors shall be considered a safe



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value.

3.3KV, 6.6KV and 11KV motors / generators shall be tested for insulation by 1000 5000 V megger and its value shall not be less than 1 M $\Omega$  for each KV. However, it is desirable that before commissioning the motors, the insulation resistance shall be improved substantially above the lower limits. The contractor shall carry out heating of winding as per the advice of the consultant/Owner. The following methods may be adopted.

b) Drying

- i) Blowing hot air
- ii) Placing heater or lamps around and inside, in case of small motors after making suitable guarding and covering arrangement so as to conserve that heat.
- iii) Heating by injecting low voltage in the winding low voltage output of welding set shall be used. The winding shall be inter-connected so that current flows through each phase, and particular care shall be exercised to prevent local over heating. The voltage applied shall be suitably adjusted. The maximum temperature of winding, while drying, shall be 70° to 80°C by thermometer or 90o to 95°C by resistance method. Heating shall be done slowly first till steady temperature of winding is reached (may be within 4 to 8 hours depending upon size of motor) once the steady temperature is reached, maintain it for some time.
- iv) Check the insulation resistance which will drop first and then become steady. Hourly reading of IR shall be taken and temperature shall be recorded 1/2 hourly. If IR is reasonably steady, supply can be switched off. Measure IR under cold condition. Never keep the motor unattended during drying process.
- v) For checking polarisation index of HT motor, use electric driven megger. Note IR value after 1 minute and 10 minutes. The ratio shall be compared with data supplied by manufacturer (but shall be not less than 2.5).

7.11.12 Operational Test

- a) Check control gear and set the protective relays as per settings supplied by Consultant. It is preferable that before first no-load run, the settings may be kept lower than 100%. However, during load running, settings shall be restored to Normal. Simulation test shall be conducted on motor starter, circuit breaker (main fuses removed on CB at test position). All interlock shall be incorporated in the control system. Testing shall be done from local and remove control station and shall be ensured that the control system works satisfactorily. In case of any defect in the integrated control wiring the contractor shall locate and rectify such defects.
- b) Any other tests recommended by the manufacturer for special type equipment like variable speed motors etc. shall be done.

7.11.13 No-load Test

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Finally the motor shall be started on no load after decoupling. Check the direction of rotation and change if required. The motor shall be run for 8 to 10 hours. Voltage, starting current, and starting time shall be noted. Hourly reading of current, winding and bearing temperature, (for small motors body temperature to be measured by thermometer) shall be noted. Note vibration, excessive noise if any.

In case of variable speed motor, variation of speed shall be checked and regulation of speed noted.

- 7.11.14 After switching off the motor, the insulation resistance shall be measured under hot and cold condition.
- 7.11.15 If the no-load trial run is found satisfactory, the motor shall be run on load after adjusting the protective relay setting to 100% value. Note the starting time, load current, winding temperature etc. The temperature rise shall not be more than the specified value. Check for any excessive vibration or noise.
- 7.11.16 Generator shall be tested in the presence of manufacturer's representative only as per their instructions.

## **8.0 DOCUMENTATION**

- 8.1 For the purpose of completion certificate, the following documents will be deemed to form completion document:
  - i) The technical documents according to which the work was carried out.
  - ii) Final check-list and completion report.
- 8.2 Three sets of construction drawings showing therein the modifications and correction made during the course of execution signed by Owner/ Consultant/ Engineer-in-charge.
- 8.3 Test certificates for the materials purchased by Contractor.
- 8.4 Material appropriation statement for the materials issued by Owner for the works and list of surplus materials returned to Owner's stores duly supported by necessary documents.
- 8.5 No claim certificate by the Contractor certifying that the entire work done by him under the contract has been measured and accepted for the final bill to his satisfaction and that he will have no claim(s) concerning any work(s) or part thereof performed by him under the Contract, to Owner except otherwise indicated in the final bill.
- 8.6 The completion certification shall be issued by Owner within 30 days of the Contractor furnishing documents listed in this clause jointly certified by Owner/ Consultant and Contractor's Site Engineer.

## **9.0 HANDING OVER TO OWNER**

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9.1 The contractor shall hand over the complete installation as a whole. Minor details not specified or mentioned in the scope or schedule of rates but required to complete the job as a whole will have to be done by the contractor without extra cost. Any equipment/ installation shall not be deemed as handed over to Owner until the same is complete in all respect and is accepted in writing by the Owner/Consultant.

9.2 The final acceptance of the work shall be after the demonstration of guarantees by the Contractor and Owner shall issue the final acceptance/ taking over certificate upon fulfilment of the guarantees.

### **10.0 OBLIGATIONS & RESPONSIBILITIES OF CONTRACTOR**

The contractor's obligations and responsibilities shall include but not limited to the following:

10.1 To deploy skilled, semi skilled and unskilled personnel in requisite numbers and as per scheduled programme so as to complete the WORK as per overall project schedule.

10.2 To deploy suitably qualified supervisors and engineers in requisite numbers to assure execution of good quality job as per best engineering practices and to the full satisfaction of Owner / Consultants / Engineer-in-charge.

10.3 To prepare detailed planning and execution schedule considering the availability of fronts and materials. This shall be reviewed by Owner & consultant and Contractor shall be required to keep updating the same (as per the instructions of Owner / Consultant / Engineer-in-charge) to take care of any changes in the availability of fronts and materials and to complete all jobs as per the overall project schedule. Owner / Consultant / Engineer-in-charge shall in no way be held responsible for such changes because such changes are deemed quite a common feature in any project of this size.

10.4 To check for quantity compliance between bill of materials and drawings for cable, structural, earthing materials etc. and intimate Owner / Consultant / Engineer-in-charge sufficiently in advance regarding discrepancies, if any.

10.5 Construction power shall be made available at one point. Arrangement for distributing the same to various areas for construction shall be the contractor's responsibility.

10.6 To arrange and supply all tools and tackles, consumables, instruments, erection materials & machineries etc. for handling erection, testing & commissioning of complete electrical installation. List of major tools and tackles required are as listed below:

- i. Cranes, winches, chain pulley blocks etc. in required quantity and of suitable capacity.
- ii. Trailers with prime mover/Tractor trailers.
- iii. D-Shackles, slings, wire ropes etc.

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- iv. Transformer welding sets
- v. Water level, spirit level etc. for levelling and alignment.
- vi. Gas cutting sets
- vii. Drilling/Grinding machines
- viii. Jacks with spindles (for cable drums)
- ix. Pipe bending machine
- x. Hydraulic crimping tools set
- xi. Hand crimping tools set
- xii. Air blower/vacuum cleaner
- xiii. Streamline transformer oil filtration machine with temperature and pressure gauges.
- xiv. Transformer oil dielectric strength testing machine, portable type.
- xv. High voltage testing set.
- xvi. Secondary injection testing set
- xvii. 5 KV motorised Megger Insulation tester
- xviii. 500 V to 2.5 KV each rating hand operated 'Megger' Insulation tester
- xix. Earth resistance tester with leads and spikes
- xx. Clip on ammeters/tong testers
- xxi. Tachometers/ Tacho-generators (for RPM checking)
- xxii. Phase sequence meter
- xxiii. Primary injection set up to 2000 amps., if required
- xxiv. Grease gun for greasing of motors
- xxv. Wooden sleepers of proper size and in adequate numbers.
- xxvi. Scaffolding materials as required.
- xxvii. Any other tools and tackles and facilities required completing all the jobs as per ITB to the best engineering practices.
- xxviii. Drilling M/C for drilling hole in RCC Roof/ Column for grouting expansion bolts.
- xxix. DG set for construction power

10.7 To arrange and supply all consumables (required for executing the under question) such as but not limited to the following in sufficient quantity, of required quality and in time to meet the schedules:

Electrodes, filler wires, industrial gases, such as oxygen, acetylene, diesel, petrol, kerosene, CTC, standard grease/ lubricant for motor bearings, insulating tapes, compounds, solders, fluxes, rawl plugs, phil plugs, saddles & bars, ferrules, bricks, sand, cement, stone chips, clamps, tags, shims, hard wares, paints, thinners (as required), salt and charcoal (for each electrode pits), copper lugs

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for GI earth wires, cotton waste, marking cloth, sand papers, emery papers, thread, nylon ropes.

- 10.8 To arrange and supply storage tanks for drinking water so as to avoid any inconvenience that may be caused due to interruption in water supply at times.
- 10.9 To provide proper storage and security arrangements for Contractor's tools, tackles, equipments, materials etc. as well as equipment and materials issued by Owner/ Consultant to Contractor. Owner/ Consultant shall not be responsible for any loss or damage to items in the custody of Contractor at site for any reason whatsoever.
- 10.10 Completion of all repairs arising out of defective work done by Contractor Owner/ Consultant / Engineer-in-charge may at his discretion require the Contractor to rectify certain defects in materials caused due to bad workmanship of supplier and/or during transportation. For such work of course, the payment modalities shall be settled by mutual agreement before starting such rectification jobs.
- 10.11 To maintain all the records for men, materials and execution of job as required by law as well as Owner / Consultant / Engineer-in-charge.
- 10.12 To get his work inspected by Owner / Engineer-in-charge and approved from statutory agencies such as but not limited to Electrical Inspector, Factory Inspector etc.  
All co-ordination with Statutory Authorities shall be contractor's responsibility. Only statutory fee required for approval shall be paid by the owner.
- 10.13 To make arrangements for services such as transport, medical, lighting, canteen etc. for working round the clock.
- 10.14 In addition to safety regulations indicated in this enquiry Owner / Consultant / Engineer-in-charge may issue certain safety directives, which shall have to be followed meticulously without any reservation.
- 10.15 To undertake and execute work and supply as per scope of work, scope of supply, to follow Technical Conditions including specification for electrical erection, specification for electrical testing and commissioning and as per schedule of rates. In honour all other obligations listed in other sections and sub-sections of this enquiry.
- 10.16 Reconciliation of materials issued to Contractor as directed by Owner / Consultant / Engineer-in-charge.
- 10.17 Handing over of the completed works to Owner / Consultant / Engineer-in-charge as per procedure laid down by Consultant.
- 10.18 To submit documentation forming part of request for issue of completion certificate.

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10.19 Clearing the site after cleaning the areas where the Contractor executed the job, stored the materials and built his office, fabrication shop etc.

## 11.0 TERMS AND CONDITIONS

11.1 All the work shall be carried out in accordance with drawings supplied to the contractor and the entire installation shall conform to the Indian Electricity Rules/ Regulations/ Acts and with latest issue of relevant IS, Specifications, drawings & documents supplied by Consultant/ Supplier/ Owner and as per the directions of Owner / Consultant / Engineer-in-charge.

### 11.2 Contractor's Staff

The contractor shall employ all skilled, semi-skilled, non-skilled labourers necessary for erection, installation testing and commissioning. All electricians, cable jointer, wire man and others employed by the contractor shall be suitably qualified and must possess valid certificates / licences recognised by the competent authorities.

Engineer-in-charge at his own discretion may put any electrician / wireman / wire cable jointer to test for ascertaining the competence of the technician concerned and the contractor shall have to replace any staff found incompetent to execute the jobs as per requirements, in the opinion of the Owner / Consultant / Engineer-in-charge. The contractor shall also furnish a list of such staff and indicating whether he holds such competence certificate to supervise electrical installation jobs as required under Indian Electricity Rules and Regulations, and State Inspectorate Rules.

### 11.3 Contractor's Workshop

The Contractor shall set up his own workshop having facilities to undertake all jobs connected with, Erection, Testing and Commissioning. He shall provide all facilities at site to undertake steel fabrication work e.g. fabrication of cable racks/ trays, cable supports/brackets/ frameworks/ base frames for electrical equipment etc.

The contractor will be required to provide workshop and other facilities to undertake minor fabrication work, including conduit bending and threading, fixing rawl plugs, welding supports, making brackets, small foundation bolts, protective guards, and such other miscellaneous items as may be necessary for completing the erection, testing and commissioning jobs. The contractor shall also, on his own, set up adequate office, stores, godowns etc. for his work in the area / space provided by the Owner / Consultant / Engineer-in-charge.

### 11.4 Tools and Tackles

The contractor shall have to arrange all tools, tackles including various erection machineries and instruments for measuring, testing, calibrating etc. required for erection as well as for Testing and commissioning on his own, such as compressors, cranes, winches, jacks, chain pulley blocks, welding sets, oxygen, acetylene gas cutting set, drilling machines, grinders, pipe bending machines,

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dies for pipe threading, scaffolding materials, cable jointing/ crimping tools, megger, ductor, filtering machines, earth tester, secondary injection sets, sub-standard meters for calibration of ammeters, voltmeter, oil testing-sets, Multi meters, phase sequence meters, HT test set, primary injection (if required), clip on ammeters (tong testers), techo-generators etc.

## 11.5 **Materials**

11.5.1 All materials shall be in contractor's scope of supply, unless indicated to be supplied by Owner. The contractor shall have to arrange at his own expenses all consumables required by him for erection as well as for testing and commissioning like Kerosene oil, petrol, CTC, grease, petroleum jelly, rawl plug, phil plug, screws/nails, wires for portable tools, lights, plugs, cotton waste, jute dusters, shims for alignment / levelling, cement, sand, stone chips, bricks, reinforcement rods, welding electrodes paint, insulating taps, compounds, solders fluxes, ferrules, nut bolts, washers, cable clamps, cable tags and such other materials contractor might need to execute the complete job. The contractor might need to execute the complete job. The contractor shall also provide foundation bolts, for all floor/ wall mounting equipment as per requirement at site. All hard wares supplied by the contractor shall be of GI. All GI materials shall have a minimum zinc coating of 800 g/m<sup>2</sup> at any point on the surface.

11.5.2 All equipment and materials including Instruments / meters required for measuring, checking, testing and commissioning are included in the scope of the contractor and shall be arranged and supplied by the contractor himself

## 11.6 **Inspection**

11.6.1 Electrical Installation work shall be subject to inspection by Owner's/ Consultant's engineers, statutory bodies like Electrical Inspector, Factory Inspector, and wherever applicable by equipment supplier's engineer. The contractor shall carry out without extra cost all damages/rectification/modification desired by the above engineers/ inspectors or to make the installation conform to relevant Electricity Rules etc.

11.6.2 Further the Owner/ Consultant may reject any portion of the work considered defective or of poor workmanship and contractor shall make good these defects without extra cost.

11.6.3 Owner/ Consultant reserves the right to get such repairs/replacements done from any other agencies in case the contractor fails to do the job within a period of 7 days after the request has been made to him in writing and the cost of such alteration/ repair/ testing shall be recovered from the contractor and will be adjusted against any bill due to the contractor.

## 11.7 **Completion of work**

Work shall be deemed to be incomplete until such certificates as required under statutory regulations are obtained and delivered to Owner / Consultant / Engineer-in-charge.

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### 11.8 Clearing of Site

The contractor will be responsible for the final clearing of site after completion of erection works as well as after completion of jobs connected with testing and commissioning. He will return all excess materials such as cables, earthing materials etc. to the Stores under instructions from Owner / Consultant / Engineer-in-charge. All empty cable drums, packing materials, cut-pieces of cables, steel scraps, and other materials, supplied by Owner for the job shall be shifted to a suitable place by contractor as per instruction of Owner / Consultant / Engineer-in-charge. Contractor will also be responsible for demolition and clearance of temporary sheds and structures put up by him. All clearance of unwanted materials shall regularly be done as per advice of the Owner / Consultant / Engineer-in-charge.

### 11.9 Materials utilisation statement and permissible wastage

After completion of the erection, the contractor shall submit to the Owner / Consultant a statement giving details of materials drawn from stores and quantity used in erection, balance quantity returned to stores and quantity of scraps for his checking & approval.

The scraps of steel shall not be more than 2% of total quantity used for erection. For cables, the quantity of scrap allowable is as follows:

- a) 11 KV and 6.6 KV cables : 1% of actual quantity laid
- b) 1000 volts & below grade : 2% of actual quantity laid  
power and control cables
- c) Lighting cables only : 3% of actual quantity laid

Any cable cut piece less than 5 mtrs. and structural steel less than 1 mtr. shall be considered as scrap.

### 11.10 Civil Foundation

Owner / Consultant will give necessary civil foundations ready complete with location of foundation bolts, sleeves etc. before the contractor is expected to commence his work. Minor rectifications and chipping etc. may, however, have to be carried out by the contractor, if found necessary while grouting the foundation bolts. Contractor shall check the foundations cleared by other agency; Owner / Consultant shall not be responsible for any delay. But all concrete cutting and chipping work necessary for fixing and grouting of base channels for switchgear and control panels will have to be done by the contractor.

## 12.0 MEASUREMENT

12.1 For all payment purposes, the measurement will be based on physical measurement. Wherever it is not possible to take physical measurement, payment shall be made on the basis of drawing. The contractor in the presence of Owner/ Consultant/ Engineer-in-charge will take physical measurement.



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12.2 Measurement of weight / length / area / volume will be in metric system corrected to nearest kilogram / centimetre / square centimetre / cubic centimetre.

12.3 For structural steel works measurement and payment will be made on weight basis.

12.4 Measurement for cable laying shall be made on the basis of length actually laid between end terminations including that of loops provided and paid accordingly.

### 13.0 PRIOR APPROVAL OF THE MATERIAL TO BE SUPPLIED BY CONTRACTOR

All items to be supplied by the contractor shall be of superior quality and shall be of approved make. These shall be as per specifications and conforming to relevant Standards.

### 14.0 RECOVERY AGAINST OWNER'S UN-RECONCILED MATERIALS

The contractor shall be responsible for material utilisation statement. Any equipments or materials not reconciled shall be charged back to the contractor.

### 15.0 STATUTORY APPROVALS

All co-ordination at site with statutory authorities (including inspection of completed WORKS from statutory authorities) shall be in the scope of CONTRACTOR. Only statutory fees deposited by CONTRACTOR for approval of installations and works shall be reimbursed to the CONTRACTOR on production of documentary evidence.

### 16.0 GUIDELINES FOR SAFETY MEASURES

Requirement of electrical power for any construction activity is of prime importance. The utilization of power in any construction site shall be done with utmost care to avoid accidents due to electrical shocks, fire due to electrical short circuits. Electrical installation increase the risk of such accidents, if it is exposed to adverse environmental conditions i.e. presence of hazardous gases. Hence, it is absolutely essential to take extra precaution for such installation to ensure safety of personnel and equipments.

This standard gives details of required safety measures to be adopted for the electrical installations by all contractors during construction activities. Following are some general guidelines & check points that should be followed:

16.1 All electrical connections for electrical installations shall be carried out as per provisions of the followings latest codes and standards in addition to the requirements of statutory authorities and IE rules:

- OISD – STD – 173 : Fire prevention and protection system for electrical installations
- IS – 30 : National electric code

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- 16.2 All electrical connections shall be done by a competent electrician having valid license and to the satisfaction of Engineer-in-charge and one competent licensed electrician shall be made available by contractor at site round the clock to attend the normal / emergency jobs.
- 16.3 All necessary personal protective equipment (PPE), Safety equipment shall be made available to use for persons employed by the contractors on the site and shall be maintained in condition suitable for immediate use. Protective equipment for head protection, body protection, eye protection, hand protection, hearing protection & respiratory protection shall be made available by the contractor. No loose clothing shall be allowed.
- 16.4 When workers are employed on electrical installations, adequate safety items / charts viz. fire extinguishers, insulating mats, hand gloves, multilingual (English, Hindi & local languages) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name and telephone number of contact person in emergency shall be provided in substation and near all distribution boards / local panels. The workers shall not wear any rings, watches & carry keys or other materials, which are good conductors of electricity.
- 16.5 When work has to be done on elevated places, towers, roofs, pipe racks & other lofty positions where plat-forms & other fall guards are not there, use of SAFETY BELT is compulsory. Safety Nets will prove very helpful in case somebody slipped from height.
- 16.6 All welding machines and switchboards shall be kept in well-ventilated and covered shed. The shed shall be elevated to avoid water logging. Use of flammable material shall be prohibited for construction shed; also flammable material shall not be stored in and around electrical equipments. Adequate clearance and operational space shall be provided around the equipment.
- 16.7 No work, however, small should be undertaken / started without obtaining valid work permit from the concerned department. Confined space entry should be done only by valid entry permit from the Engineer-in-charge. Safety permit shall be obtained before taking the temporary electrical equipment inside the hazardous area.
- 16.8 No work must be carried out on any live equipment. Electrical equipment should be considered live unless it is ensured that they are isolated & made dead / safe. A 'permit-to-work' shall be issued before any work is carried out. Don't tamper with any type of electric switches / equipments or any other appliances or moving machinery installed in factory area without permission.
- 16.9 Before the contractor connects any electrical appliance to any plug / socket belonging to the other contractor / owner, he shall:
- i) Indicate to the Engineer-in-charge that the appliance is in good working condition.
  - ii) Inform the Engineer-in-charge of the maximum current rating, voltage and phase of appliance.

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- iii) Obtain the permission of the owner dealing the sockets to which the appliance may be conducted.
- 16.10 The Engineer-in-charge shall not grant permission to plug-in until he is satisfied that:
- i) The appliance is in good working condition and is fitted with a suitable plug.
  - ii) The appliance is fitted with a suitable cable having earth conductors.
- 16.11 All temporary installation shall be tested before energizing to ensure proper earthing, bonding and suitability of protection system and adequacy of feeders / cables.
- 16.12 Voltage for all portable equipment viz. drilling machine, temporary lighting etc. will not exceed 240 volts.
- 16.13 Earth leakage device shall be checked for operation regularly by temporarily connecting the series lamps. The operating current of earth leakage device shall not exceed 30mA.
- 16.14 All the electrical equipments should be properly earthed as per Indian Electricity Rules.
- 16.15 Use of hoisting machines & tackle including their attachments, anchorage & supports shall be good of mechanical construction, sound materials & adequate strength & free from patent defect & shall be kept in good condition & in good working order.
- 16.16 No welding / grinding / cutting / soldering or open flare / fire etc. should be done without valid safety permit issued by the Engineer-In-charge. While welding / grinding / cutting make sure that sparks & molten slag etc. don't fly or come into contact with combustible materials surrounding equipments, valves etc. i.e. make provision for collection of sparks by using 'Fire Blankets'.
- 16.17 Use of SAFETY APPLIANCES like safety goggles, canvas hand gloves, welding helmet, chrome-leather hand gloves, safety shoes, etc. during welding/ chipping/ grinding should be enforced.
- 16.18 The following design features shall be ensured for all electrical installation during construction phase:
- i) Each installation shall have a main switch with a protective device, installed in enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5M. The main switch shall be connected to the point of supply by means of armoured cables.
  - ii) The out going feeders shall be double or triple pole switch with fuses / MCB. Loads connected to three phase circuit shall be balanced as far as possible and load on neutral shall not exceed 20% of load in the phase.
  - iii) The installation shall be provided adequate protection against overload, short circuit and earth leakage by using suitable protective devices. Fuses

	<b>ENGINEERING STANDARD</b> <b>ELECTRICAL</b> <b>ERECTION, TESTING &amp; COMMISSIONING</b>	<b>ES: 8028</b>	0
		DOCUMENT NO	REV
		SHEET 49 OF 50	

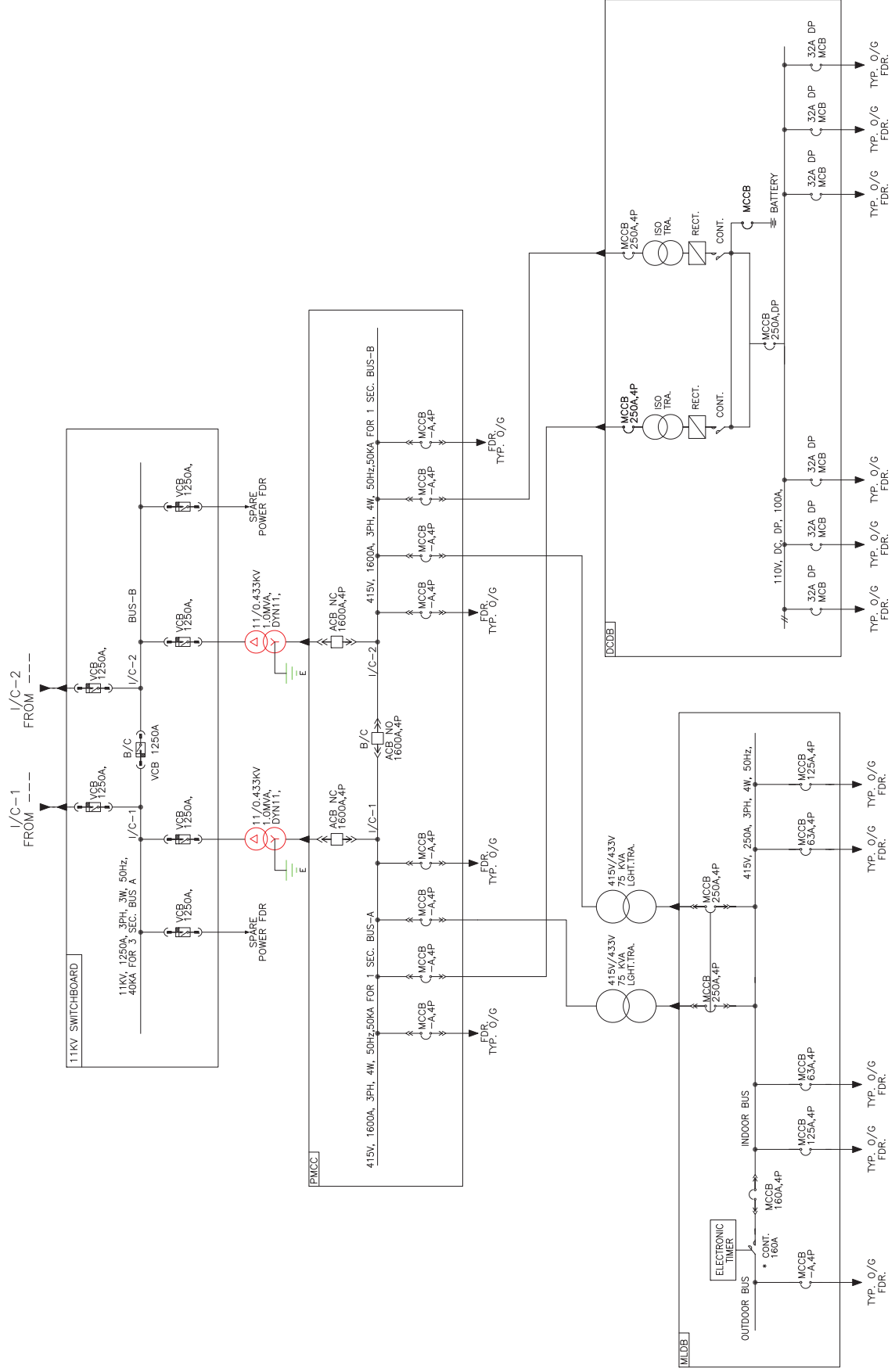
wherever required, shall be of HRC type only. Use of rewirable fuses shall be strictly prohibited.

- iv) Connections to the welding receptacles / hand tools shall be taken through proper switches, sockets and plugs.
  - v) It shall be ensured that all single phase sockets shall be 3-pin type only and all unused sockets shall be provided with socket caps.
  - vi) Contractor shall use 3 core (P+N+E) overall sheath flexible cables with minimum conductor size of 1.5 sq. mm. copper for all hand tools.
  - vii) Metallic distribution boxes with double earthing shall be used only at site. No wooden boxes shall be used.
  - viii) It shall be ensured that cables to be used for installation purpose shall be free from insulation damage.
  - ix) An independent earthing facility should preferably be provided within the temporary premises.
  - x) For local earthing, separate earth electrodes shall be installed near the supply point and earth continuity wire shall be connected to local earth plate for further distribution to various appliances. All insulated wires for earthing shall have insulation of green colour.
  - xi) It shall be ensured that structures shall not be used as a neutral. Separate core shall be provided for neutral earth.
  - xii) ON / OFF position of all switches shall be clearly marked / painted for easy isolation in emergency.
- 16.19 Don't check gas leaks with lighter, matches or other flame. Always keep gas cylinders away from direct rays of sun, hot place, welding, grinding & cutting sparks. Valves on cylinders should not be lubricated. Gas cylinders should be kept away from work place & Acetylene cylinders should be kept vertical. Cylinder should not be rolled on roads for transportation from stores or one place to another place, use suitable handcart for the purpose. It is prohibited to carry gas cylinder up-stair in the plant or in-side the vessel or confined spaces for cutting / welding job.
- 16.20 Permission of a supervisor before any excavation is a must. Also the presence of underground electric cables or any pipelines must be taken care of during excavation. Excavated earth must not be dumped within five feet. The further the better.
- 16.21 All the sewers or openings / cut-outs should be kept covered to avoid pit falls. Red illuminated signal should be displayed so that nobody goes near the pit / opening during dark hours. Proper approaches / scaffoldings / ladders etc. must be provided to avoid falls.
- 16.22 Be careful to keep all aisles, passageways and stairways clean & unobstructed. All discarded metal & other scrap should be collected. Storage area for keeping equipments, machines & other raw materials should be isolated & properly

	<b>ENGINEERING STANDARD</b> <b>ELECTRICAL</b> <b>ERECTION, TESTING &amp; COMMISSIONING</b>	<b>ES: 8028</b>	0
		DOCUMENT NO	REV
		SHEET 50 OF 50	

protected. Combustible materials like wooden pieces, cotton waste, bags etc. should be immediately removed to safe places.

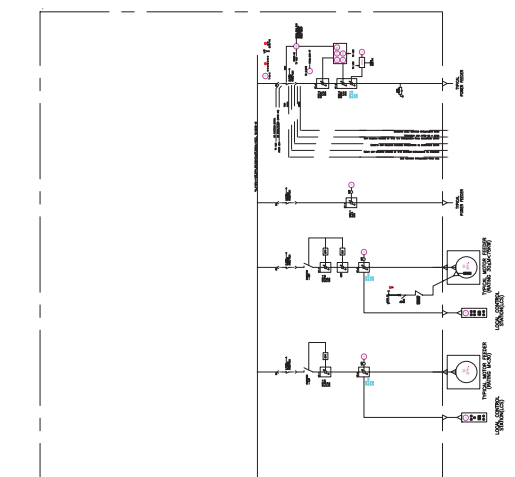
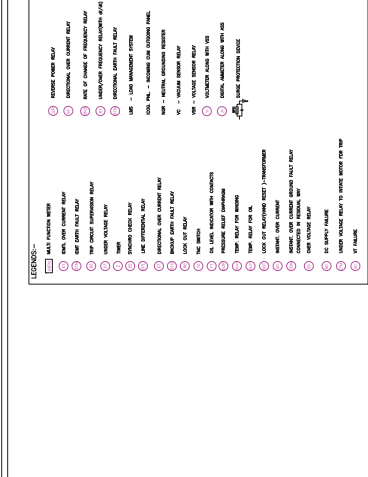
- 16.23 Sitting or walking on rail tracks, crossing between wagons, taking rest under stabled wagons, crossing the rail through the openings underneath the stationary wagons shall be strictly prohibited. Standing under a suspended load is very dangerous. It may slip & fall on you thereby causing serious injury & even death.
- 16.24 Hands should be thoroughly washed before touching anything that goes in your mouth. All concerned personnel at site should maintain a high standard of 'Cleanliness'. Smoking & carrying matchbox, cigarettes, lighter, bidis etc. shall be prohibited.
- 16.25 Unauthorized entry into any battery limit of plant shall be strictly prohibited. Reckless driving or other non-observance of traffic safety rules shall result into withdrawal of permission to carry vehicles in side factory.



FOR TENDER PURPOSE

REV.	DATE	ISSUED FOR TENDER	SS	RK	SKB	
0	03.06.22	DESCRIPTION				
CLIENT:- TALCHER FERTILIZER LIMITED			PPD.	CKD.	APPD.	
PROJECT:- ASH POND AND ALLIED SERVICES			REV.	0	1	
TITLE:- TYPICAL KEY SINGLE LINE DIAGRAM			SHEET	1	OF	1
			SCALE	N.T.S.		
			DRG. NO.-	PC183-1230		
			FILE:			





LOAD DETAILS OF BUS-A		LOAD DETAILS OF BUS-B				
FEEDER NO.	TAG NO. / DESCRIPTION	QTY( NOS)	MOTOR / FEEDER RATING	FEEDER TYPE	PROTECTION	CT RATIO & BURDEN
1	BUS-COUPLER	01	1000 A	LS	1000/2000 A & 5/10 V	1000/2000 A & 5/10 V
2	LINE OF 3/3R/3A	01	200 VA	LPT	..	..
3	CAPACITOR BANK (300KVAR)	01	300 VA	CAP. FDR.	..	..
4	MOTOR FEEDER UP TO 300V	21	..A	MOTOR FDR.	..	..
5	MOTOR FEEDER UP TO 400V	08	..A	MOTOR FDR.	..	..
6	MOTOR FEEDER UP TO 400V	08	..A	MOTOR FDR.	..	..
7	POWER FEEDER 200A	02	..A	POWER FDR.	..	..
8	POWER FEEDER 200A	02	..A	POWER FDR.	..	..

REV.	DATE	ISSUED FOR	DESCRIPTION
0	03.06.22	TENDER	ISSUED FOR TENDER
1	01.06.23	APPD.	PPD, CKD, APPD.

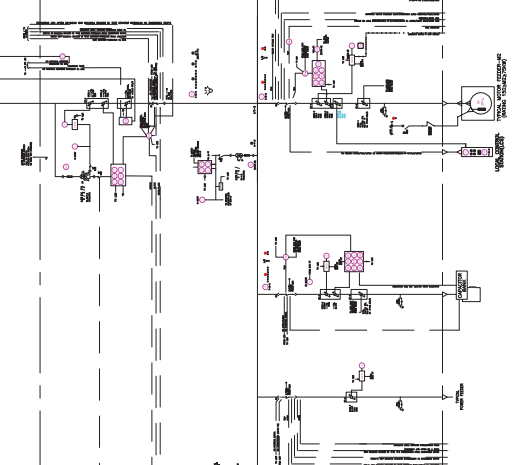
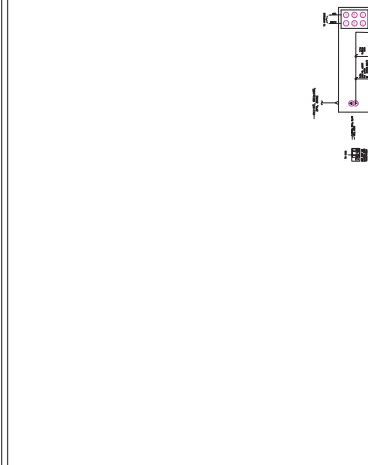
CLIENT:- TALCHER FERTILIZER LIMITED

PROJECT:- ASH POND AND ALLIED SERVICES

SCALE: N.T.S.

DRG. NO.- PCB3-1232

TITLE:- TYPICAL 415V SW. BD. SINGLE LINE DIAGRAM



LOAD DETAILS OF BUS-A		LOAD DETAILS OF BUS-B				
FEEDER NO.	TAG NO. / DESCRIPTION	QTY( NOS)	MOTOR / FEEDER RATING	FEEDER TYPE	PROTECTION	CT RATIO & BURDEN
1	BUS-COUPLER	01	1000 A	LS	1000/2000 A & 5/10 V	1000/2000 A & 5/10 V
2	LINE OF 3/3R/3A	01	200 VA	LPT	..	..
3	CAPACITOR BANK (300KVAR)	01	300 VA	CAP. FDR.	..	..
4	MOTOR FEEDER UP TO 300V	21	..A	MOTOR FDR.	..	..
5	MOTOR FEEDER UP TO 400V	08	..A	MOTOR FDR.	..	..
6	MOTOR FEEDER UP TO 400V	08	..A	MOTOR FDR.	..	..
7	POWER FEEDER 200A	02	..A	POWER FDR.	..	..
8	POWER FEEDER 200A	02	..A	POWER FDR.	..	..

REV.	DATE	ISSUED FOR	DESCRIPTION
0	03.06.22	TENDER	ISSUED FOR TENDER
1	01.06.23	APPD.	PPD, CKD, APPD.

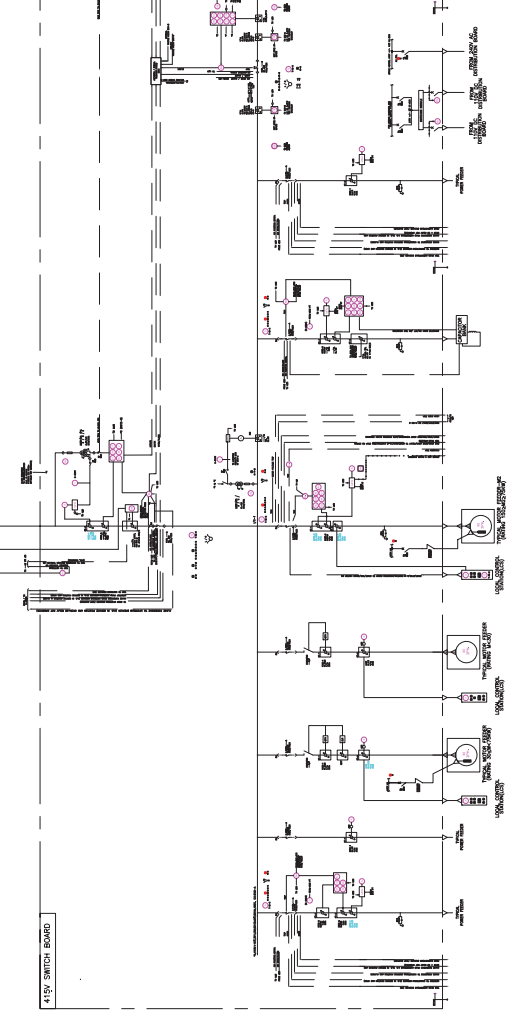
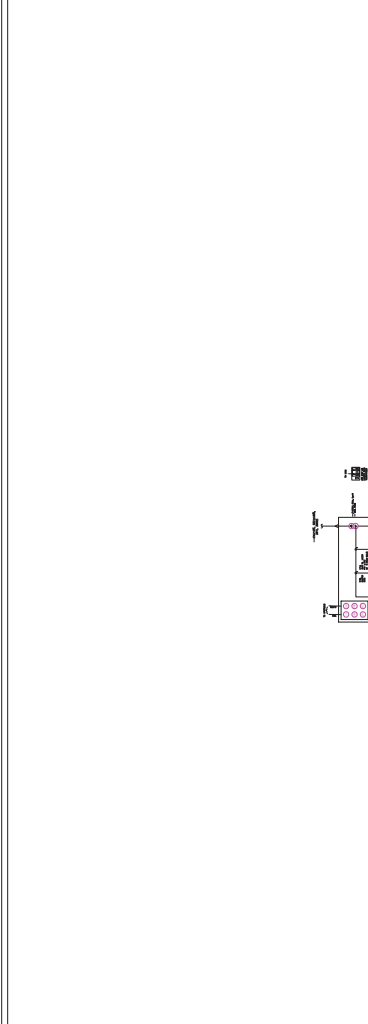
CLIENT:- TALCHER FERTILIZER LIMITED

PROJECT:- ASH POND AND ALLIED SERVICES

SCALE: N.T.S.

DRG. NO.- PCB3-1232

TITLE:- TYPICAL 415V SW. BD. SINGLE LINE DIAGRAM



LOAD DETAILS OF BUS-A		LOAD DETAILS OF BUS-B				
FEEDER NO.	TAG NO. / DESCRIPTION	QTY( NOS)	MOTOR / FEEDER RATING	FEEDER TYPE	PROTECTION	CT RATIO & BURDEN
1	BUS-COUPLER	01	1000 A	LS	1000/2000 A & 5/10 V	1000/2000 A & 5/10 V
2	LINE OF 3/3R/3A	01	200 VA	LPT	..	..
3	CAPACITOR BANK (300KVAR)	01	300 VA	CAP. FDR.	..	..
4	MOTOR FEEDER UP TO 300V	21	..A	MOTOR FDR.	..	..
5	MOTOR FEEDER UP TO 400V	08	..A	MOTOR FDR.	..	..
6	MOTOR FEEDER UP TO 400V	08	..A	MOTOR FDR.	..	..
7	POWER FEEDER 200A	02	..A	POWER FDR.	..	..
8	POWER FEEDER 200A	02	..A	POWER FDR.	..	..

REV.	DATE	ISSUED FOR	DESCRIPTION
0	03.06.22	TENDER	ISSUED FOR TENDER
1	01.06.23	APPD.	PPD, CKD, APPD.

CLIENT:- TALCHER FERTILIZER LIMITED

PROJECT:- ASH POND AND ALLIED SERVICES

SCALE: N.T.S.

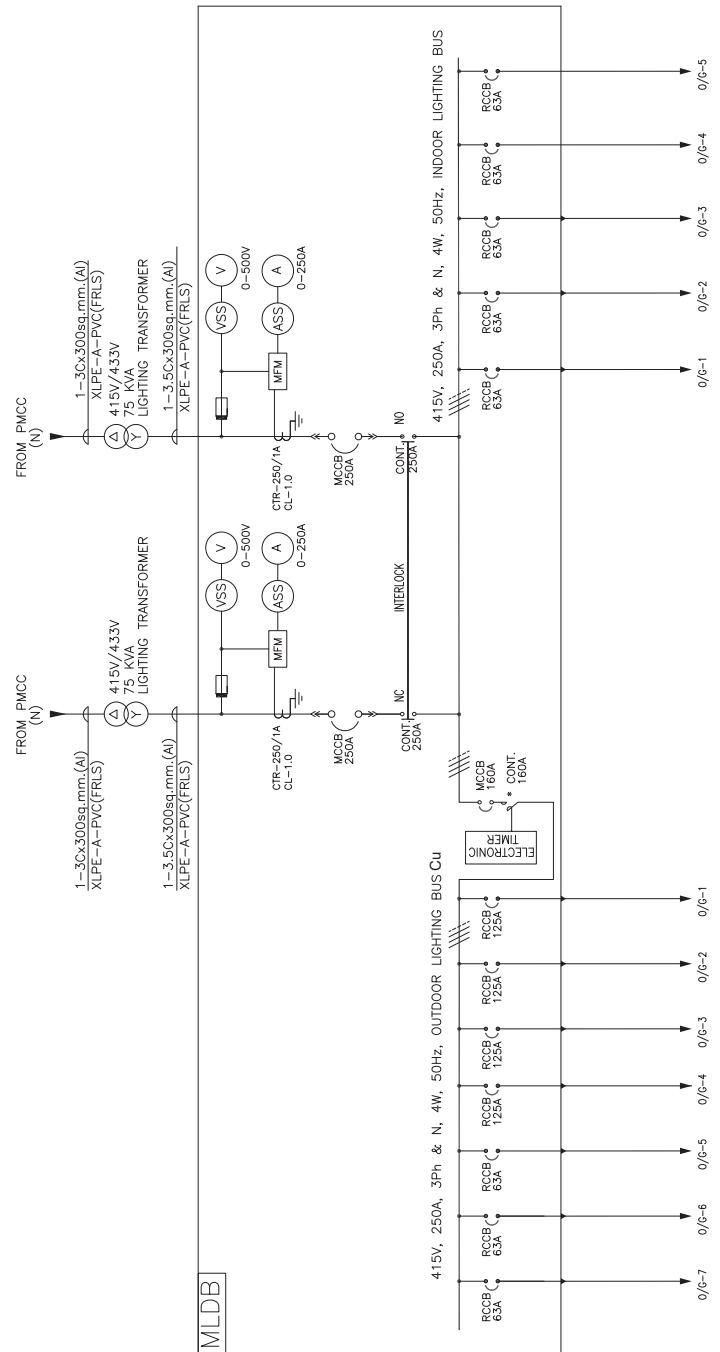
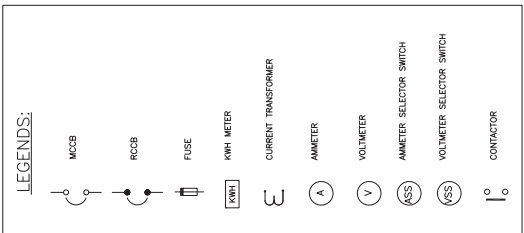
DRG. NO.- PCB3-1232

TITLE:- TYPICAL 415V SW. BD. SINGLE LINE DIAGRAM

FOR TENDER PURPOSE

PROJECTS & DEVELOPMENT INDIA LTD. - NOIDA





FOR TENDER PURPOSE

REV.	03.06.22	ISSUED FOR TENDER	SS	RK	SKB
DATE		DESCRIPTION	PPD.	CKD.	APPD.
CLIENT:-		TALCHER FERTILIZER LIMITED	REV. 0		
PROJECT:-		ASH POND AND ALLIED SERVICES	SHEET 1 OF 1		
TITLE:-		TYPICAL MLDB SINGLE LINE DIAGRAM	SCALE: N.T.S.		
			DRG. NO.:-		
			FC183-1233		
			FILE:		

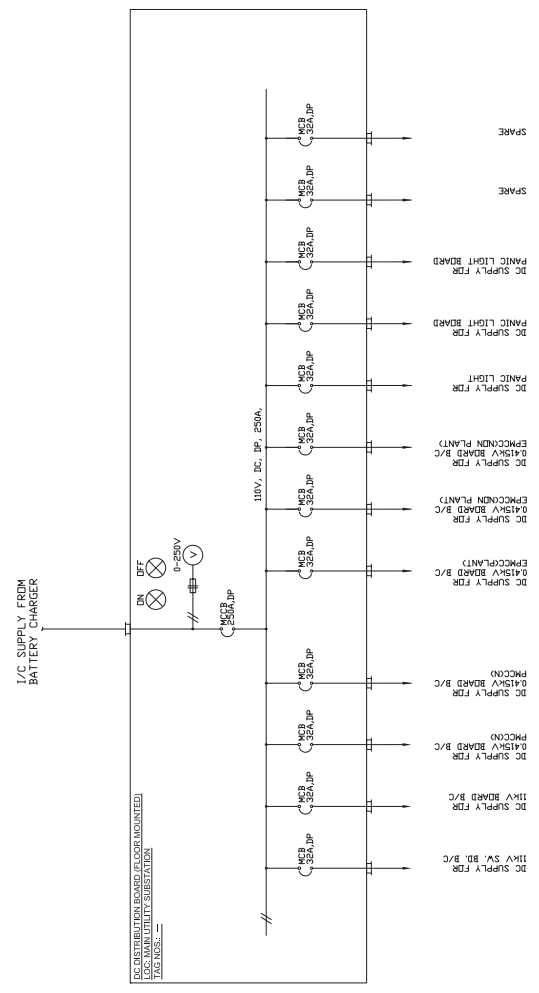

 प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा  
 PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA

**GENERAL NOTES:**

- 1. BUSBAR MATERIAL - Cu
- 2. SYSTEM VOLTAGE - 110V DC
- 3. PAINT SHADE - RAL 7032.
- 4. CABLE ENTRY : INCOMER - BOTTOM  
OUTGOING - BOTTOM

**LEGEND:**

-  FUSE
-  INDICATING LAMP
-  SWITCH FUSE UNIT
-  CABLE GLAND
-  VOLTMETER
-  MCCB

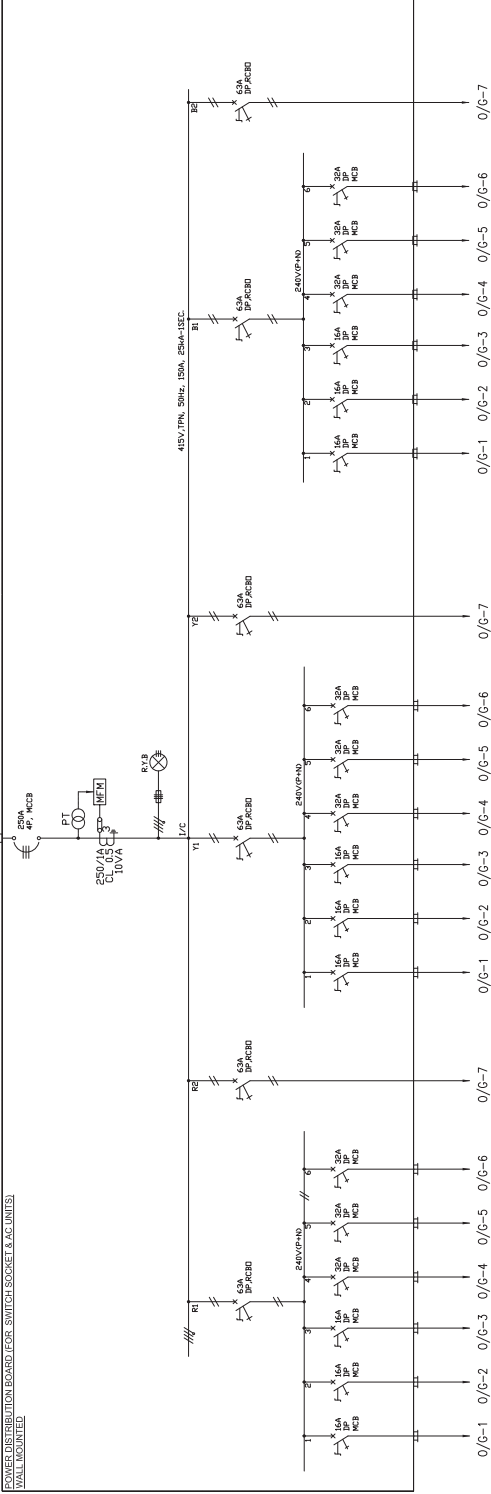


FOR TENDER PURPOSE

REV.	DATE	ISSUED FOR TENDER	SS	RK	SKB
0	03.06.22	DESCRIPTION	PPD.	CKD.	APPD.
Tallchor Fertilizers		CLIENT:--	REV. 0	1	1
PROJECT:--		TALCHER FERTILIZER LIMITED	SHEET 1 OF 1		
TITLE:--		ASH POND AND ALLIED SERVICES	SCALE: N.T.S.		
			DRG. NO.:- PC183-1234		
			FILE:		
			TYPICAL DCDB SINGLE LINE DIAGRAM		
			PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA		

GENERAL NOTES:

1. BUSBAR MATERIAL - CU
2. SYSTEM VOLTAGE - 415V, 3 $\phi$  N 50HZ
3. DEGREE OF PROTECTION (IEC 60629) - IP65.
4. CABLE ENTRY : INCOMER - BOTTOM OUTGOING - BOTTOM



LEGEND:-

- FUSE
- INDICATING LAMP
- MCB/RCCBO WITH THERMAL ELECTROMAGNETIC PROTECTION
- MCCB
- CABLE GLAND

FOR TENDER PURPOSE

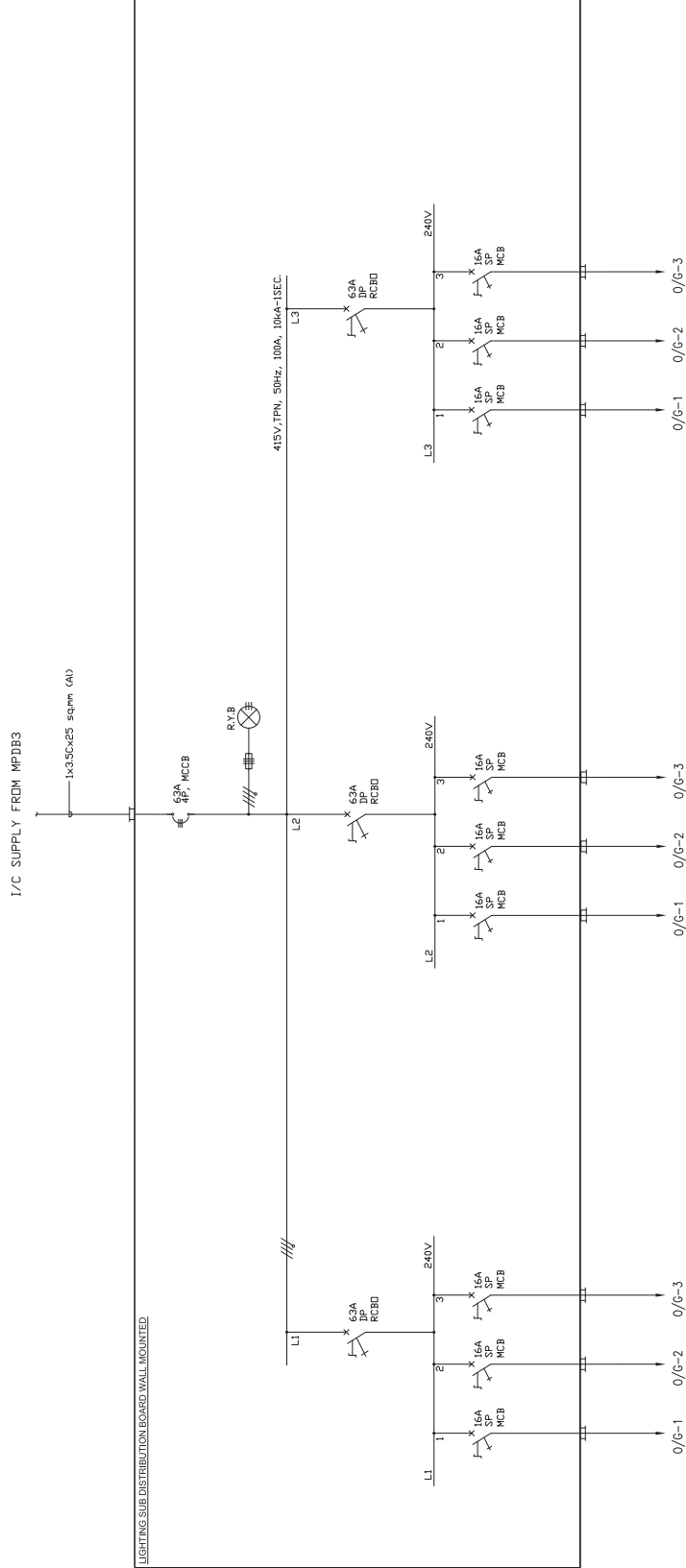
REV.	DATE	ISSUED FOR TENDER	SS	RK	SKB
0	03.06.22				
DESCRIPTION			PPD	CKD	APPD.
CLIENT:- TALCHER FERTILIZER LIMITED			REV.	1	0
			SHEET	1	OF 1
PROJECT:- ASH POND AND ALLIED SERVICES			SCALE:	N.T.S.	
TITLE:- TYPICAL PDB SINGLE LINE DIAGRAM			DRG. NO.-	PG.183-1235	
			FILE:		

प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा
   
 PROJECTS & DEVELOPMENT INDIA LTD. - NOIDA

**GENERAL NOTES:**

1. BUSBAR MATERIAL - Cu
2. SYSTEM VOLTAGE - 415V, 3ø N, 50HZ
3. RATED SHORTCIRCUIT WITHSTAND - 10KA, 1 SEC
4. DEGREE OF PROTECTION (IEC 60529) - IP65, PAINT SHADE - RAL 7032.
5. INCOMER - BOTTOM
6. CABLE ENTRY: OUTGOING - BOTTOM

**LIGHTING SUB DISTRIBUTION BOARD WALL MOUNTED**



**LEGEND:**

- FUSE
- INDICATING LAMP
- MCB/RCBO WITH THERMAL ELECTROMAGNETIC PROTECTION
- CABLE GLAND
- MCCB

0	03.06.22	ISSUED FOR TENDER	SS	RK	SKB
REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
CLIENT:- TALCHER FERTILIZER LIMITED			REV.	0	
PROJECT:- ASH POND AND ALLIED SERVICES			SHEET	1	OF 1
TITLE:- TYPICAL LSDB SINGLE LINE DIAGRAM			SCALE:	N.T.S.	
			DRG. NO.-	PG.183-1236A	
			FILE:		

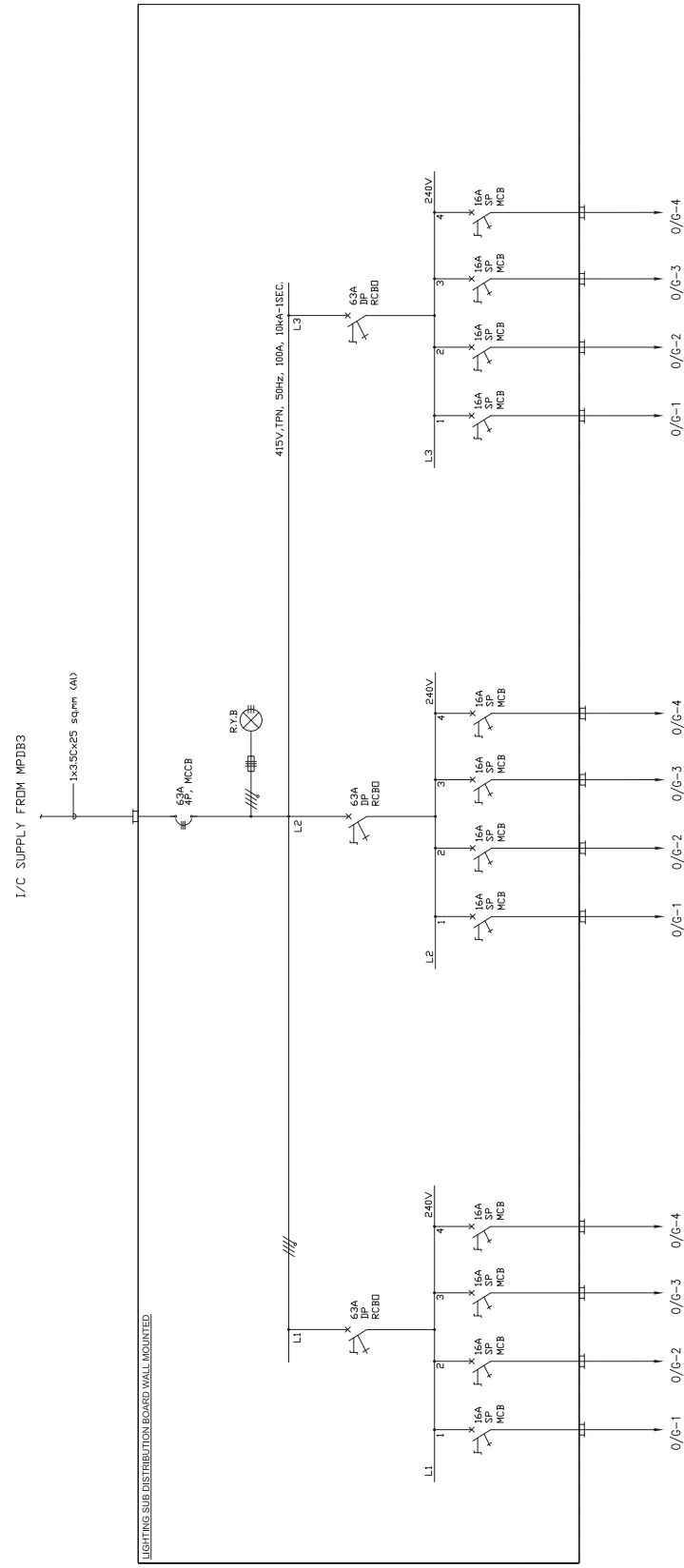
**FOR TENDER PURPOSE**

**प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा**  
**PROJECTS & DEVELOPMENT INDIA LTD. -NOIDA**

**GENERAL NOTES:**

1. BUSBAR MATERIAL - CU
2. SYSTEM VOLTAGE - 415V, 3ø N, 50HZ
3. RATED SHORTCIRCUIT WITHSTAND - 10KA, 1 SEC
4. DEGREE OF PROTECTION (IEC 60529) - IP65, PAINT SHADE - RAL 7032.
5. CABLE ENTRY: INCOMER - BOTTOM  
OUTGOING - TOP

**LIGHTING SUB-DISTRIBUTION BOARD WALL MOUNTED**



**LEGEND:**

- FUSE
- INDICATING LAMP
- MCB/RCBO WITH THERMAL ELECTROMAGNETIC PROTECTION
- CABLE GLAND
- MCCB

REV.	DATE	ISSUED FOR TENDER	SS	RK	SKB
0	03.06.22				
TALCHER Fertilizers		DESCRIPTION	PPD.	CKD.	APPD.
		CLIENT:- TALCHER FERTILIZER LIMITED	REV.	0	
		PROJECT:- ASH POND AND ALLIED SERVICES	SHEET 1 OF 1		
		TITLE:- TYPICAL LSDB SINGLE LINE DIAGRAM	SCALE: N.T.S.		
			DRG. NO.- PC/183-12368		
			FILE:		

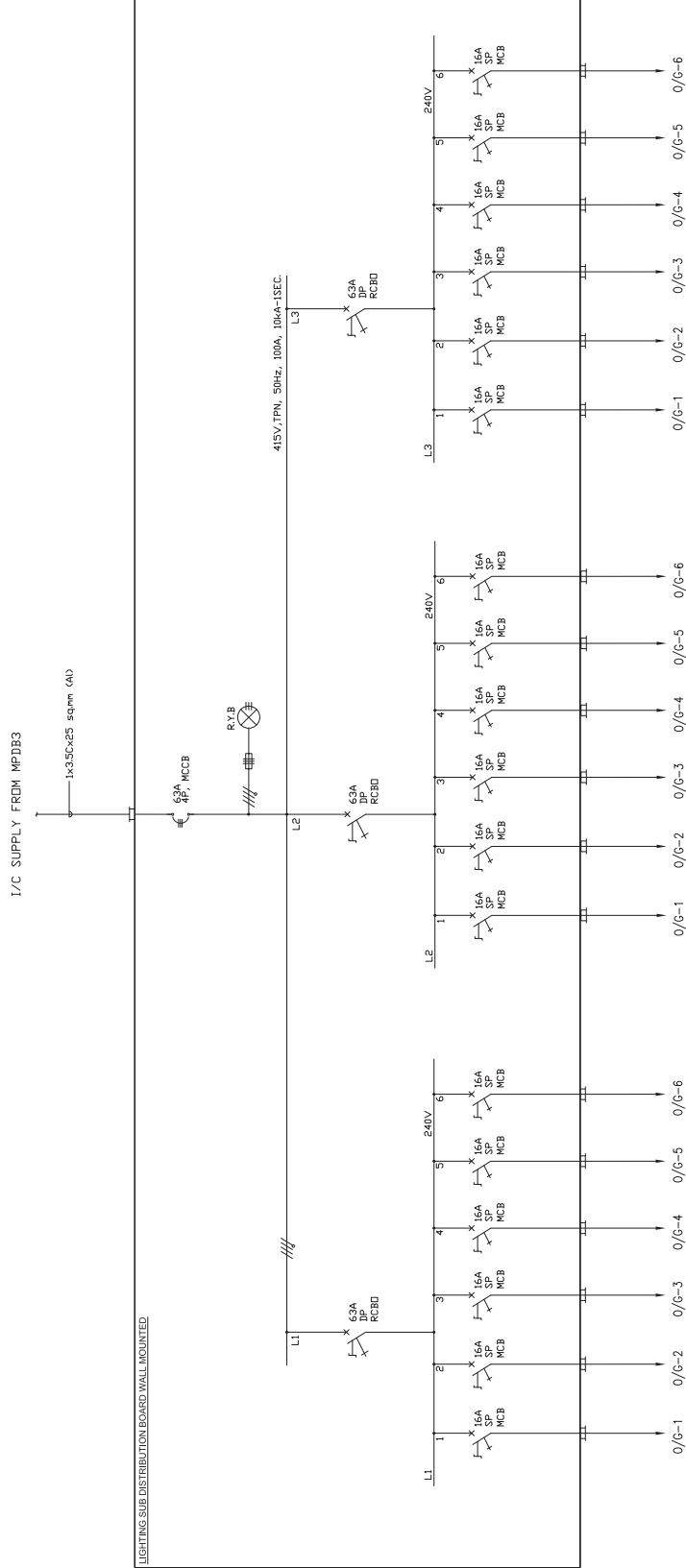
**FOR TENDER PURPOSE**

**प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा**  
**PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA**

**GENERAL NOTES:**

1. BUSBAR MATERIAL - Cu
2. SYSTEM VOLTAGE - 415V, 3ø N, 50HZ
3. RATED SHORTCIRCUIT WITHSTAND - 10KA, 1 SEC
4. DEGREE OF PROTECTION (IEC 60529) - IP65, PAINT SHADE - RAL 7032.
5. INCOMER - BOTTOM
6. CABLE ENTRY: OUTGOING - BOTTOM

**LIGHTING SUB DISTRIBUTION BOARD WALL MOUNTED**



**LEGEND:**

- FUSE
- INDICATING LAMP
- MCB/RCBO WITH THERMAL ELECTROMAGNETIC PROTECTION
- CABLE GLAND
- MCCB

REV.	DATE	ISSUED FOR TENDER	SS	RK	SKB
0	03.06.22				
DESCRIPTION			PPD.	CKD.	APPD.
CLIENT:- TALCHER FERTILIZER LIMITED			REV.	0	
PROJECT:- ASH POND AND ALLIED SERVICES			SHEET	1	OF 1
TITLE:- TYPICAL LSDB SINGLE LINE DIAGRAM			SCALE:	N.T.S.	
			DRG. NO.-	PG.183-1238C	
			FILE:		

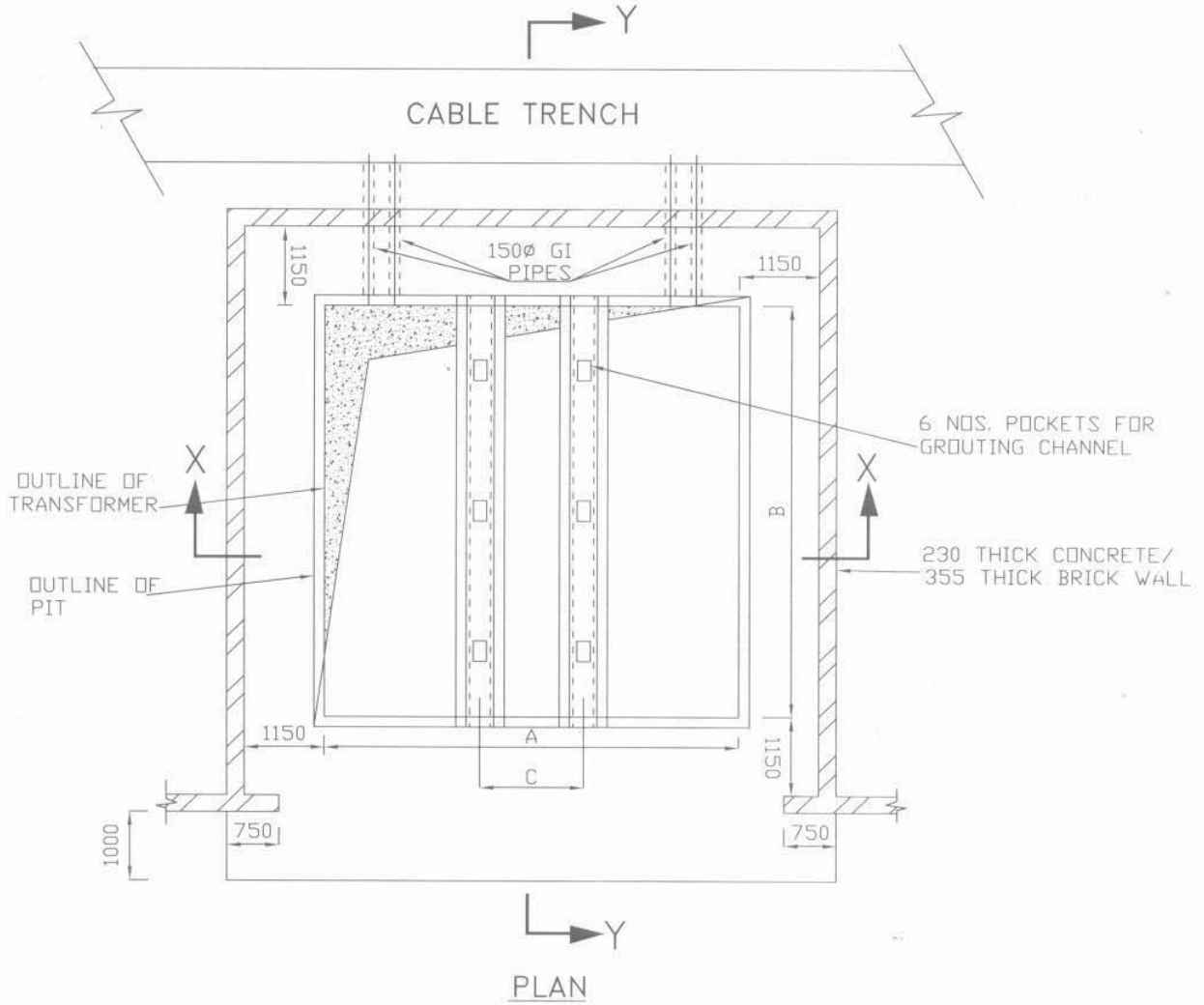
**FOR TENDER PURPOSE**

**PDIL** प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा  
PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA

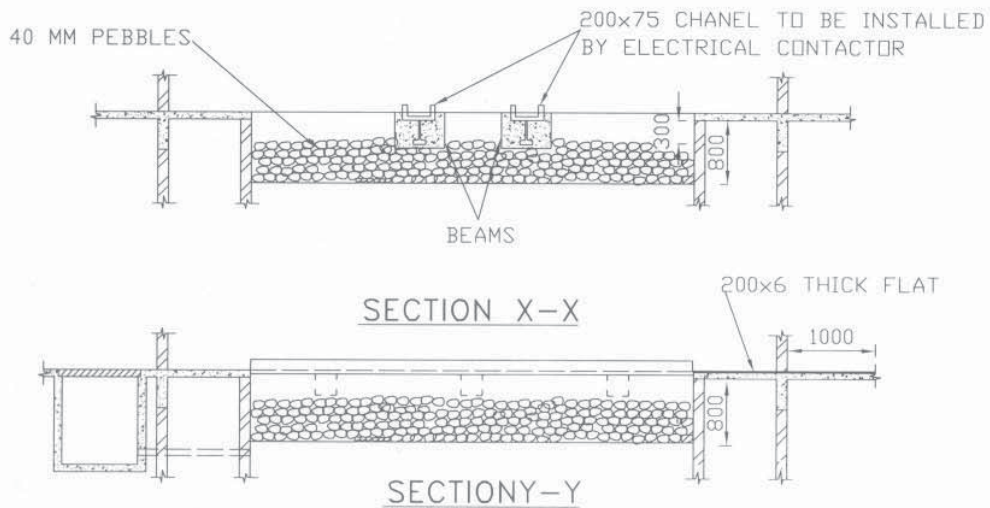


# FOUNDATION DETAIL OF 11/.433 KV TRANSFORMER

PC183 PDS: E113	0
DOCUMENT NO.	REV
SHEET 1 OF 1	



TYPICAL DETAIL OF 11/.433KV T/F



NOTE :

TRANSFORMERS RATED ABOVE 10MVA SHALL BE MOUNTED ON 200MM x 8MM THICK PLATES.



TYPICAL DETAILS OF  
TRANSFORMER ROOM DOOR

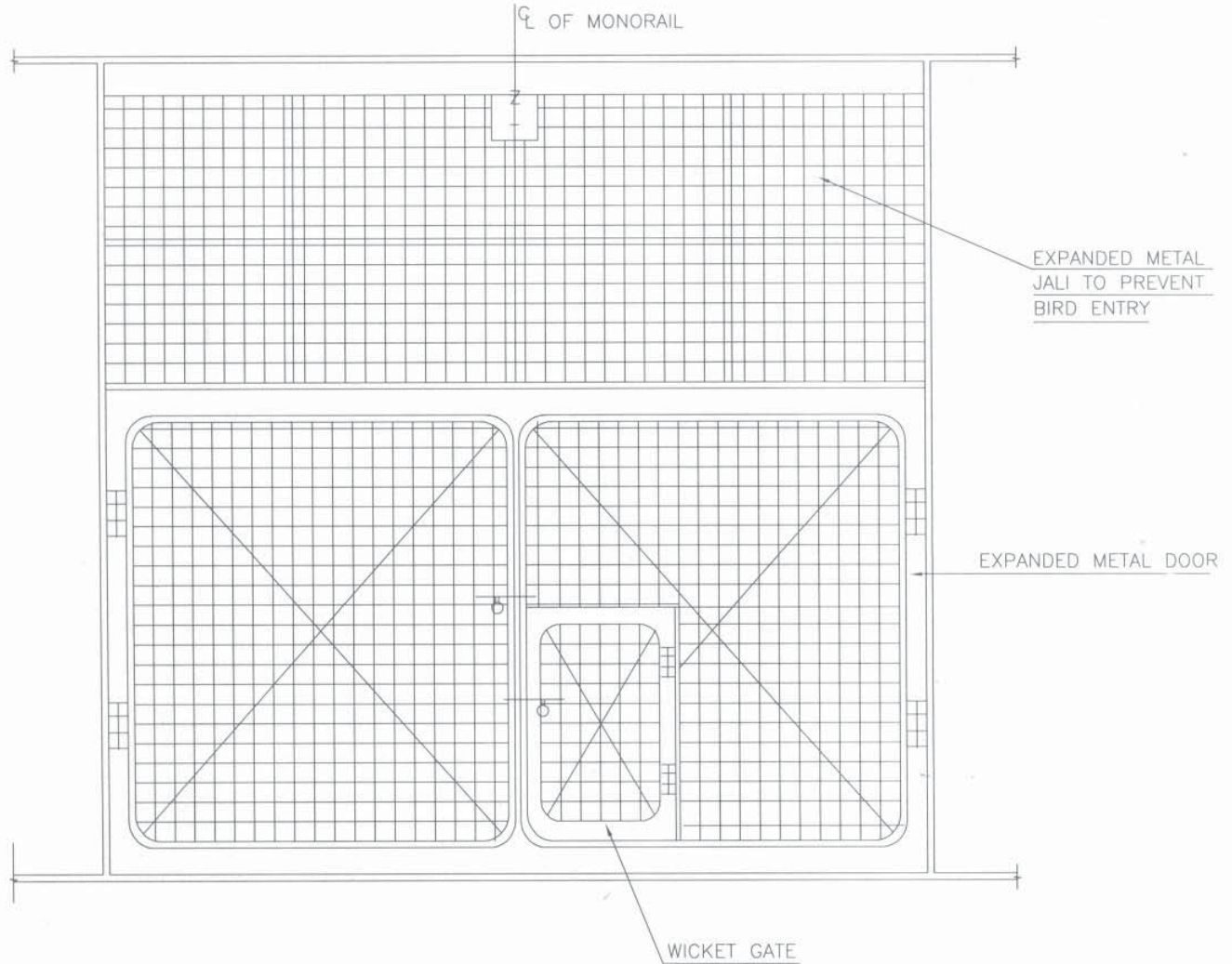
PC183 E 115

0

DOCUMENT NO.

REV

SHEET 1 OF 1



NOTE :-

1. THIS STANDARD IS INDICATIVE ONLY, THE EXACT DIMENSIONS SHALL BE DECIDED AS PER TRANSFORMER SIZE & SUB-STATION LAYOUT.
2. TRANSFORMER GATE HEIGHT SHALL BE 250MM MORE THAN THE TRANSFORMER HEIGHT AND SHALL BE OPENABLE OUTSIDE.

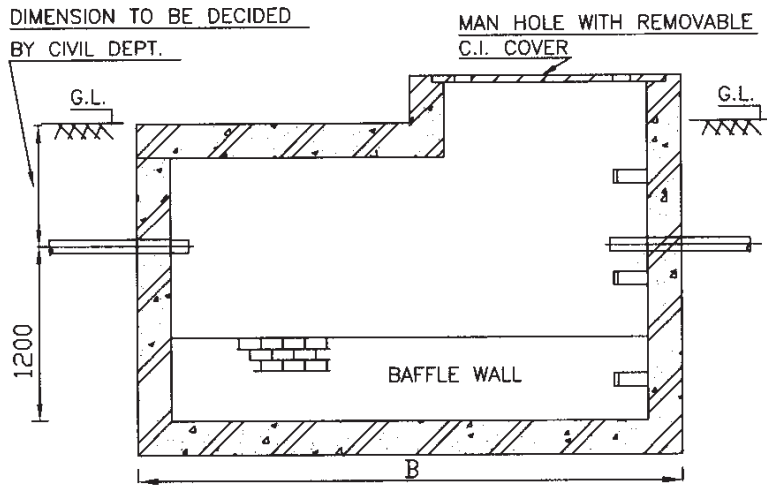
0	20.01.07	01.02.07	ISSUED FOR IMPLEMENTATION	<i>Shree</i> RUNDA/AV	<i>SC</i> SC	<i>BB</i> BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



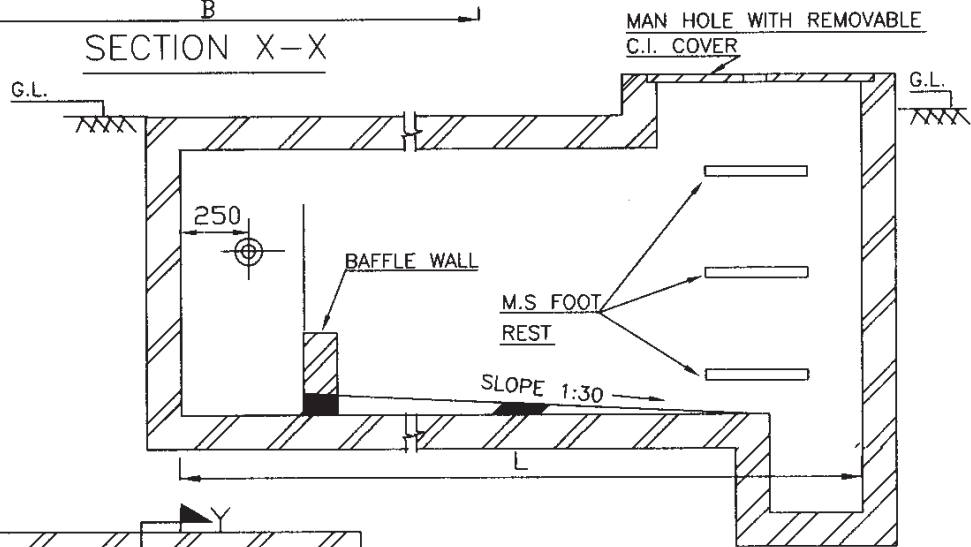


# SUMP PIT FOR TRANSFORMER OIL

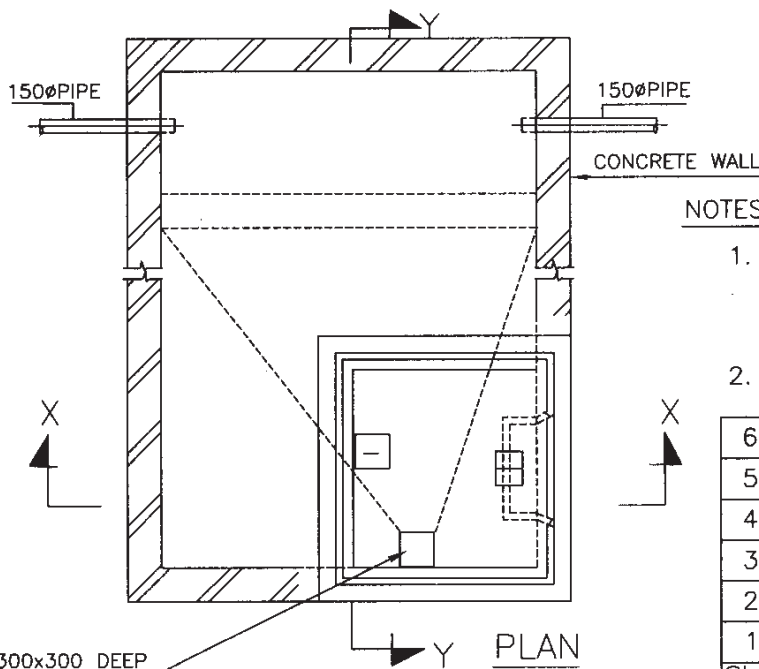
PC183 PDS: E116	1
DOCUMENT NO.	REV
SHEET 1 OF 1	



SECTION X-X



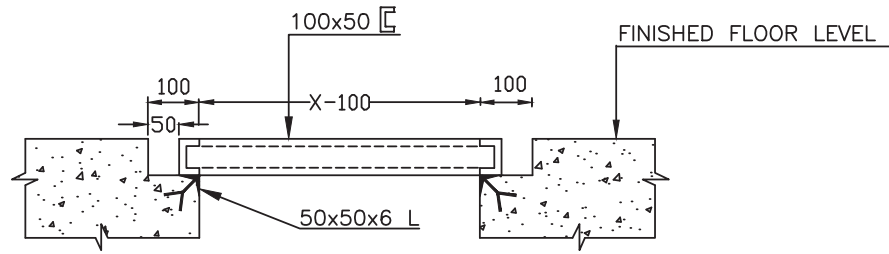
SECTION Y-Y



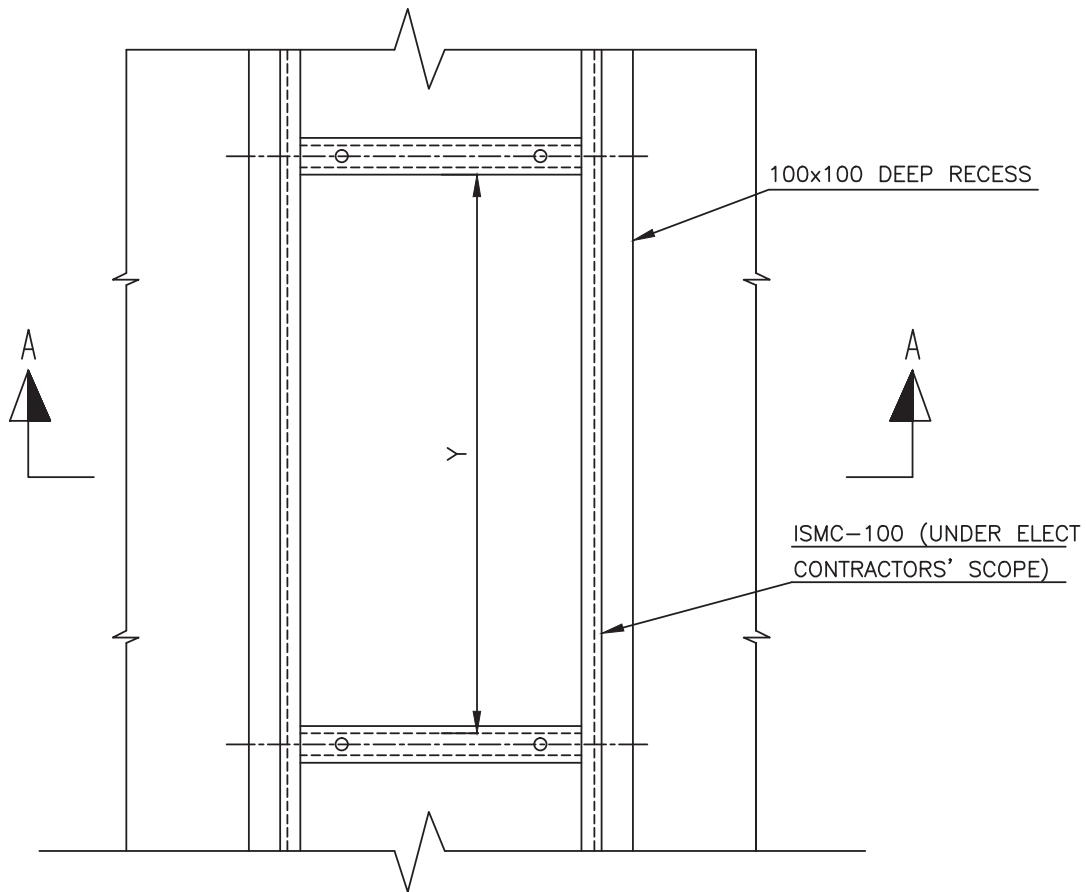
NOTES:-

1. DIMENSION 'L' AND 'B' SHALL BE DECIDED BASED ON OIL VOLUME OF HIGHEST RATED TRANSFORMER.
2. ALL DIMENSIONS ARE IN mm

6	2000	1.5	1.5
5	3000	1.5	2
4	5000	2.5	2
3	7000	3.0	2.5
2	8000	3.5	2.5
1	10000	4.0	2.5
SL. No.	OIL CAPACITY	L	B



SECTION-A A



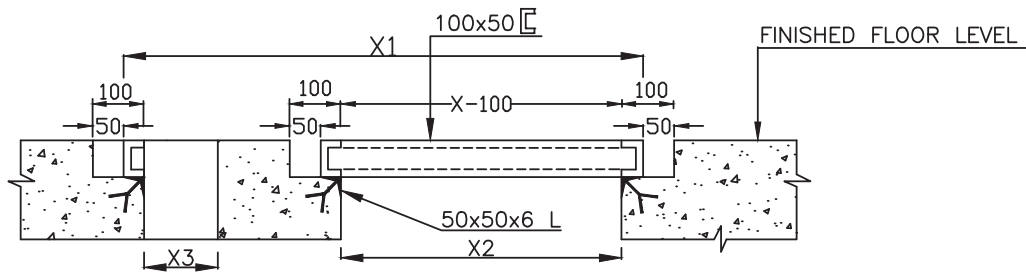
PLAN

X- DEPTH OF PANEL

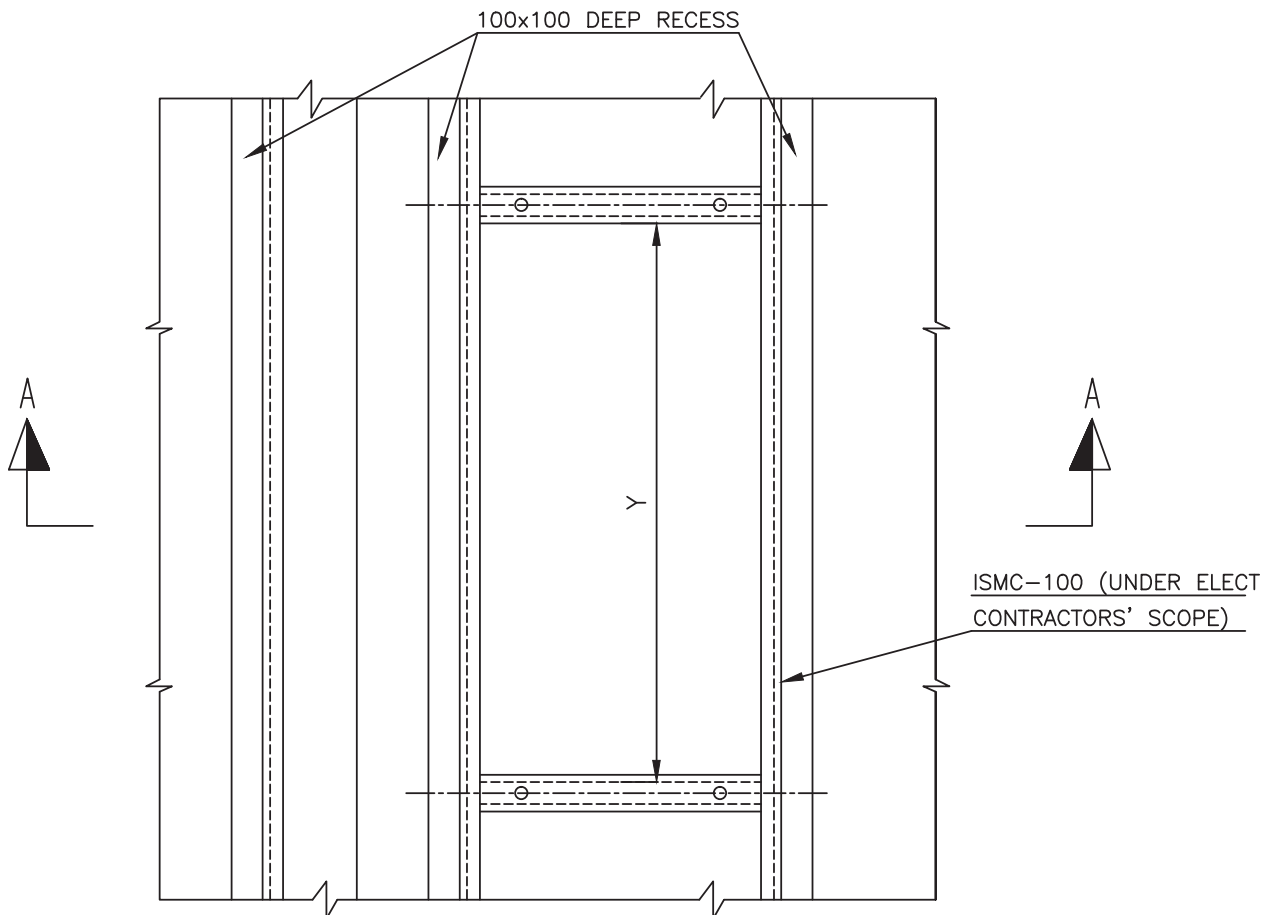
Y- LENGTH OF TWO PANELS

NOTES:-

1. THIS ARRANGEMENT SHALL BE APPLICABLE FOR M.C.C., DISTRIBUTION BOARDS, CONTROL PANELS ETC.
2. PANELS AFTER ERECTION SHALL BE TAG WELDED TO FOUNDATION CHANNELS



SECTION-A A

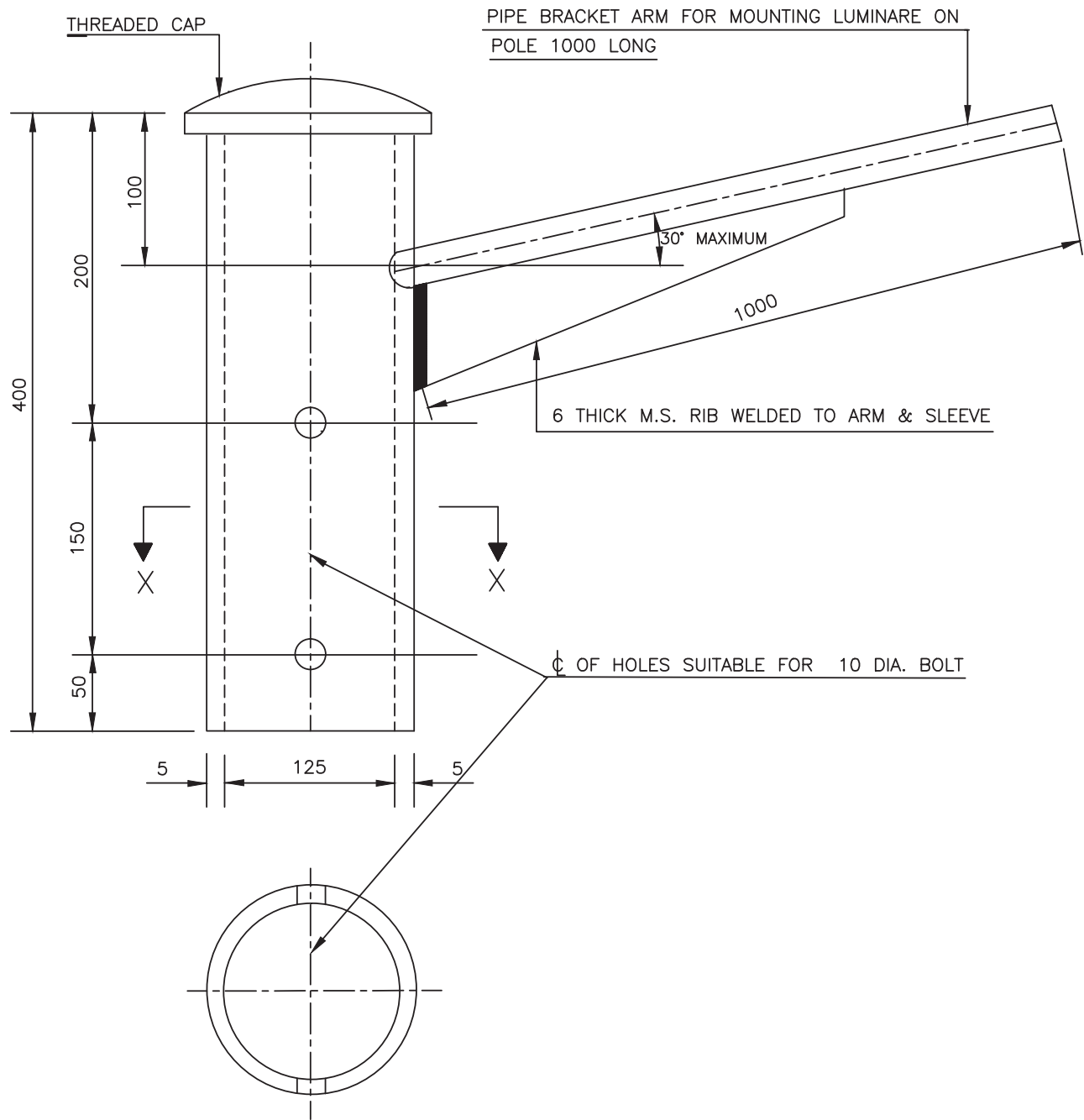


X1 = DEPTH OF PANEL  
X2 = FLOOR OPENING  
X3 = FLOOR OPENING  
Y = LENGTH OF PANEL

PLAN

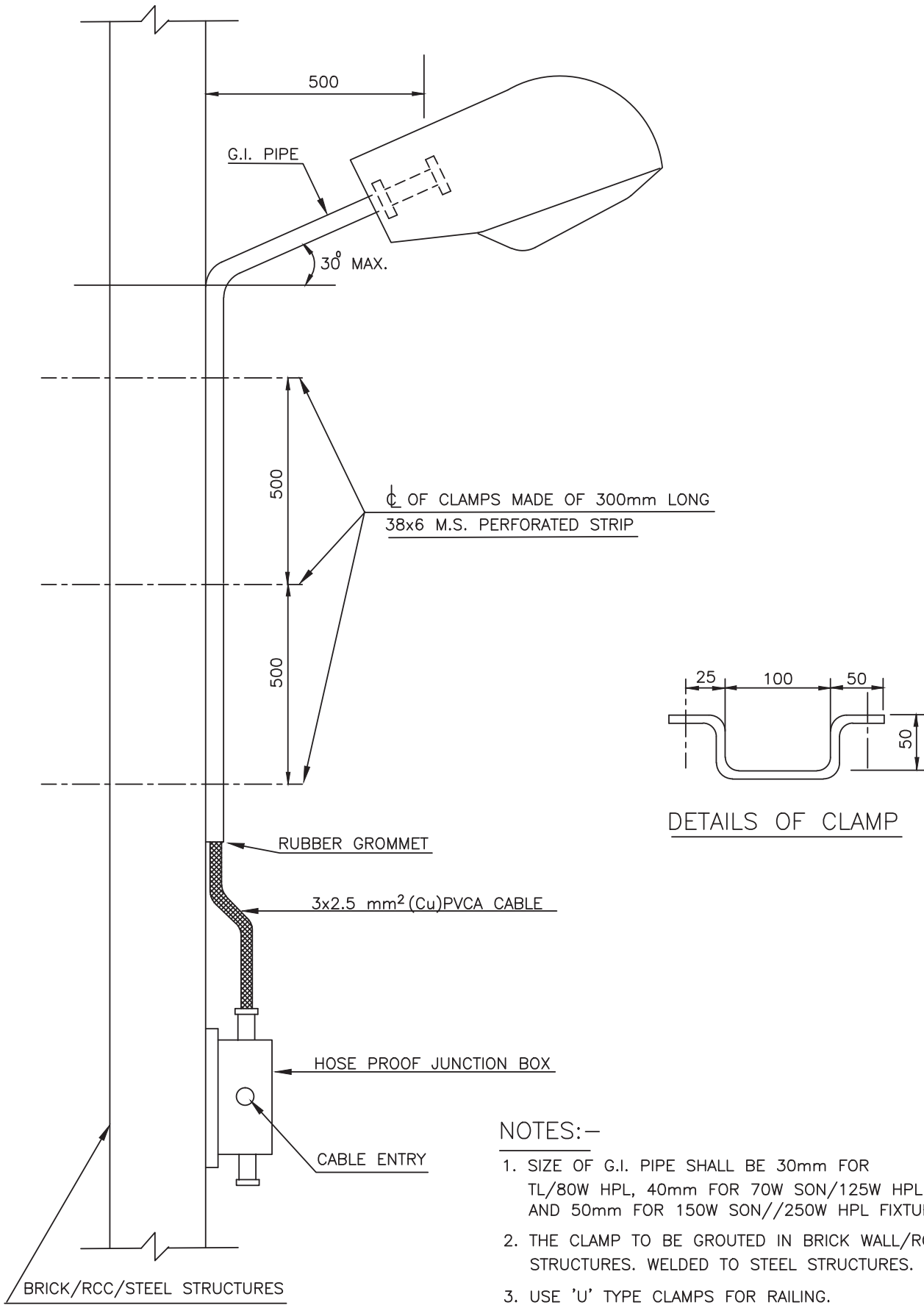
NOTES:-

1. PANELS AFTER ERECTION SHALL BE BOLTED TO FOUNDATION CHANNELS
2. POWER & CONTROL CABLES SHALL ENTER THROUGH OPENING X2
3. DEPENDING UPON THE FINAL DATA FROM THE VENDOR, ONLY TWO CHANNELS MAY BE NECESSARY IN WHICH CASE THE 3RD. RECESS SHALL BE FILLED AT SITE.



NOTES:-

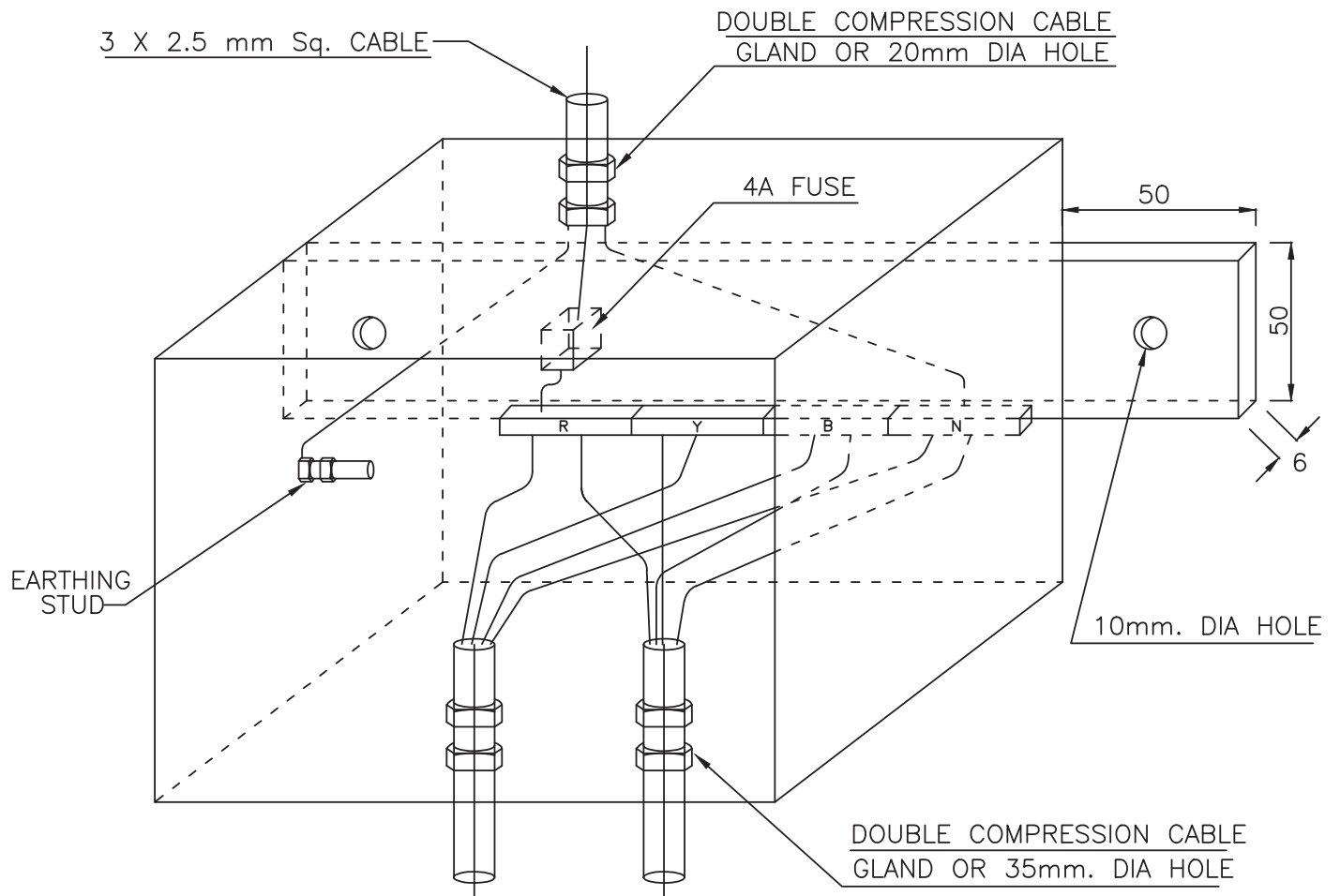
1. SIZE OF PIPE SHALL BE 30mm FOR TL/80W HPL FIXTURES,  
40mm FOR 70W SON/125W HPL FIXTURES AND 50mm FOR  
150W SON/250W HPL FIXTURES.
2. ALL DIMENSIONS ARE IN mm.



DETAILS OF CLAMP

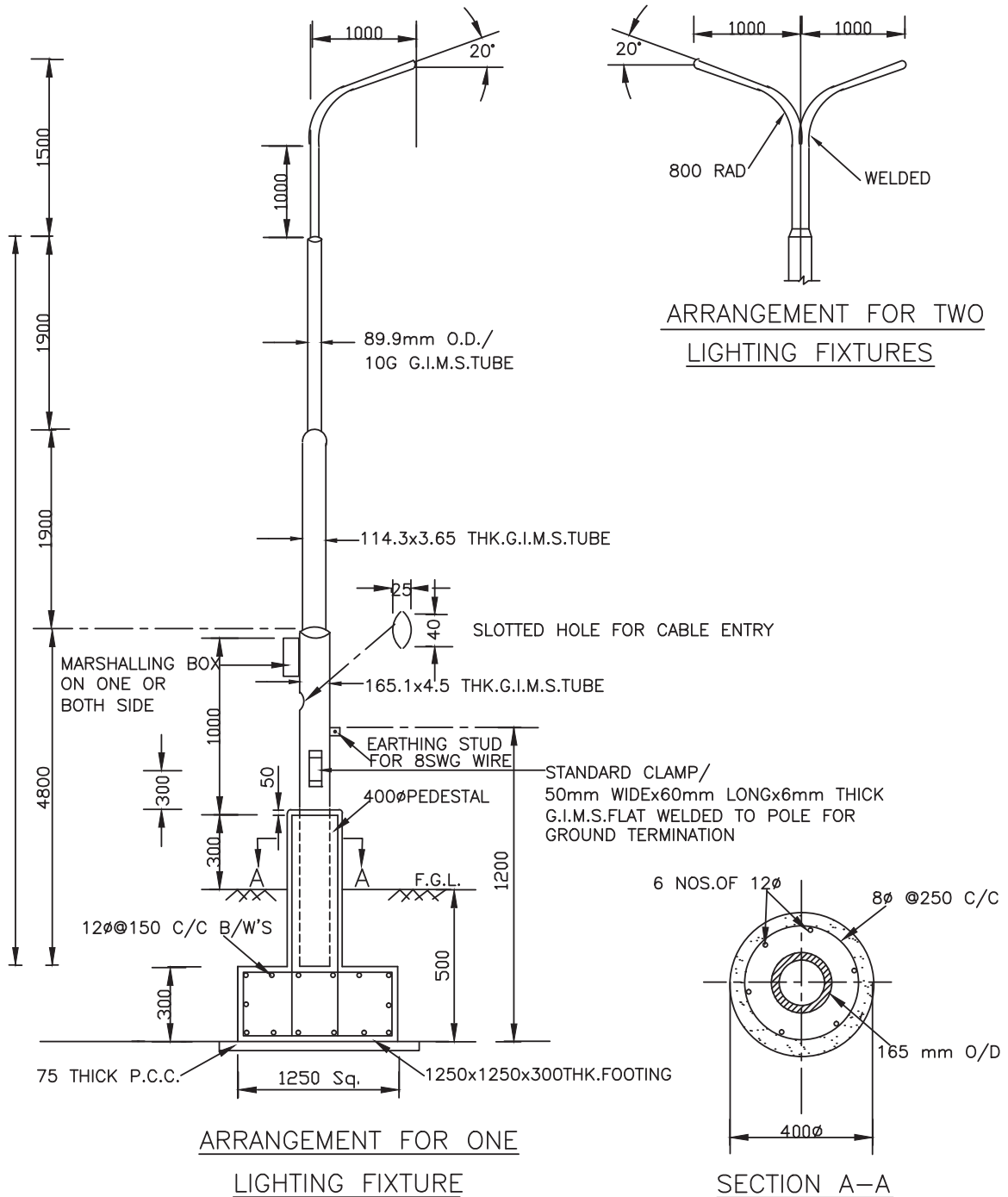
NOTES:-

1. SIZE OF G.I. PIPE SHALL BE 30mm FOR TL/80W HPL, 40mm FOR 70W SON/125W HPL AND 50mm FOR 150W SON//250W HPL FIXTURES.
2. THE CLAMP TO BE GROUTED IN BRICK WALL/RCC STRUCTURES. WELDED TO STEEL STRUCTURES.
3. USE 'U' TYPE CLAMPS FOR RAILING.
4. ALL DIMENSIONS ARE IN mm.



NOTE:-

1. THE MINIMUM INTERNAL DIMENSION OF THE J.B. SHALL BE 152 X 152 X 152.
2. THE FRONT DOOR SHALL BE HINGED & LOCKABLE TYPE.
3. THE CONNECTION OF FUSE TO THE PHASE 'R' IS TYPICAL ONE THE EXACT PHASE TO WHICH CONNECTION SHALL BE MADE SHALL BE DECIDED AT SITE.
4. FOR HAZARDOUS AREA'S THESE JUNCTION BOXES SHALL BE INCREASED SAFETY TYPE AND THE FUSE NEED NOT BE PROVIDED.
5. FOR POLE MOUNTED JUNCTION BOXED THE CABLE GLAND SHALL BE SIDE MOUNTED.
6. ALL DIMENSIONS ARE IN mm.

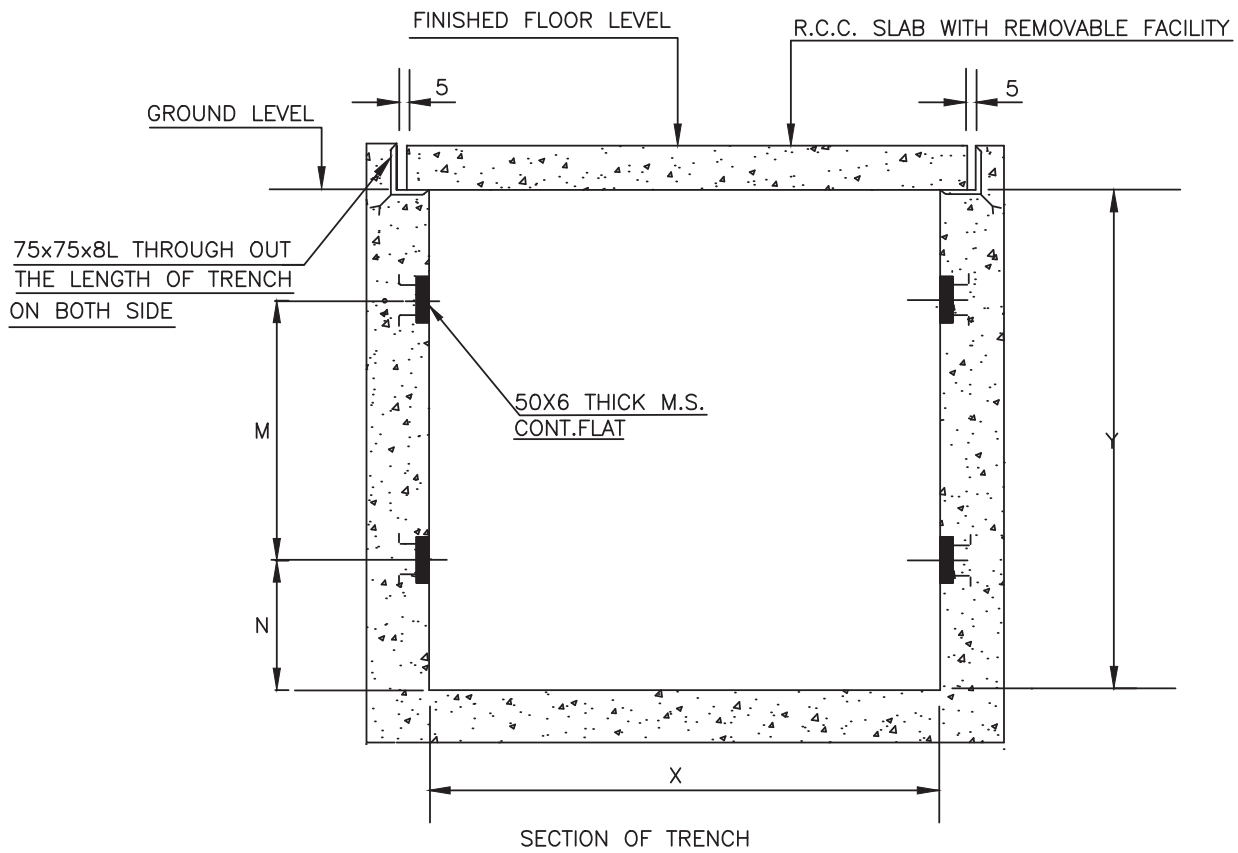


NOTE :-

1. CONCRETING AND APPROVED MOUNTING HARDWARE FOR LIGHTING FIXTURES ARE INCLUDING IN SCOPE OF SUPPLY.
2. CONCRETE FOUNDATION OF GRADE M15 SHALL BE PROVIDED.

ALL DIMENSIONS ARE IN mm.

## DETAILS OF CONCRETE CABLE TRENCH

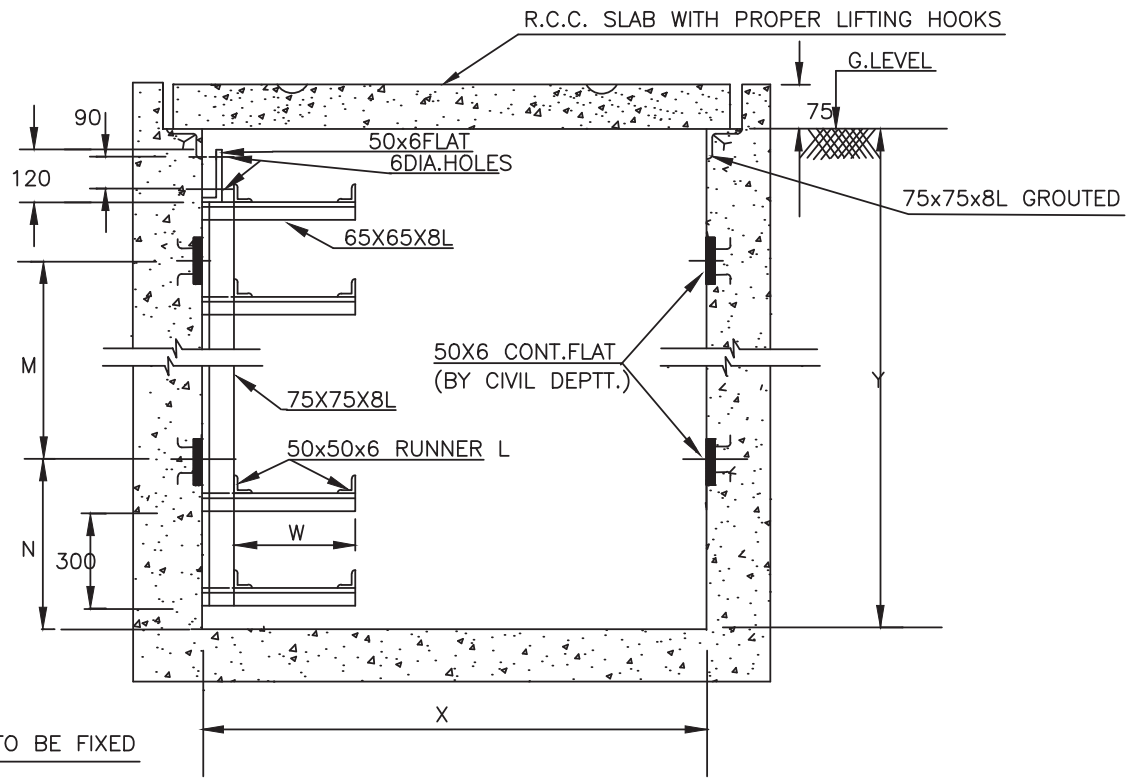


DESIGN TYPE	X	Y	N	M
5T 350DS.	1400	1500	400	650
4T 350DS.	1400	1200	250	650
3T 350DS.	1400	900	250	300
5T 350SS.	1000	1500	400	650
4T 350SS.	1000	1200	250	650
3T 350SS.	1000	900	250	300
5T 250DS.	1200	1500	400	650
4T 250DS.	1200	1200	250	650
3T 250DS.	1200	900	250	300
5T 250SS.	900	1500	400	650
4T 250SS.	900	1200	250	650
3T 250SS.	900	900	250	300

### NOTES:—

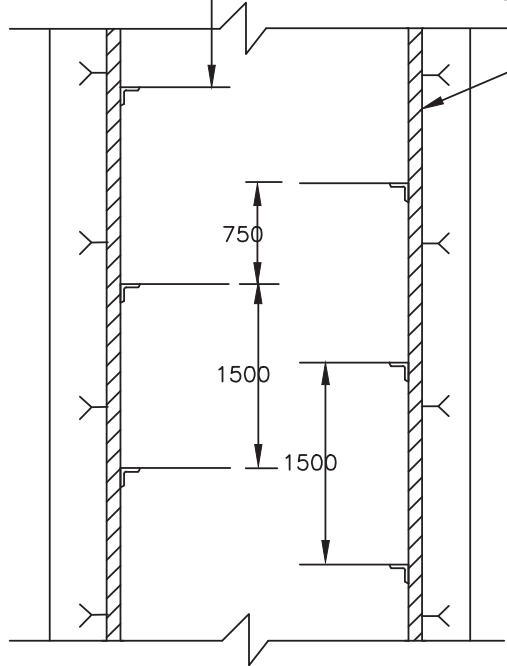
1. THE TOP OF TRENCH SHALL MATCH THE FLOOR LEVEL IN PLANT AREA.
2. IN INDOORS INSTEAD OF RCC SLAB, 20mm. THICK AL. EXTRUDED PLANK OR 10mm. THICK M.S. CHEQUERED PLATE SHALL BE USED AS PER PDS:E 507.
3. PROPER SLOPE TO BE GIVEN IN THE TRENCH FOR NATURAL DRAINAGE.
4. SS—SINGLE SIDE CABLE SUPPORTS.
5. DS—DOUBLE SIDE CABLE SUPPORTS.
6. ALL DIMENSIONS ARE IN mm.





CABLE SUPPORTS TO BE FIXED  
@ 1500 INTERVAL

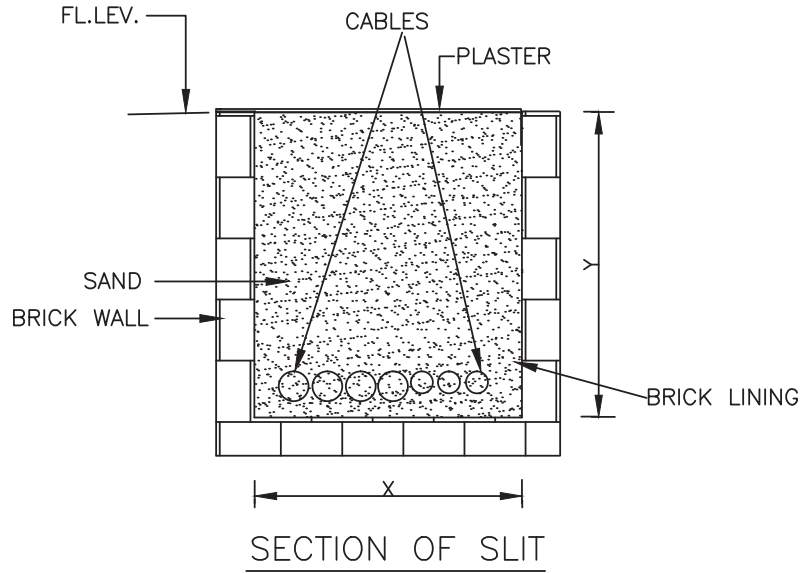
SECTION OF TRENCH



TYPICAL PLAN OF TRENCH

DESIGN TYPE	X	Y	N	M	W
5T-350-DS.	1400	1500	400	650	350
4T-350-DS.	1400	1200	250	650	350
3T-350-DS.	1400	900	250	300	350
5T-350-SS.	1000	1500	400	650	350
4T-350-SS.	1000	1200	250	650	350
3T-350-SS.	1000	900	250	300	350
5T-250-DS.	1200	1500	400	650	250
4T-250-DS.	1200	1200	250	650	250
3T-250-DS.	1200	900	250	300	250
5T-250-SS.	900	1500	400	650	250
4T-250-SS.	900	1200	250	650	250
3T-250-SS.	900	900	250	300	250

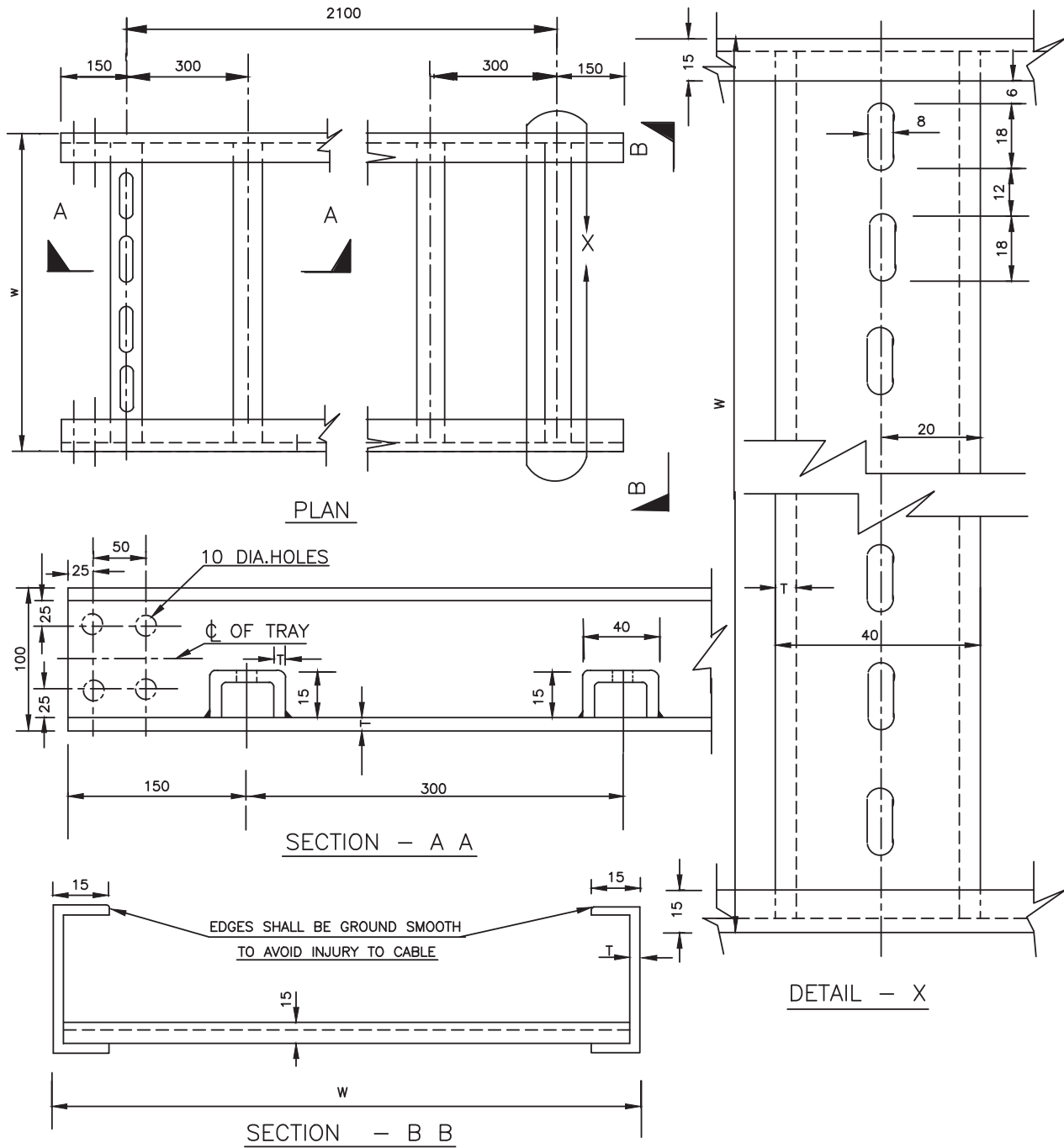
NOTES:-1. SS-SINGLE SIDE CABLE SUPPORT.  
2. DS-DOUBLE SIDE CABLE SUPPORT.  
3. ALL DIMENSIONS ARE IN mm.



DESIGN TYPE	X	Y
S 300	300	300
S 200	200	200

NOTE:-

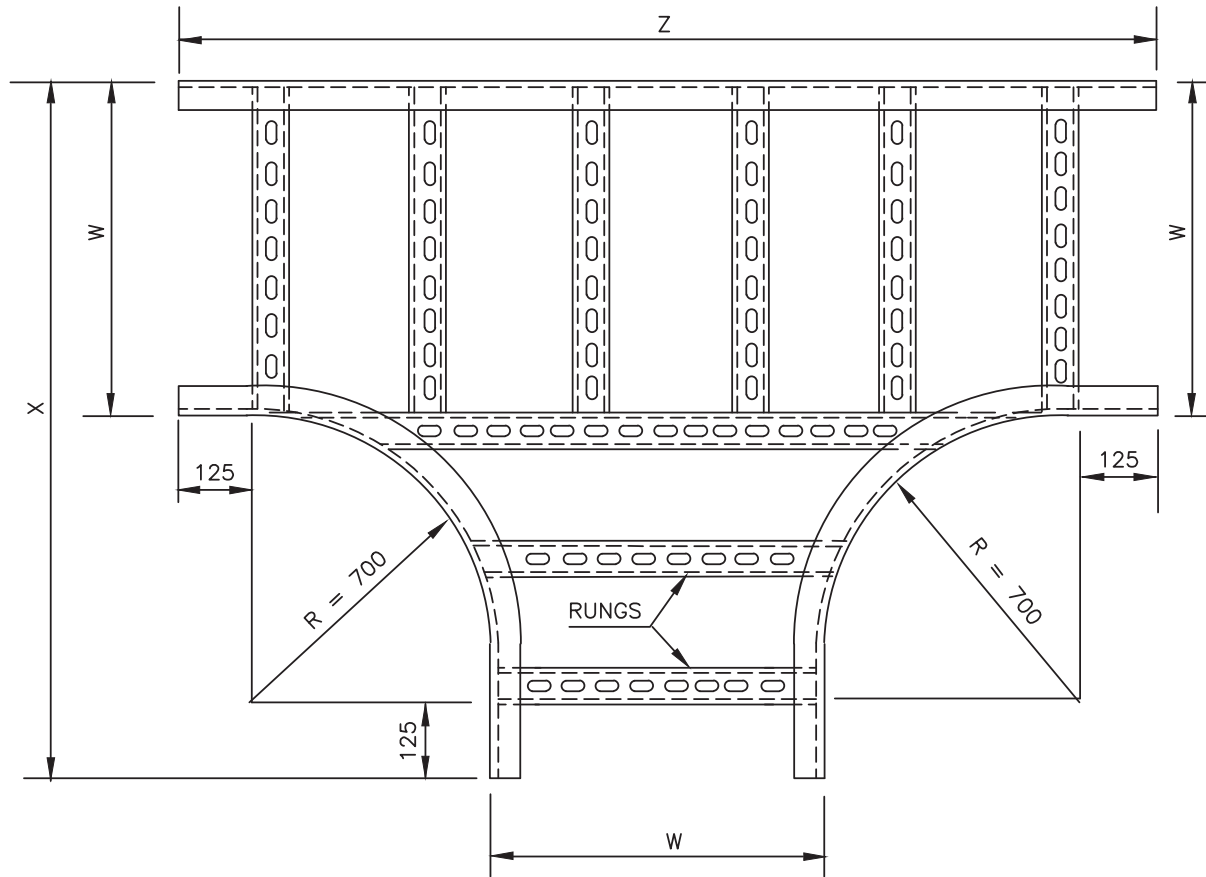
1. CABLE SLITS SHALL BE FILLED WITH SAND AND PROPERLY PLASTERED WITH LEAN CONCRETE AFTER LAYING OF CABLES.
2. WHEREVER CABLES ARE COMING OUT OF THE SLIT, SUITABLE MECH.PROTECTION TO BE PROVIDED.



DESIGN TYPE (WIDTH)	MAX.SUPPORTING SPAN		WEIGHT/METER APPROX. IN Kg.	
	G. I.	A. L	G. I.	A. L
SR 900	2000	2000	10.5	3.6
SR 600	2000	2000	8.9	3.05
SR 450	2000	2000	8.0	2.75
SR 300	2000	2000	7.6	2.6
SR 150	2000	2000	6.8	2.33

**NOTE:-**

THICKNESS " T " SHALL BE 3mm FOR G.I  
AND 4mm.FOR AL.

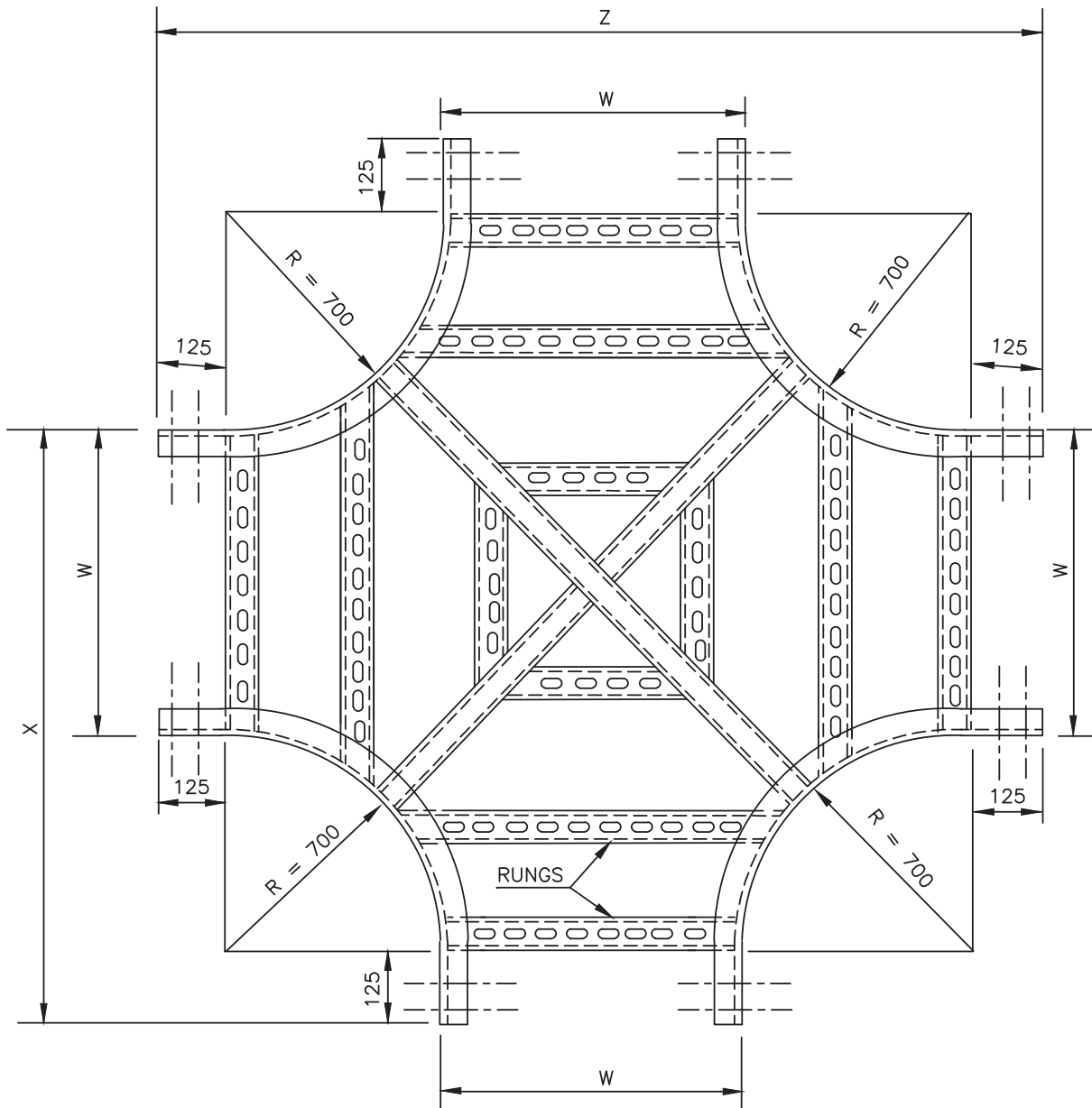


PLAN

DESIGN TYPE	W	$X=R+W+125$	$Z=2R+W+250$
HT 900	900	1725	2550
HT 600	600	1425	2250
HT 450	450	1275	2100
HT 300	300	1125	1950

NOTES :-

1. DISTANCE BETWEEN TWO RUNGS SHOULD BE APPROX. 300mm.
2. ALL DIMENSIONS ARE IN mm.

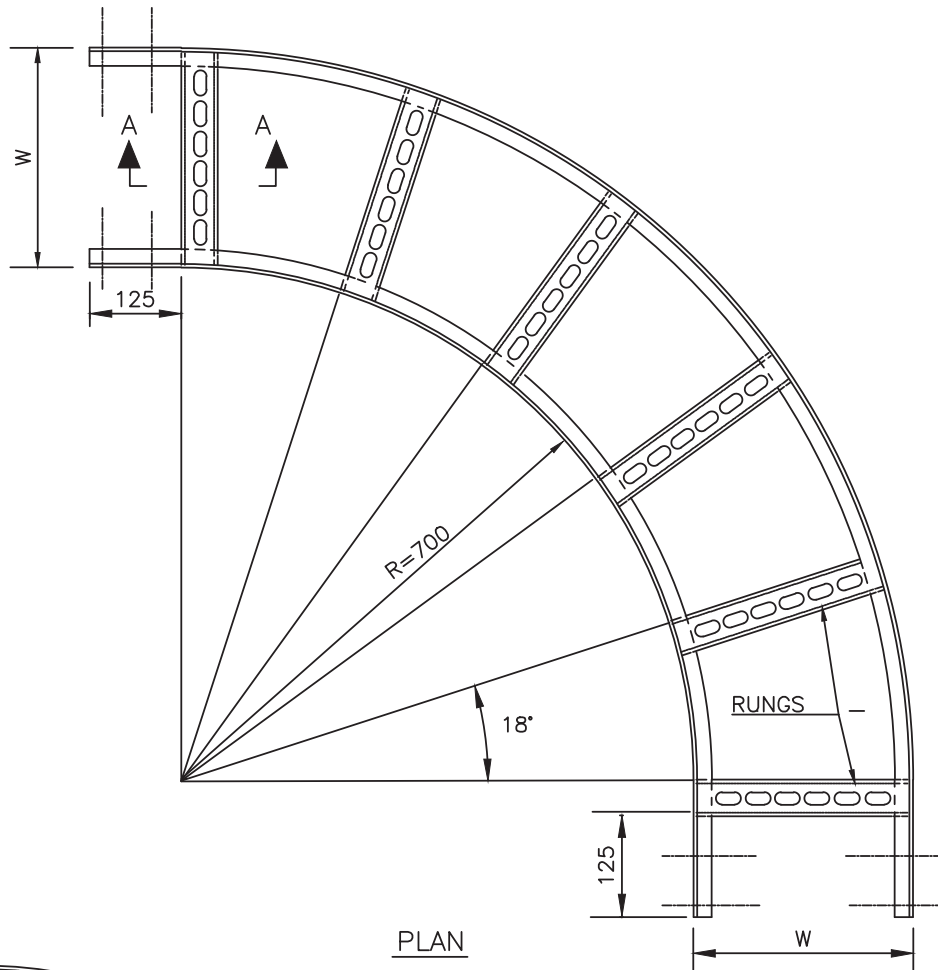


PLAN

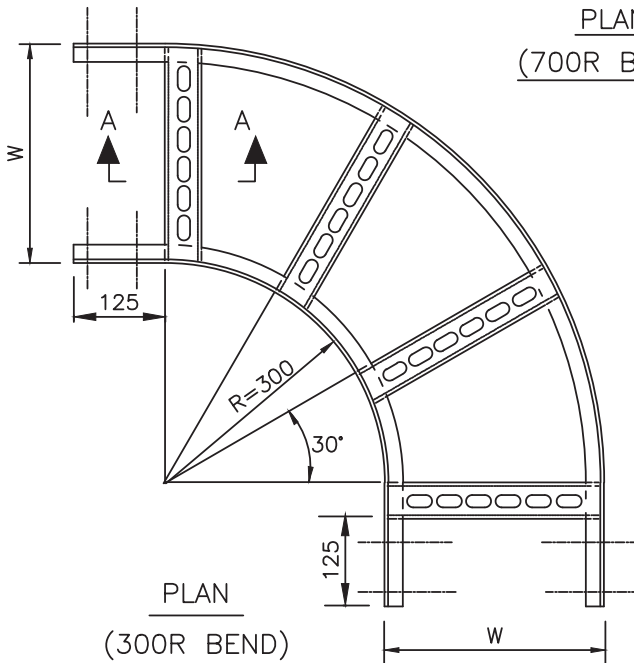
DESIGN TYPE	W	$X=R+W+125$	$Z=2R+W+250$
HC 900	900	1725	2550
HC 600	600	1425	2250
HC 450	450	1275	2100
HC 300	300	1125	1950

NOTES :-

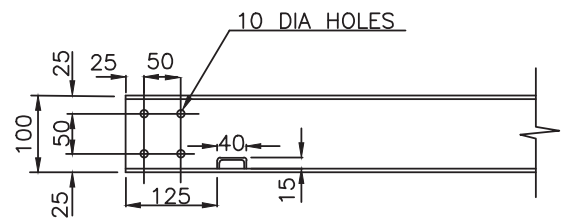
1. DISTANCE BETWEEN TWO RUNGS SHOULD BE APPROX. 300mm.
2. ALL DIMENSIONS ARE IN mm.



PLAN  
(700R BEND)

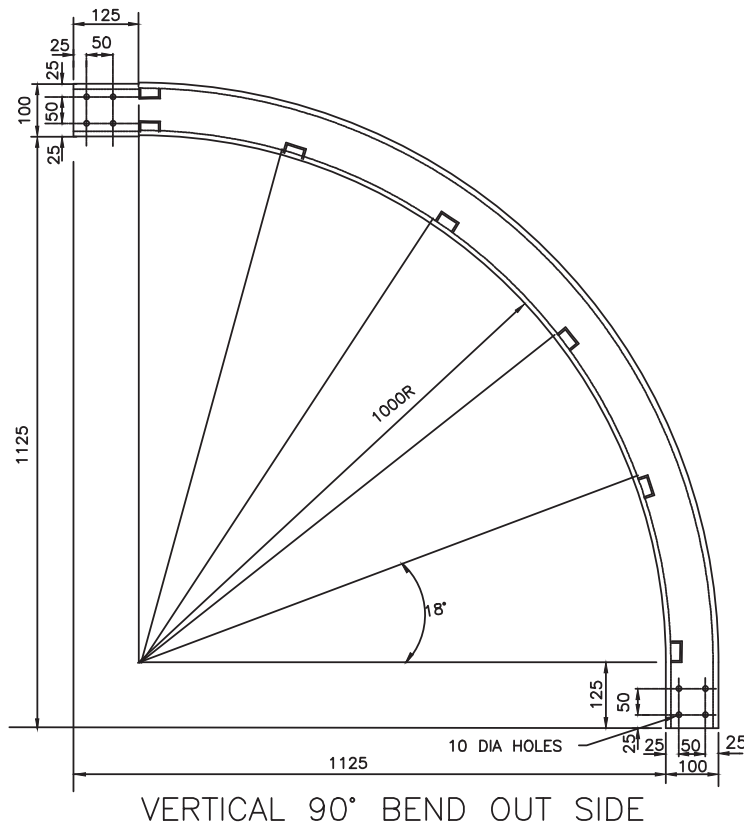
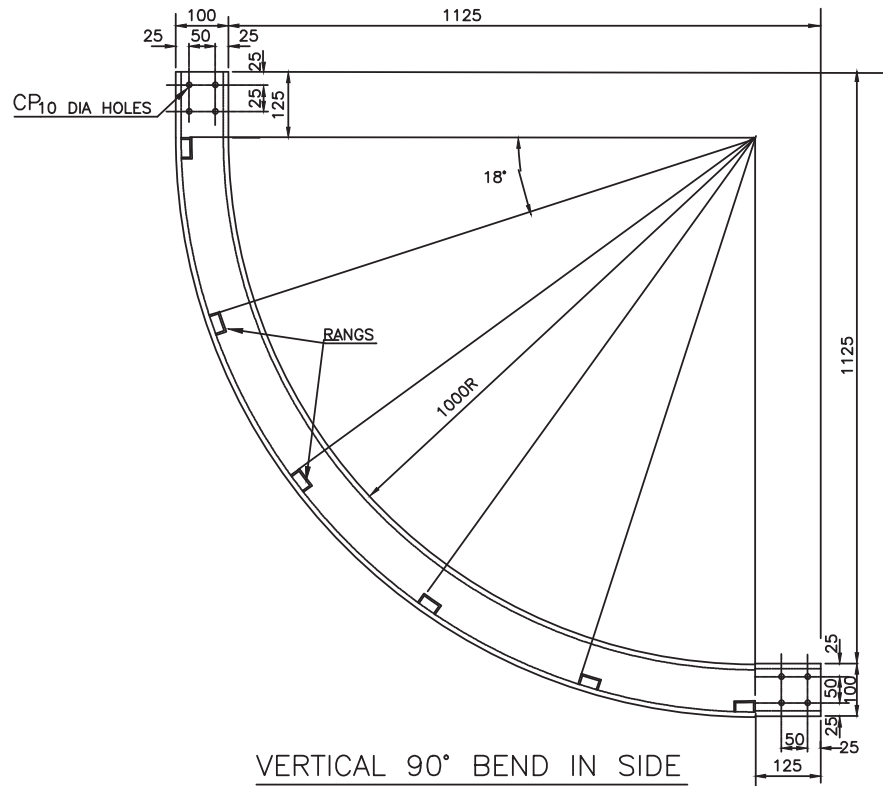


PLAN  
(300R BEND)

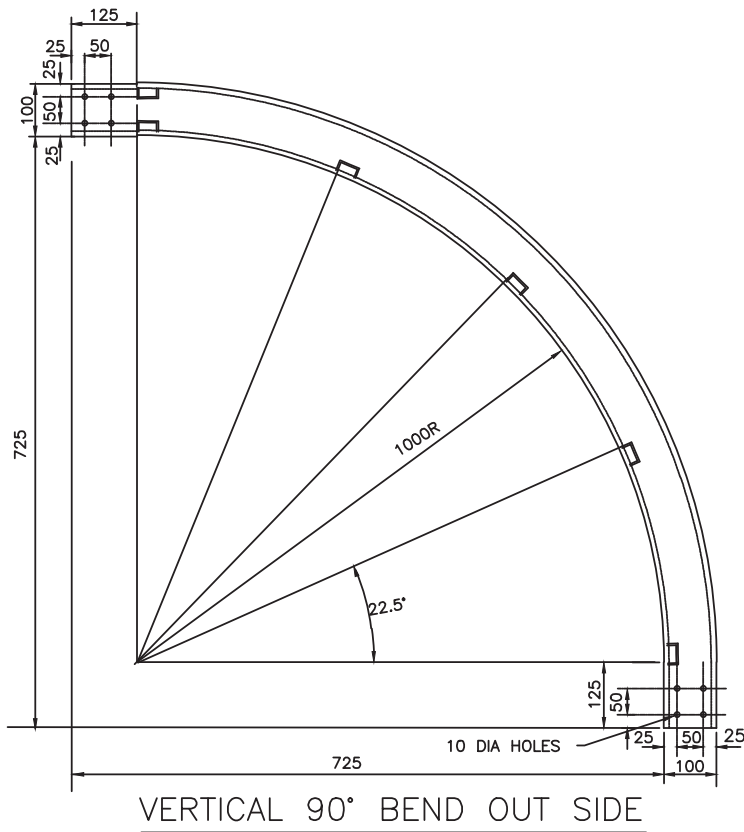
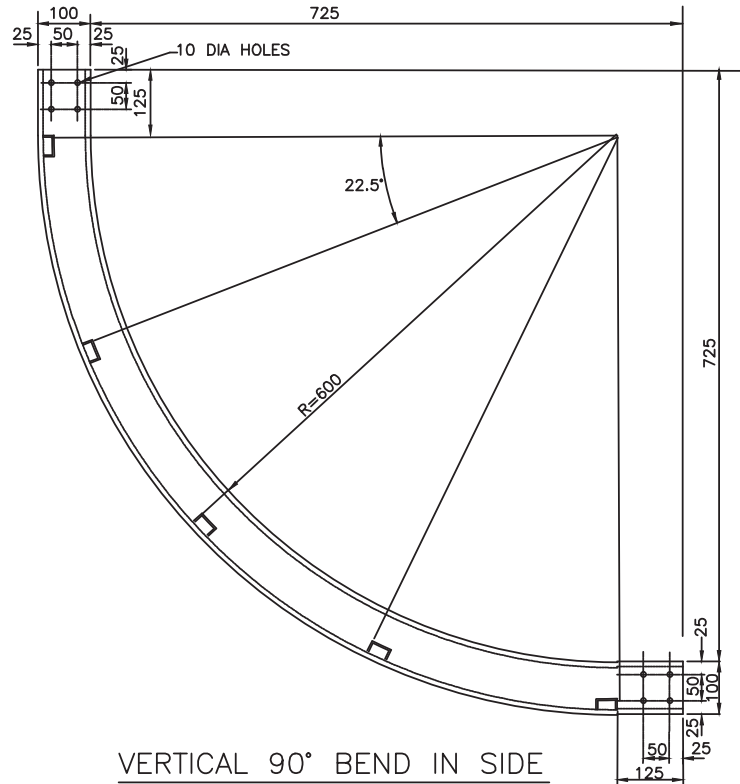


SECTION A-A

ALL DIMENSIONS ARE IN mm.

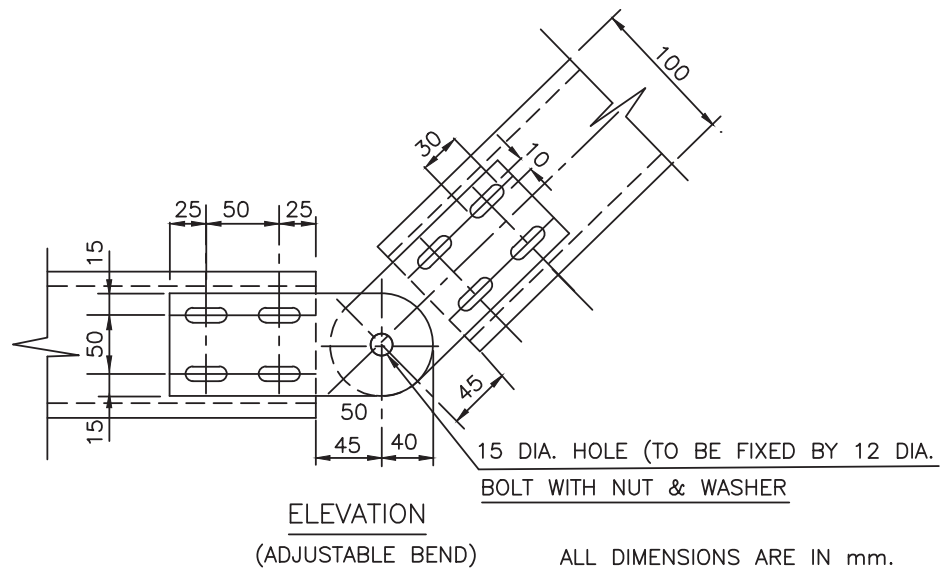
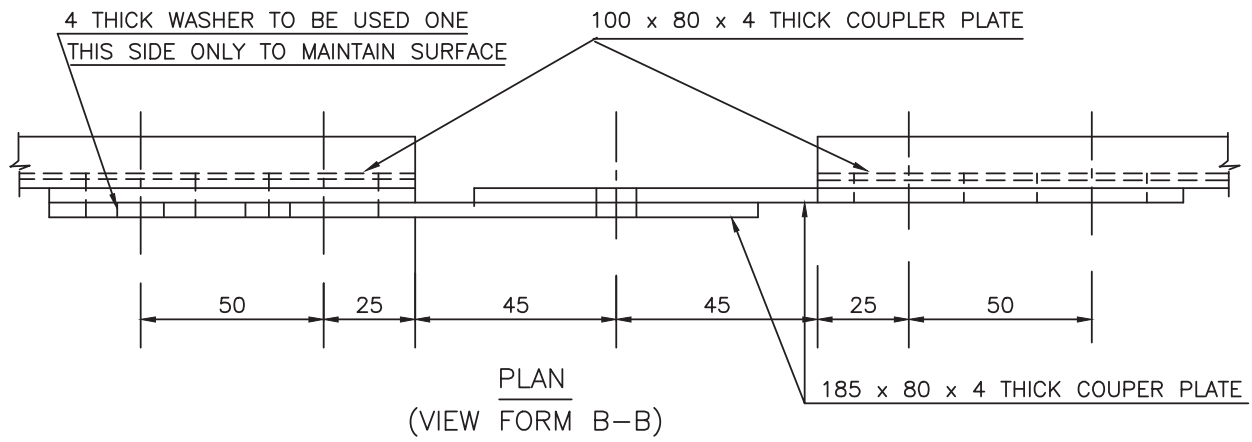
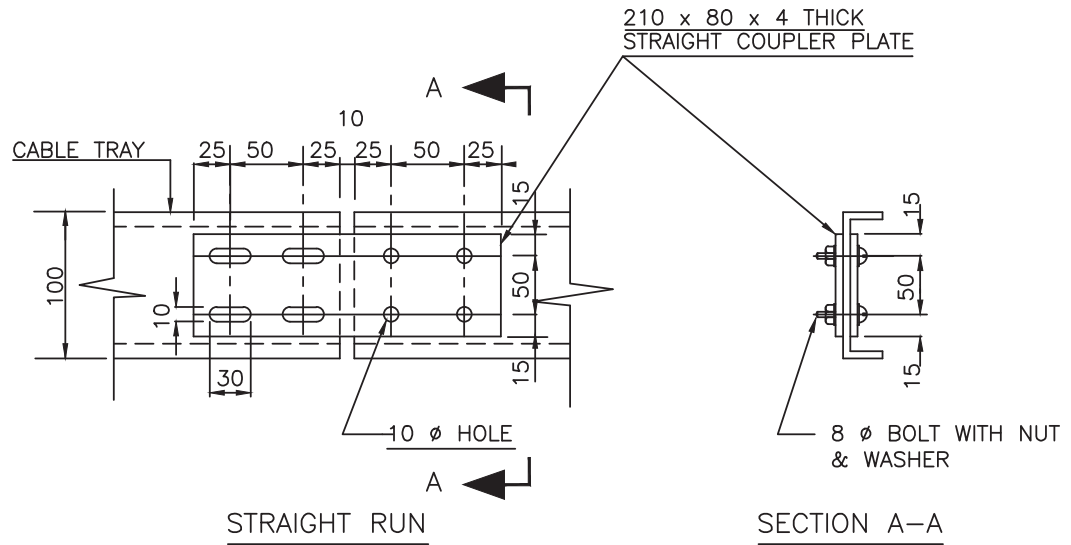


DIMENSIONS ARE IN mm.

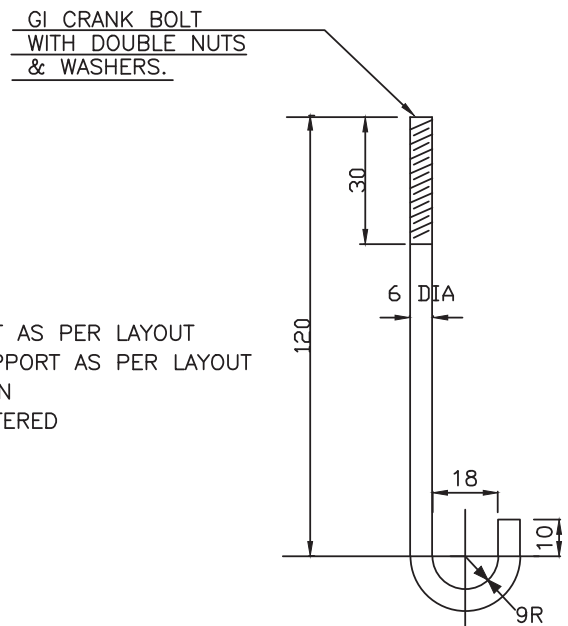
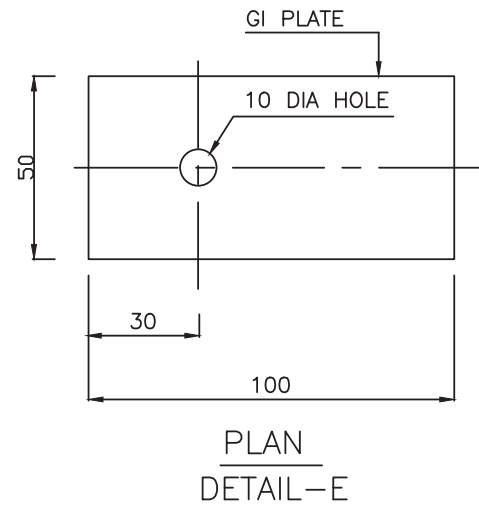
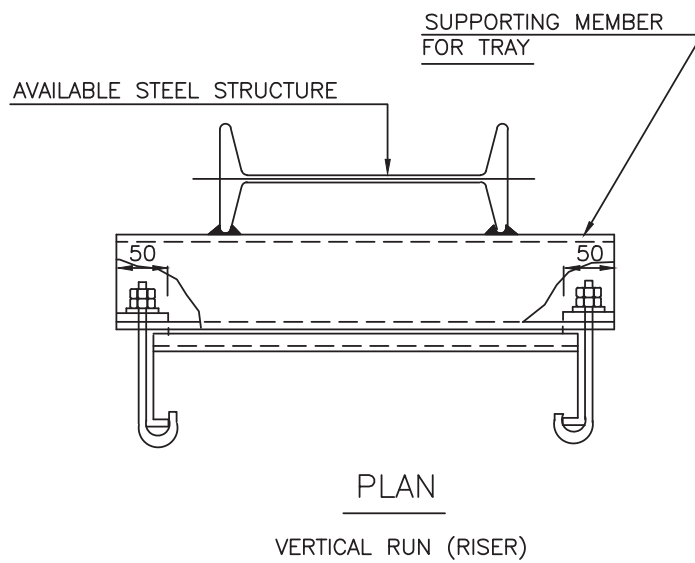
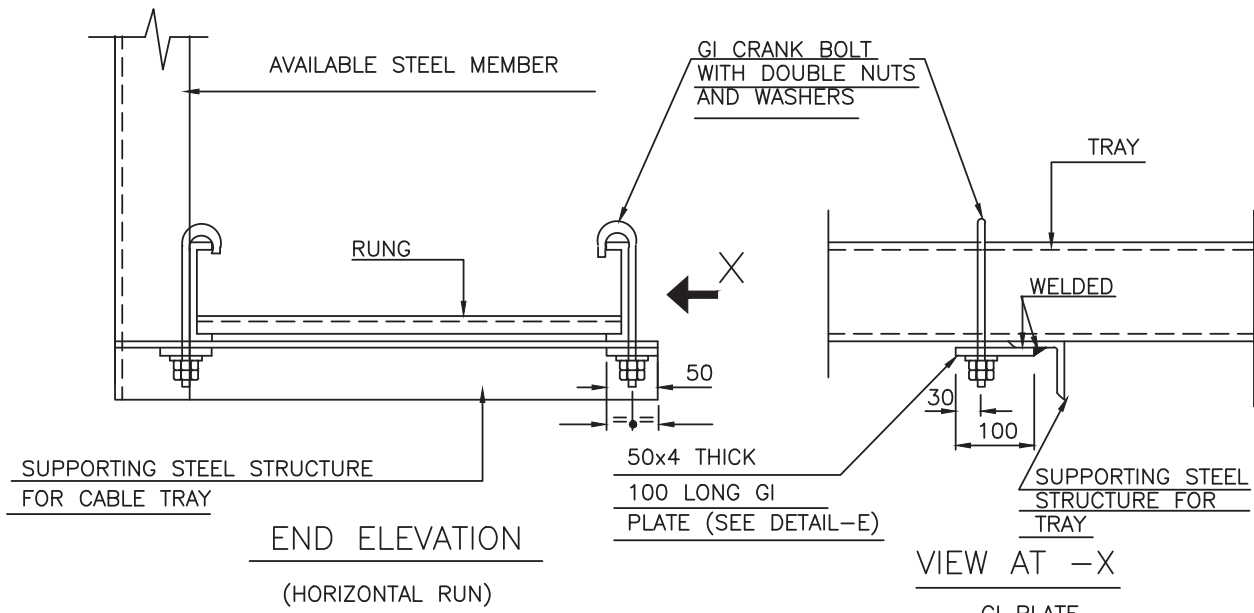


ALL DIMENSIONS ARE IN mm.



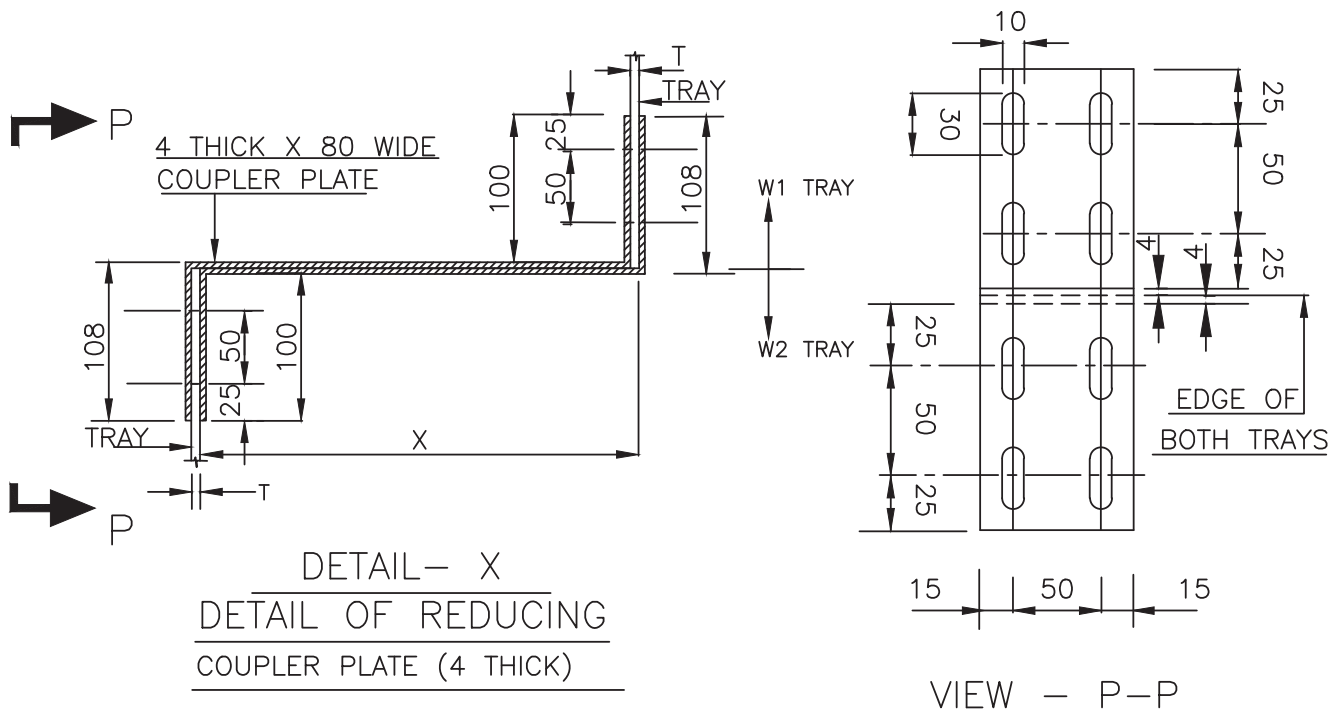
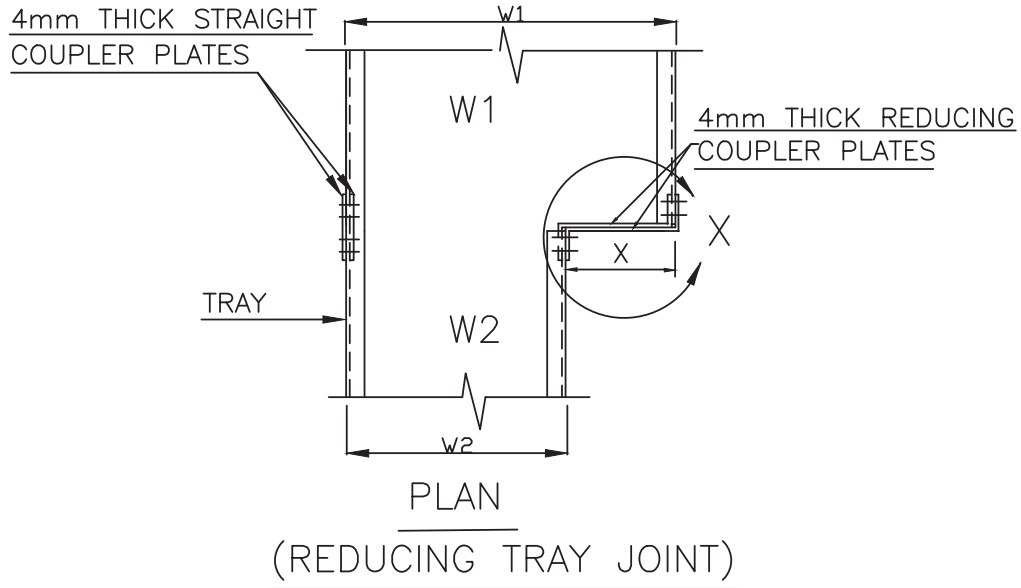


ALL DIMENSIONS ARE IN mm.



NOTES:-

1. HORIZONTAL RUN TO BE CLAMPED WITH EVERY SUPPORT AS PER LAYOUT
2. VERTICAL RUN/ RISER TO BE CLAMPED WITH EVERY SUPPORT AS PER LAYOUT
3. EACH CRANK HOOK SHALL BE SUPPLIED WITH ONE PLAIN WASHER, ONE SPRING WASHER AND TWO DOUBLE CHAMFERED HEX NUTS. THESE SHALL BE GALVANISED ITEMS.
4. ALL DIMENSIONS ARE IN mm.



ALL DIMENSIONS ARE IN mm.

SL. NO.	W1	W2	X
1	900	600	300
		450	450
		300	600
2	600	450	150
		300	300
3	450	300	150
		150	300



# GENERAL NOTES ON EARTHING AND LIGHTNING PROTECTION

PDSE: 601	0
DOCUMENT NO.	REV
SHEET 1 OF 2	

## A. GENERAL

1. EARTHING AND LIGHTNING PROTECTION SHALL BE CARRIED OUT IN ACCORDANCE WITH IS : 3043 AND IS : 2309 RESPECTIVELY AND SHALL ALSO CONFORM TO THE REQUIREMENTS OF INDIAN ELECTRICITY RULES.
2. THESE NOTES SHALL BE READ IN CONJUNCTION WITH EARTHING & LIGHTNING PROTECTION LAYOUT DRGS. AND RELEVANT EARTHING STANDARDS (PDSE)
3. THE SIZE OF EARTH CONDUCTORS & SYMBOLS SHOWN IN THE LAYOUT DRGS. SHALL AS PER PDSE: 602
4. AS FAR AS POSSIBLE, THE EARTH CONDUCTORS SHALL BE TAKEN ALONG POWER & CONTROL CABLE ROUTES.
5. EARTHING CONDUCTORS BURIED UNDER THE GROUND SHALL BE LAID ATLEAST 500 MM BELOW THE GROUND LEVEL UNLESS REQUIRED OTHERWISE, e.g FOR CROSSING ANY UNDER GROUND PIPE OR TRENCH ETC. WHERE THE EARTHING CONDUCTORS SHALL RUN AT A MINIMUM DEPTH 300 MM BELOW THE BOTTOM OF THE PIPE/TRENCH.
6. BARE ALUMINIUM CONDUCTORS SHALL NOT BE BURIED DIRECTLY UNDER THE GROUND.
7. TAPPING FROM THE UNDER GROUND EARTH GRID SHALL BE TAKEN ONLY FROM EARTH PIT OR A PIT WITHOUT ELECTRODE PROVIDED FOR THIS PURPOSE.
8. JOINTING OF UNDERGROUND EARTHING STRIPS SHALL BE AVOIDED TO THE EXTENT POSSIBLE. HOWEVER, IF JOINTING IS TO BE DONE DUE TO UNAVOIDABLE REASONS, THIS SHALL BE DONE BY ELECTRIC ARC WELDING.
9. TERMINAL JOINTING & CLAMPING ARRANGEMENT SHALL BE AS SHOWN IN PDSE:603. ALL WELDED OR BOLTED JOINTS SHALL BE PAINTED WITH EPOXY RESIN PAINT OR BITUMINOUS PAINT.
10. EARTH BUSES, AS PER CONVENIENCE, SHALL BE PROVIDED IN PLANTS FOR EARTHING GROUPS OF EQUIPMENT TO EARTHING GRID. THESE EARTH BUSES, SHALL BE AS SHOWN IN PDSE: 615.
11. DETAILS OF EARTH PIT CONNECTIONS & ACCESSORIES FOR EARTH ELECTRODES SHALL BE AS SHOWN IN PDSE :604, 605 , 610 AND 611.
12. EARTH PITS FOR EQUIPMENT EARTHING, SYSTEM NEUTRAL EARTHING & LIGHTNING PROTECTION SHALL BE SEPARATE. HOWEVER, THESE PITS SHALL BE INTERCONNECTED.
13. SPACING BETWEEN TWO EARTH PITS SHALL NOT BE LESS THAN 10 M & THESE MAY BE LOCATED ABOUT 4M AWAY FROM THE BUILDING / STRUCTURE.
14. TYPICAL ARRANGEMENT OF NEUTRAL & EQUIPMENT EARTHING SHALL BE AS SHOWN IN PDSE: 617.

## B. SYSTEM NEUTRAL EARTHING

1. THE NEUTRALS OF H.T & L.T SYSTEMS SHALL BE EARTHED BY USING 2 NOS. 150 SQ. MM ALUMINIUM CABLE OF RESPECTIVE VOLTAGE GRADE. EACH EARTH CONNECTION SHALL BE TERMINATED ON SEPERATE EARTH PITS. HOWEVER, FOR ECONOMY REASONS, 2 EARTH CONNECTIONS OF 2 DIFFERENT EQUIPMENT CAN BE TERMINATED ON THE SAME EARTH PIT AS SHOWN IN PDSE: 617.
2. THE NEUTRAL OF H.T. SYSTEM SHALL BE CONNECTED TO EARTH PIT AS ABOVE THROUGH THE NEUTRAL EARTHING RESISTOR (N.E.R.) AS REQUIRED, WHERE AS THE NEUTRAL OF L.T. SYSTEM SHALL BE SOLIDLY EARTHED THROUGH RESPECTIVE L.T. SWITCH BOARD.
3. FOR D.C. SYSTEM, POSITIVE POLE SHALL BE EARTHED THROUGH HIGH IMPEDANCE IN BATTERY CHARGER.

## C. ELECTRICAL EQUIPMENT EARTHING

1. ALL EQUIPMENT RATED ABOVE 250V SHALL HAVE TWO EXTERNAL EARTH CONNECTIONS & THOSE RATED 250V & BELOW SHALL HAVE ONE EXTERNAL EARTH CONNECTION.  
FLAME PROOF EQUIPMENT, IN ADDITION, SHALL HAVE ONE INTERNAL EARTH CONNECTION THROUGH ADDITIONAL CORE OF POWER / CONTROL CABLE.

0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION			
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD



# GENERAL NOTES ON EARTHING AND LIGHTNING PROTECTION

PDSE: 601	0
DOCUMENT NO.	REV
SHEET 2 OF 2	

2. EARTHING CONNECTION TO INDIVIDUAL EQUIPMENT SHALL BE TAPPED ONLY FROM THE EARTHING GRID / RING OR EARTH BUS EXCEPT FOR EQUIPMENT RATED 250V & BELOW, FOR WHICH THE CONNECTION MAY BE TAKEN FROM THE NEAR BY EARTH CONDUCTOR OF A LARGER EQUIPMENT OR FROM THE BODY OF THE LARGER EQPT.
3. EARTHING ARRANGEMENT OF MOTOR AND ASSOCIATED LOCAL CONTROL STATION SHALL BE AS SHOWN IN PDSE: 608.
4. EARTHING ARRANGEMENT OF RAILS SHALL BE AS SHOWN IN PDSE: 609 WITH BOTH ENDS EARTHED.
5. CABLES RACKS/RISERS/TRAYS SHALL BE ELECTRICALLY CONTINUOUS BY BONDING THE JOINTS BETWEEN THE RUNNER MEMBERS OF THE ADJACENT SECTIONS. THE CABLE RACKS SHALL BE CONNECTED TO THE EARTHING GRID AT SUITABLE INTERVALS.
6. EARTHING ARRANGEMENT OF LIGHTING FIXTURES & PLUG SOCKETS RATED 250V AND BELOW SHALL NOT BE SHOWN IN THE EARTHING LAYOUT DRGS. HOWEVER, PLUG SOCKETS SHALL BE EARTHED BY 10 SWG SIZE G.I./AL. CONDUCTOR TAKEN FROM THE NEAREST EARTHING GRID/CONDUCTOR AND LIGHTING FIXTURES SHALL BE PROVIDED EARTHING THROUGH CABLE ARMOURS.
7. IN SWITCH YARD AND GENERATING STATIONS SUITABLE EARTHING MAT SHALL BE PROVIDED TO REDUCE THE VALUE OF STEP/TOUCH POTENTIAL TO PERMISSIBLE VALUE.
8. SWITCH YARD FENCE SHALL BE CONNECTED TO EARTH AT A REGULAR INTERVAL, NOT EXCEEDING 10 M.

### D. STATIC EARTHING

1. ALL PROCESS EQUIPMENT WHICH ARE LIKELY TO GET STATICALLY CHARGED, e.g. STORAGE TANKS, HIGH PRESSURE & MEDIUM PRESSURE VESSELS/PIPES, HIGH PRESSURE COMPRESSORS, HIGH PRESSURE STEAM EJECTORS ETC. SHALL BE EARTHED AGAINST STATIC CHARGE ACCUMULATION.
2. EARTHING ARRANGEMENT ACROSS PIPE JOINTS/VALVES SHALL BE AS SHOWN IN PDSE: 612
3. DETAILS OF EARTHING OF VESSELS SHALL BE AS SHOWN IN PDSE: 613.
4. MOBILE EQUIPMENT, REQUIRING EARTHING AGAINST STATIC CHARGE, SHALL BE TEMPORARILY EARTHED AS SHOWN IN PDSE: 608.
5. PIPE TRESTLE CARRYING PIPES WITH HYDRO CARBONS SHALL BE CONNECTED TO EARTH GRID AT REGULAR INTERVALS, NOT EXCEEDING 25 M.
6. WHEREVER PROCESS EQUIPMENT ARE MOUNTED ON STEEL STRUCTURE, THE BASE OF THE STRUCTURES SHALL BE EARTHED INSTEAD OF EARTHING THE INDIVIDUAL EQUIPMENT.

### E. LIGHTNING PROTECTION

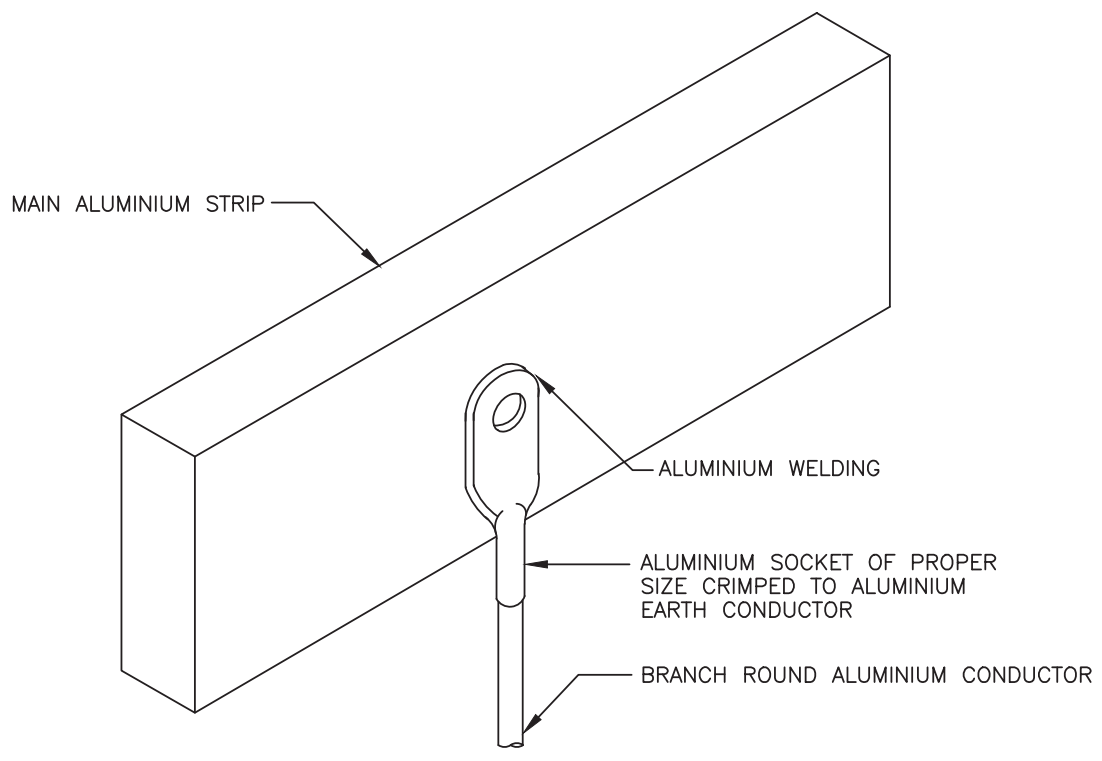
1. FIXING ARRANGEMENT ON AIR TERMINATION AND ROOF/DOWN CONDUCTOR FOR LIGHTNING PROTECTION SYSTEM SHALL BE AS SHOWN IN PDSE: 614.
2. FOR LIGHTNING PROTECTION OF TALL STEEL STRUCTURES/VESSELS/TANKS, DOWN CONDUCTOR SHALL BE TAKEN FROM THE BASE AND CONNECTED TO EARTH PITS. AIR TERMINATION ROD SHALL NOT BE REQUIRED.
3. LIFT SHAFT SHALL NOT BE USED FOR FIXING THE DOWN CONDUCTOR.
4. IN CASE EARTH PITS FOR CONNECTING THE DOWN CONDUCTORS ARE NOT AVAILABLE IN THE BEGINNING OF FABRICATION/ERECTION OF SUCH STRUCTURES/VESSELS / TANKS. THEIR BASES SHALL TEMPORARILY BE CONNECTED TO NEAR BY STEEL COLUMN. ELECTRICAL CONTINUITY OF THE STRUCTURES, HOWEVER, SHALL BE CHECKED AND ENSURED.
5. FOR ALL HIGH RISE CONCRETE STRUCTURES, TEMPORARY LIGHTNING PROTECTION NEED BE PROVIDED DURING CONSTRUCTION AND MAINTAINED TILL PERMANENT LIGHTNING PROTECTION IS INSTALLED. FOR THIS PURPOSE THE VERTICAL REINFORCEMENT, PROJECTING OVER EACH LIFT, SHALL BE CONNECTED TO EARTH PITS BY MEANS OF 2 NOS. FLEXIBLE COPPER CONDUCTOR CABLES. EACH OF THE FLEXIBLE CABLE SHALL BE OF 95 Sq. mm SIZE HAVING ONE END PERMANENTLY CONNECTED TO EARTH PIT AND OTHER END PROVIDED WITH A CLAMP FOR CONNECTING TO THE EXPOSED REINFORCEMENT.

0	03.01.07	15.01.07	ISSUED FOR IMPLEMENTATION	<i>WSD</i> NKR	<i>Amur</i> AV	<i>RS</i> BB
REV	REV.DATE	EFF.DATE	PURPOSE	PREPD	REVWD	APPD

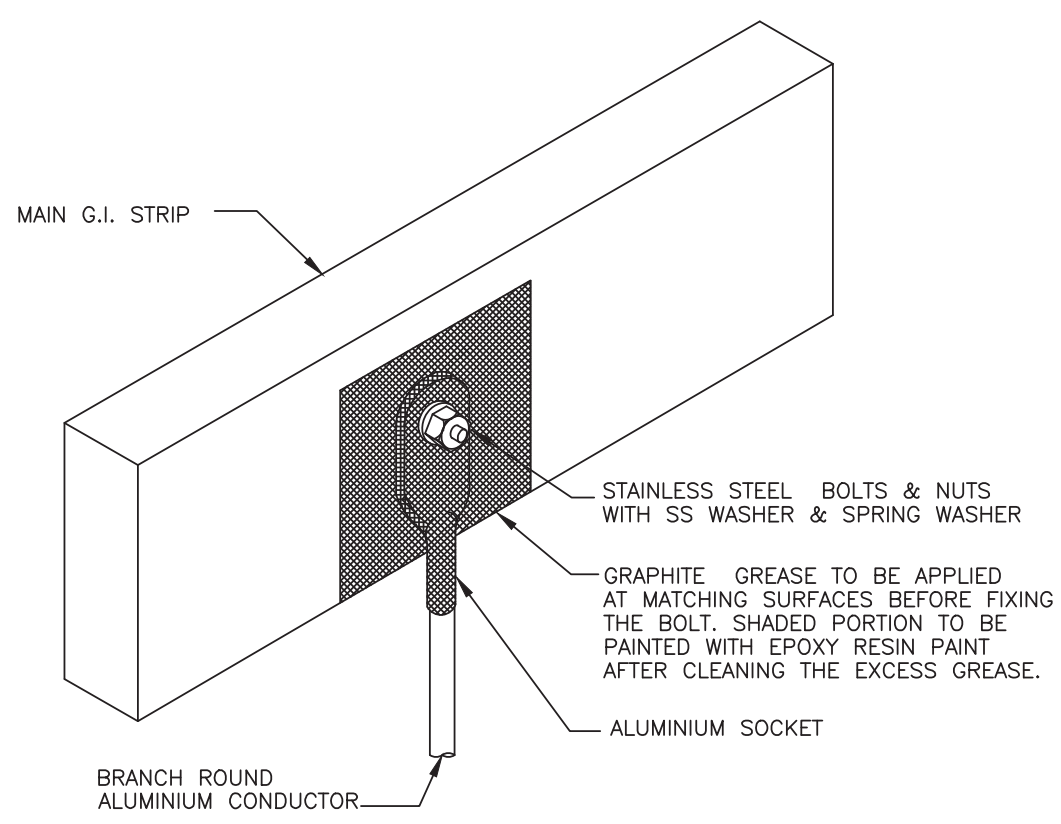
SL. No.	EQUIPMENT TO BE EARTHED	FAULT LEVEL (MVA)	G.I. STRIPS/WIRES		ALUMINIUM			REMARKS			
			MIN. SIZE (mm <sup>2</sup> )	SIZE TO BE USED (mm <sup>2</sup> )	SYMBOL	MIN. SIZE (mm <sup>2</sup> )	STRIPS/WIRES SIZE TO BE USED (mm <sup>2</sup> )		SYMBOL		
1A.	FOR PLANTS HAVING SWITCHYARDS/ GENERATING STATION										
I.	SWITCH YARD EQUIPMENT, GENERATORS, H.T. SWITCH BOARDS, TRANSFORMERS, MAIN EARTHING GRID, CONNECTION FROM EARTH BUS TO EARTHING GRID.	750 AT 11KV	706	2-50x8	2	491	2-38.1x6.35=484	2	500	21	AS PER CLAUSE 17.3.2 OF IS:3043
II.	SWITCH YARD EQUIPMENT, GENERATORS, H.T. SWITCH BOARDS, TRANSFORMERS, MAIN EARTHING GRID, CONNECTION FROM EARTH BUS TO EARTHING GRID.	500 AT 11KV 300 AT 6.6KV 150 AT 3.3KV	471	60x8	1	328	50.8x6.35=323	11	400	22	-D0-
III.	SWITCH YARD EQUIPMENT, GENERATORS, H.T. SWITCH BOARDS, TRANSFORMERS, MAIN EARTHING GRID, CONNECTION FROM EARTH BUS TO EARTHING GRID.	250 AT 6.6KV 125 AT 3.3KV	392	50x8	2	272	50.8x6.35=323	11	300	23	-D0-
IV.	SWITCH YARD EQUIPMENT, GENERATORS, H.T. SWITCH BOARDS, TRANSFORMERS, MAIN EARTHING GRID, CONNECTION FROM EARTH BUS TO EARTHING GRID.	350 AT 11KV 200 AT 6.6KV 100 AT 3.3KV	330 314 314	50x8	2	229 218 218	38.1x6.35=242	12	240	24	-D0-
V.	SWITCH YARD EQUIPMENT, GENERATORS, H.T. SWITCH BOARDS, TRANSFORMERS, MAIN EARTHING GRID, CONNECTION FROM EARTH BUS TO EARTHING GRID.	250 AT 11KV 150 AT 6.6KV 75 AT 3.3KV	235	50x6	3	163	31.75x4.78=152	13	185	25	-D0-
1B	FOR PLANTS WITHOUT SW. YARD/GENERATING STN. H.T. SWITCH BOARDS, TRANSFORMERS, MAIN EARTHING GRID, CONNECTION FROM EARTH BUS TO EARTHING GRID.	ANY FAULT LEVEL AT ANY VOLTAGE	210	50x6	3	120	38.1x3.18=121	14	120	27	AS PER CLAUSE 12.3.2 OF IS:3043
1C	ALL M.V. SWITCH BOARDS		210	50x6	3	120	38.1x3.18=121	14	120	27	AS PER CLAUSE 12.3.2 OF IS:3043
2	H.V. MOTORS		210	50x6	3	120	38.1x3.18=121	14	120	27	-D0-
3	TRANSFORMER NEUTRALS		-	-	-	120	-	-	150	26	-
4	M.V. MOTORS RATED 75KW & ABOVE		210	50x6	3	120	38.1x3.18=121	14	120	27	AS PER CLAUSE 12.3.2 OF IS:3043
5	M.V. MOTORS ABOVE 30KW & LESS THAN 75KW		175	35x6	4	93	31.75x3.18=101	15	95	28	-D0-

SL. No.	EQUIPMENT TO BE EARTHED	FAULT LEVEL (MVA)	G.I. STRIPS/WIRES		ALUMINIUM STRIPS/WIRES			REMARKS			
			MIN. SIZE (mm <sup>2</sup> )	SIZE TO BE USED (mm <sup>2</sup> )	SYMBOL	MIN. SIZE (mm <sup>2</sup> )	SIZE TO BE USED (mm <sup>2</sup> )		SYMBOL		
6	M.V.MOTORS ABOVE 5.5KW & LESS THAN 30KW 63A SW.SOCKETS,BATTERY CHARGERS,LIGHTING SUB-DIST.BDS.,D.C.BDS.		44	25x6	5	25	2 SWG=38.6	17	25	29	AS PER CLAUSE 12.3.2 OF IS:3043
7	M.V.MOTORS RATED 5.5KW & BELOW		7	8 SWG=13	6	5	10 SWG=8.3	18	6	30	-D0-
8	ALL MINOR EQUIPMENT RATED FOR 250V & BELOW		-	10 SWG=8.3	7	-	10 SWG=8.3	18	6	30	
9	NON ELECTRICAL EQUIPMENT,SUCH AS VESSELS STRUCTURES IN HAZARDOUS AREA & LIGHTNING PROTECTION CONDUCTORS		32x6	35x6	4	-	25.4x3.18=81	16	-	-	AS PER IS:2309

NOTE :--EARTHING CONDUCTOR SIZES FOR ITEMS AT SL.No.4,5,6 & 7 SHOULD BE CHOSEN AS HALF THE POWER CABLE SIZES ACTUALLY USED.

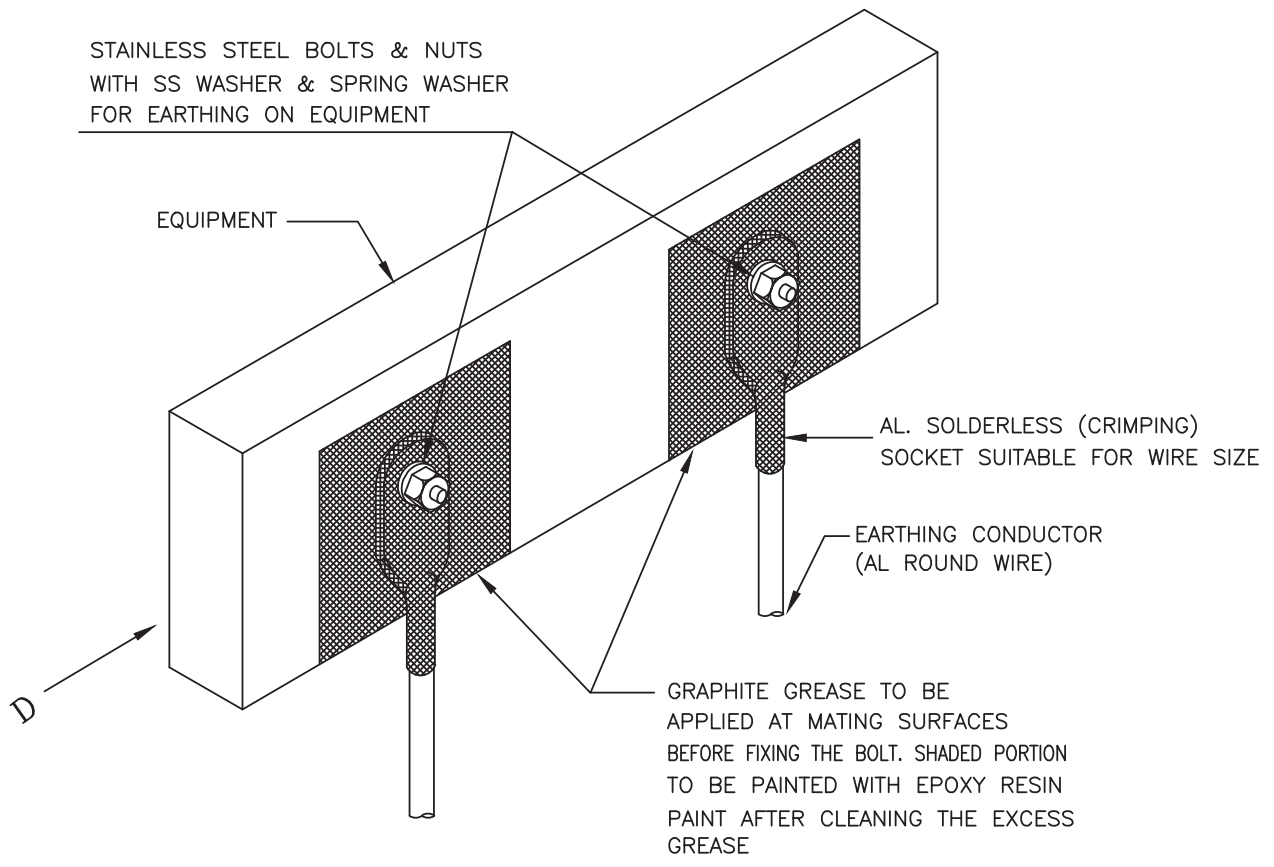


' T ' JOINT ALUMINIUM STRIP TO ROUND ALUMINIUM CONDUCTOR

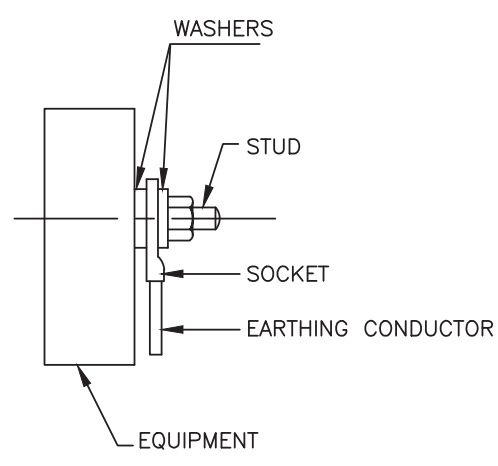


' T ' JOINT G.I. STRIP TO ROUND ALUMINIUM CONDUCTOR

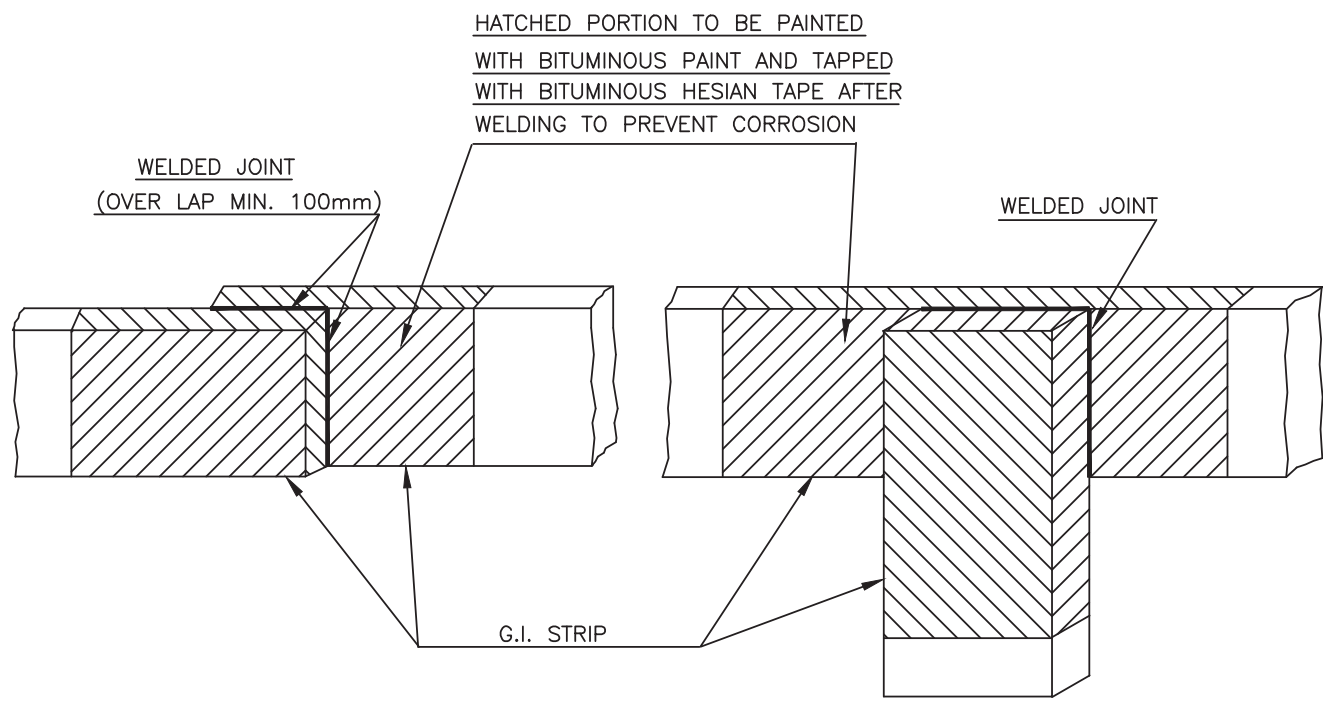




ARRANGEMENT OF DOUBLE EARTH CONNECTIONS TO EQUIPMENT

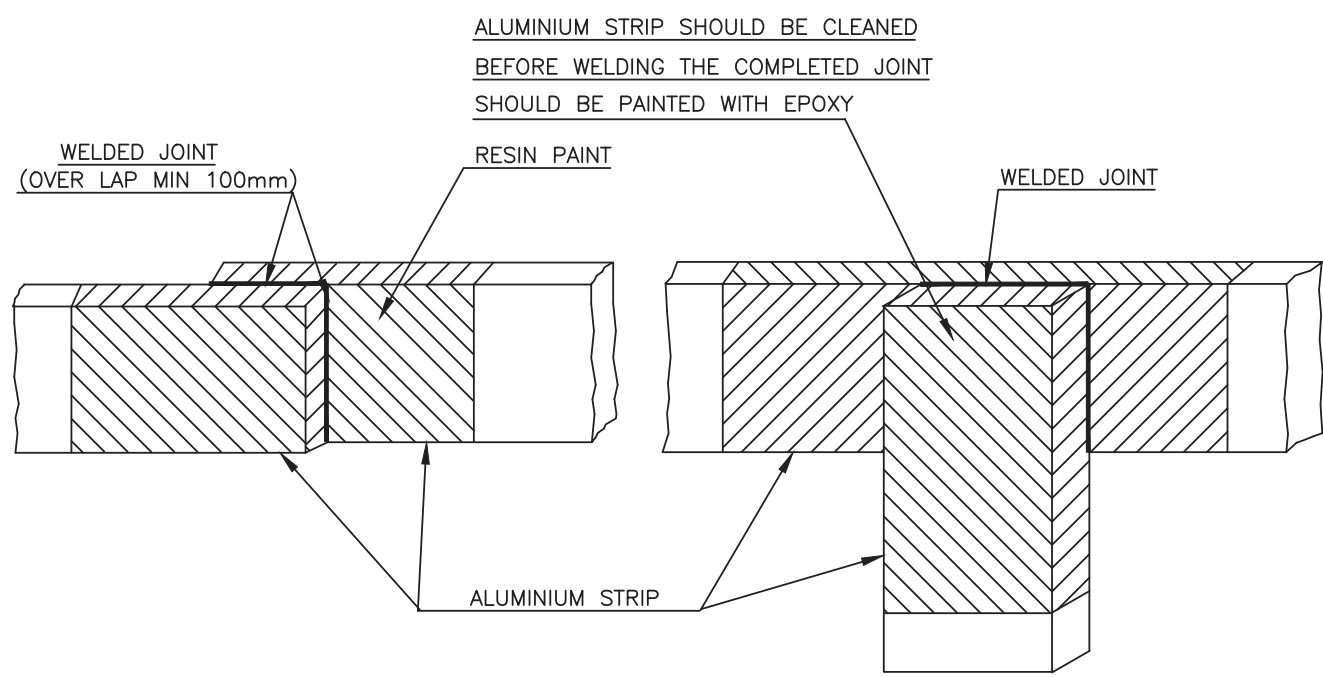


V I E W F R O M - D



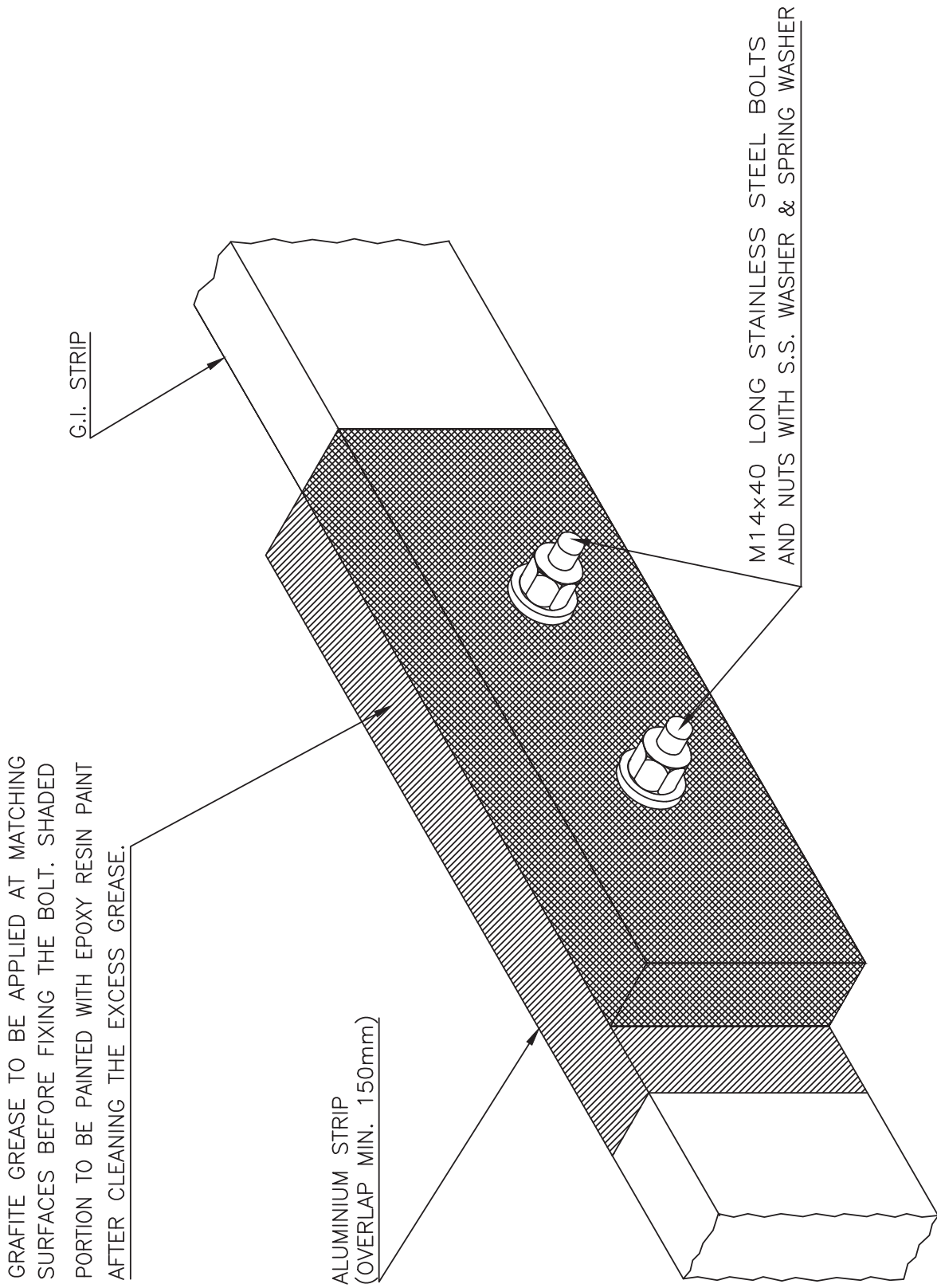
STRAIGHT JOINT G.I TO G.I. STRIP

" T " JOINT G.I. TO G.I. STRIP



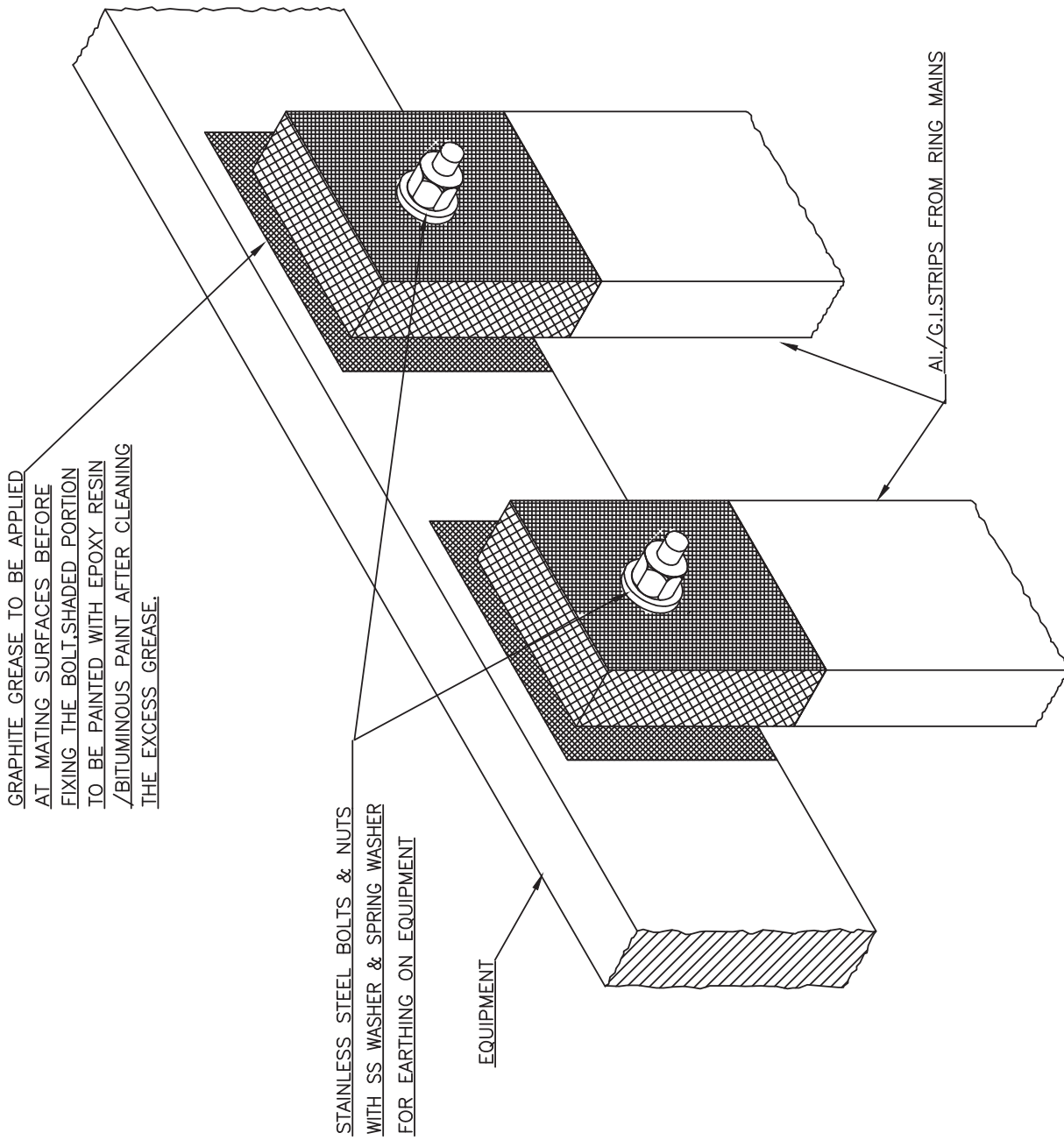
STRAIGHT JOINT AL. TO AL. STRIP

" T " JOINT AL TO AL STRIP



ARRANGEMENT OF LAP JOINT BETWEEN

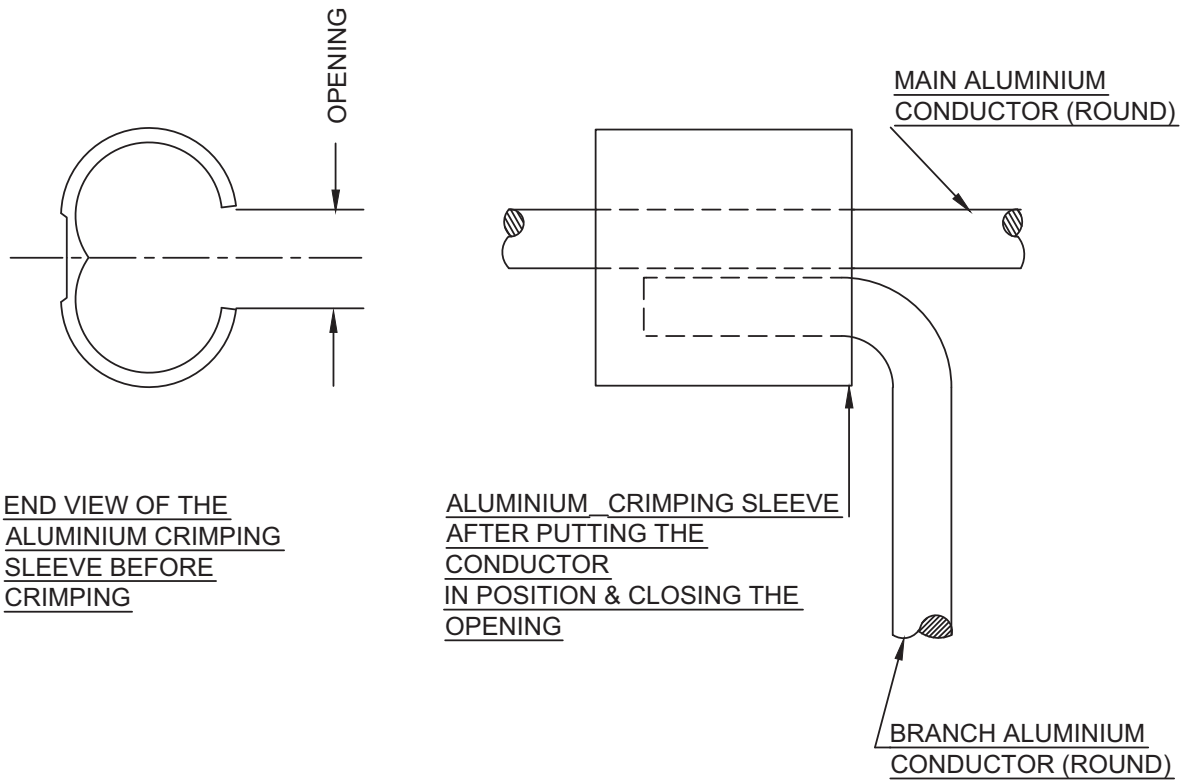
AL. EARTH STRIP TO G.I. EARTH STRIP



ARRANGEMENT OF DOUBLE EARTH CONNECTION ON EQUIPMENT

NOTE:-

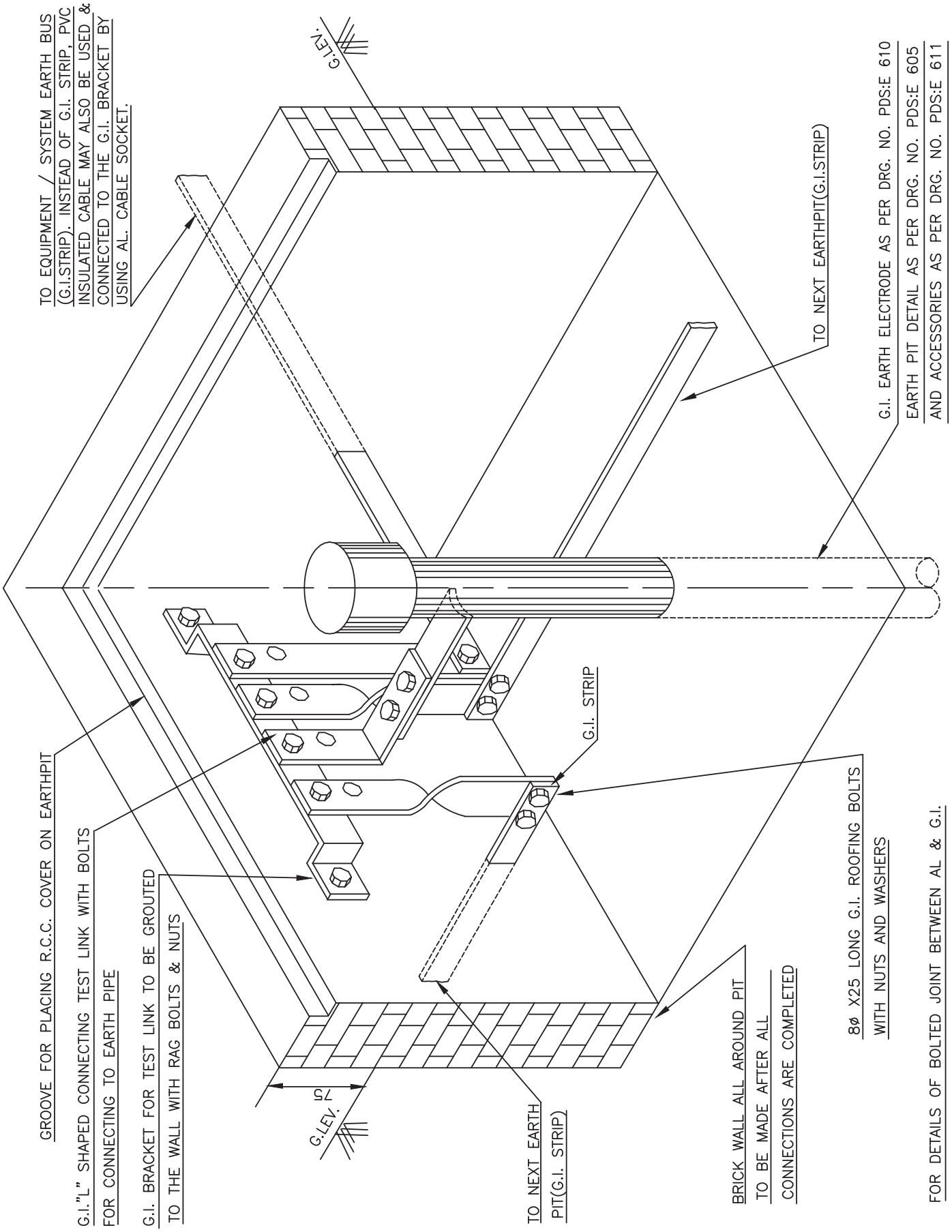
EPOXY RESIN PAINT SHALL BE USED FOR AL STRIP AND BITUMINOUS PAINT FOR G.I.STRIP.



"T" JOINT ROUND ALUMINIUM CONDUCTOR TO ROUND ALUMINIUM CONDUCTOR ( CRIMPING TYPE )

NOTE :-

USE CORRECT SIZE OF COMPRESSION DIES.



GROOVE FOR PLACING R.C.C. COVER ON EARTH PIT

G.I. "L" SHAPED CONNECTING TEST LINK WITH BOLTS FOR CONNECTING TO EARTH PIPE

G.I. BRACKET FOR TEST LINK TO BE GROUTED TO THE WALL WITH RAG BOLTS & NUTS

12"  
G.LEV.

TO NEXT EARTH PIT (G.I. STRIP)

G.I. STRIP

BRICK WALL ALL AROUND PIT TO BE MADE AFTER ALL CONNECTIONS ARE COMPLETED

8φ X25 LONG G.I. ROOFING BOLTS WITH NUTS AND WASHERS

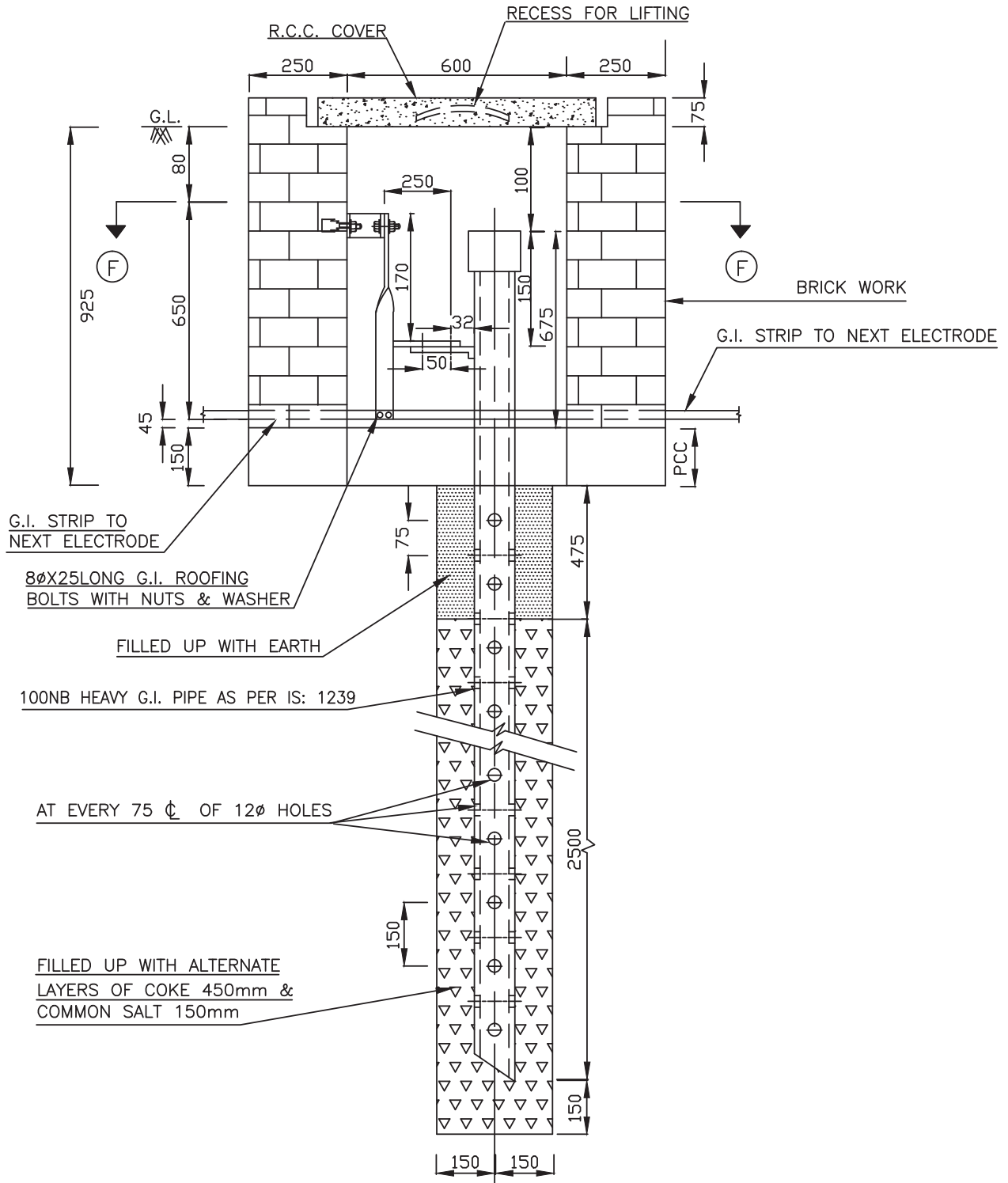
FOR DETAILS OF BOLTED JOINT BETWEEN AL & G.I.

REFER PDS:E 603 (SHEET 4 OF 6)

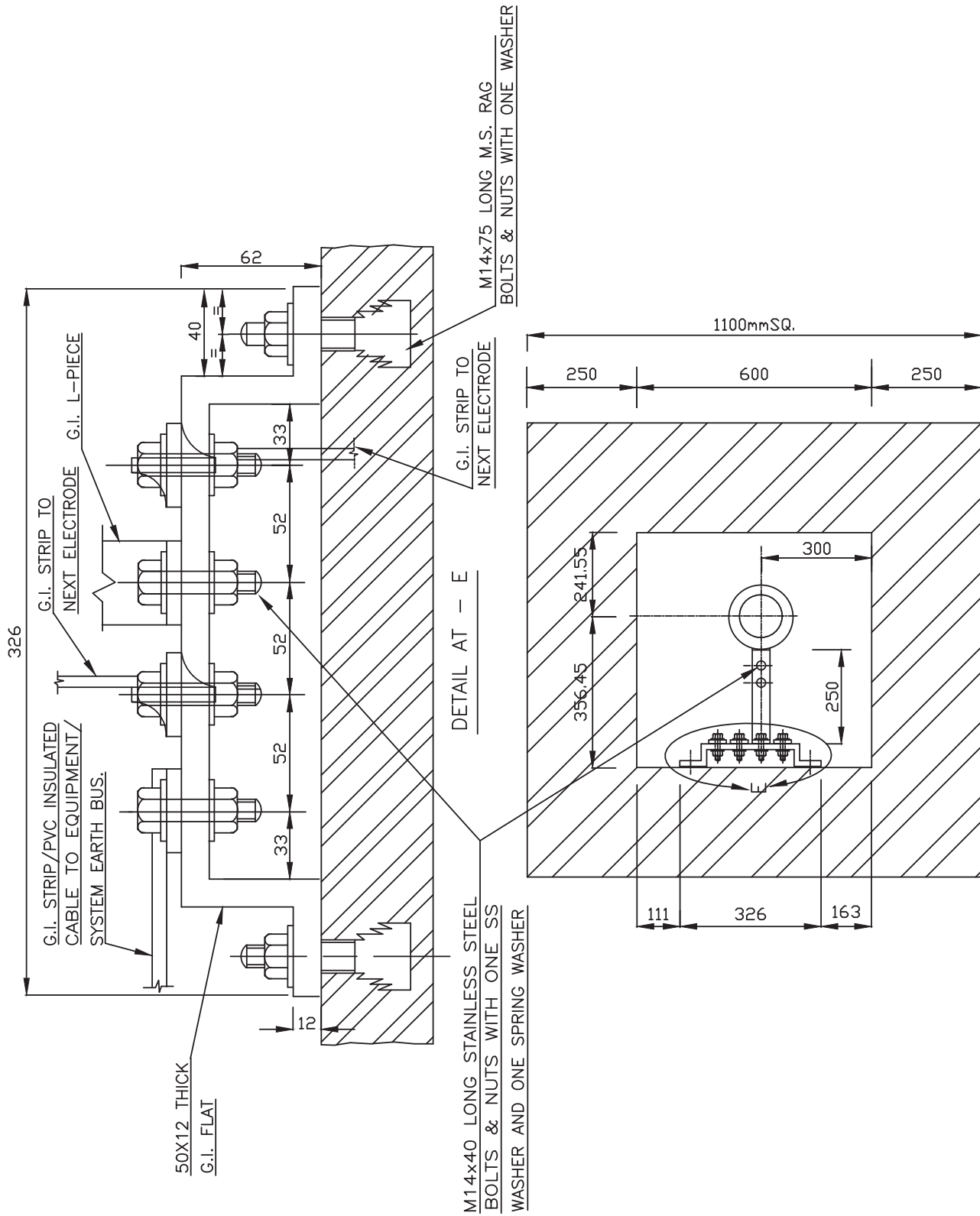
TO EQUIPMENT / SYSTEM EARTH BUS (G.I. STRIP). INSTEAD OF G.I. STRIP, PVC INSULATED CABLE MAY ALSO BE USED & CONNECTED TO THE G.I. BRACKET BY USING AL. CABLE SOCKET.

TO NEXT EARTH PIT (G.I. STRIP)

G.I. EARTH ELECTRODE AS PER DRG. NO. PDS:E 610  
EARTH PIT DETAIL AS PER DRG. NO. PDS:E 605  
AND ACCESSORIES AS PER DRG. NO. PDS:E 611



SECTIONAL ELEVATION OF EARTH PIT





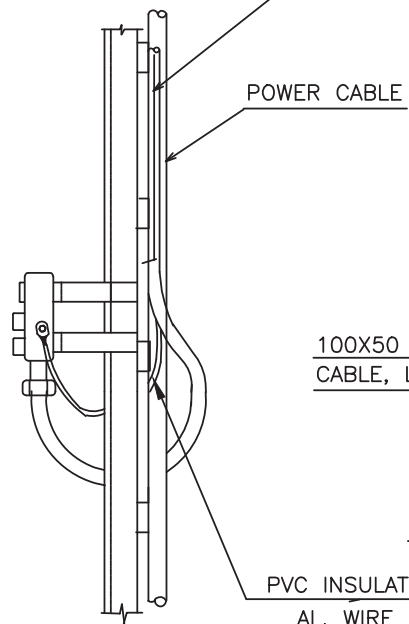
PVC INSULATED CONDUCTOR/ G.I.WIRE/  
AL. WIRE FOR EARTHING OF MOTOR

2 NOS. EARTHING CONDUCTORS

POWER CABLE

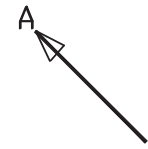
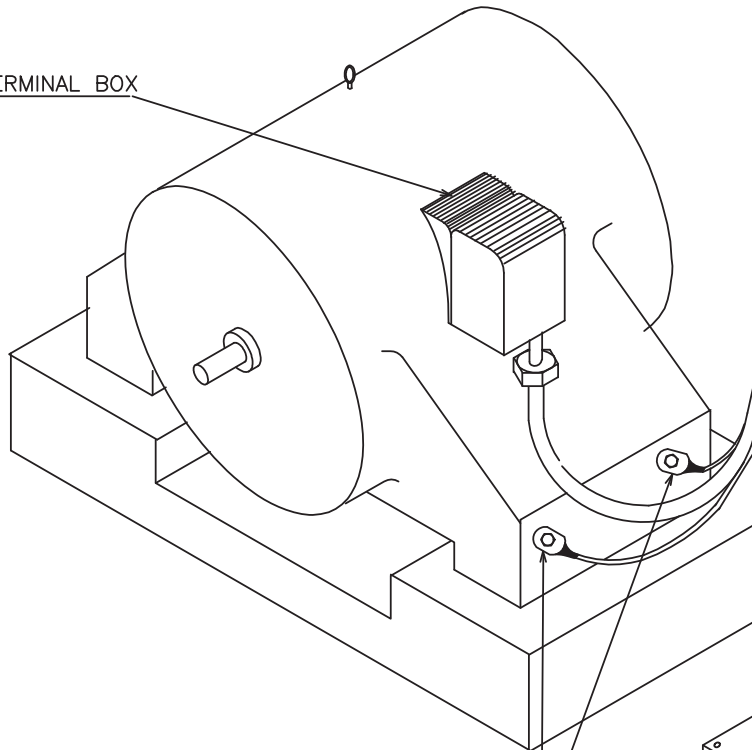
CONTROL CABLE

CABLE CLAMPING  
ARRANGEMENT



VIEW AT-A

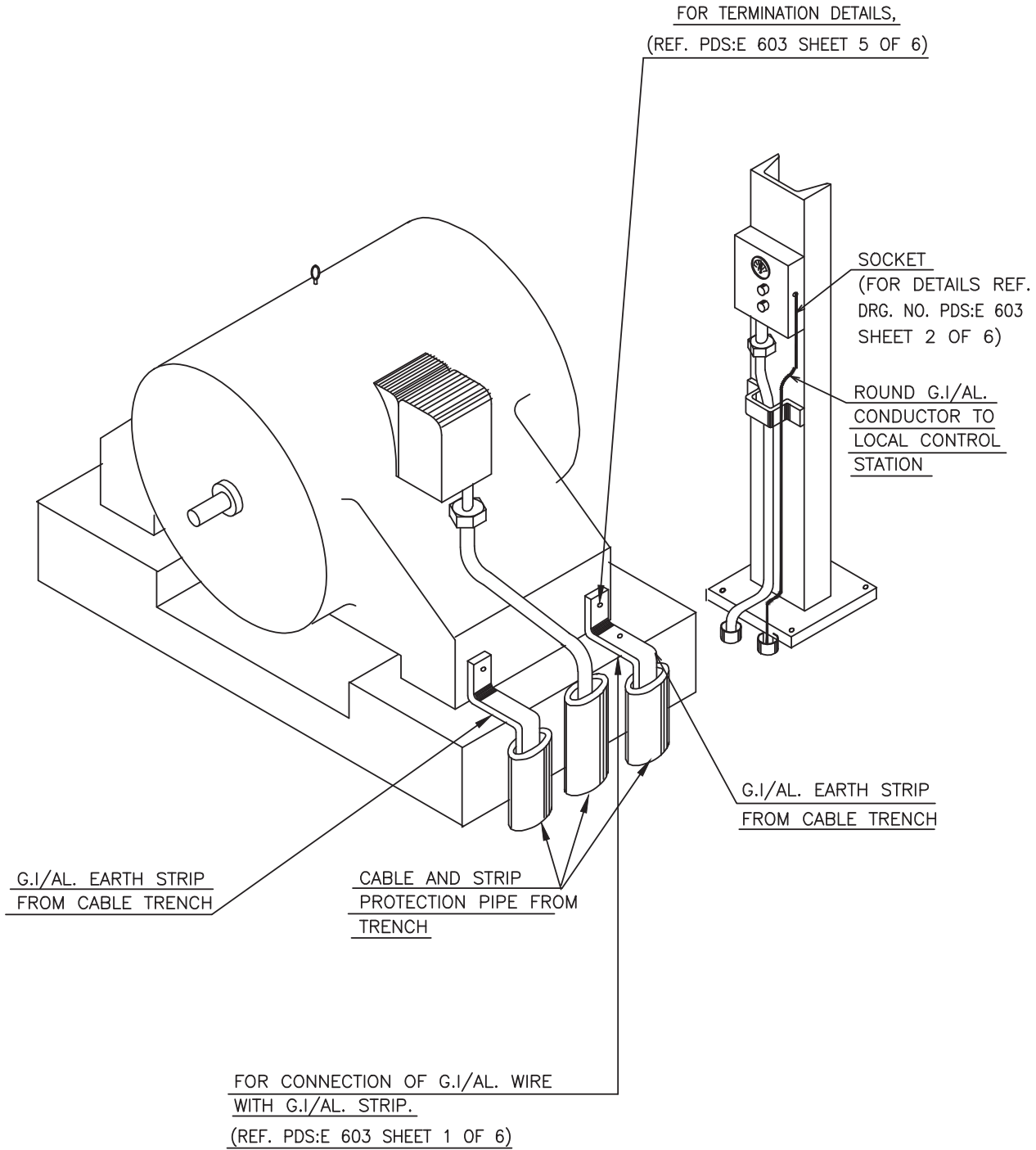
MOTOR TERMINAL BOX

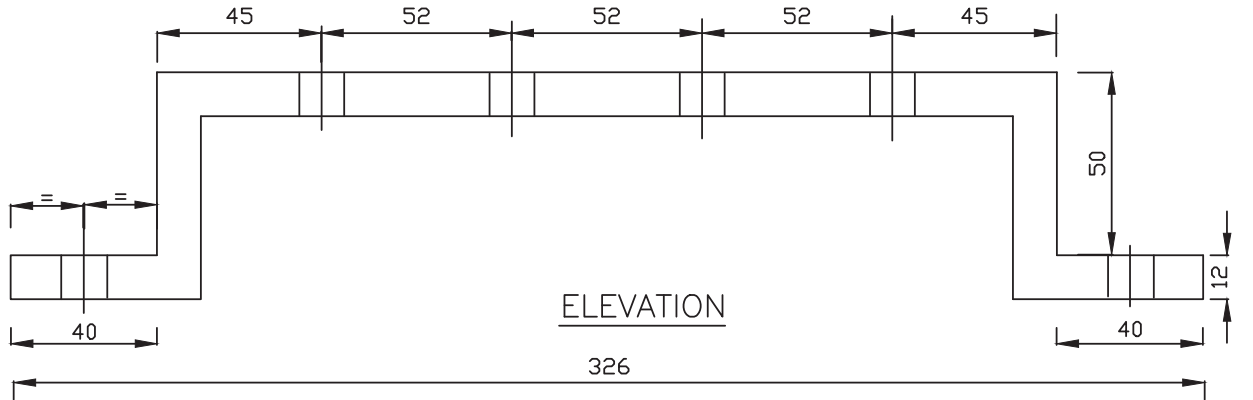


RUBBER BUSHING

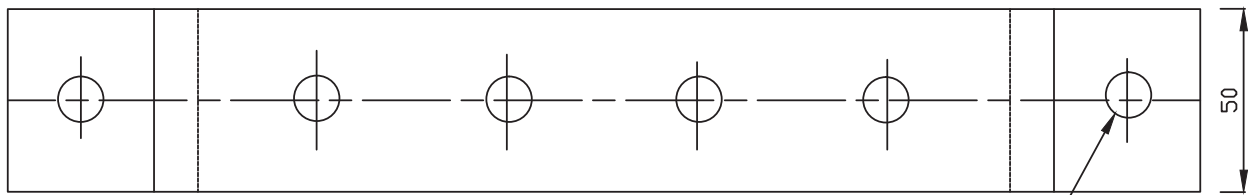
50X6 FLATS WELDED TO  
THE CHANNEL @ 300  
INTERVAL

200x200x10 THCK PLATE  
GROUTED FLUSHING WITH  
FINISH FLOOR LEVEL





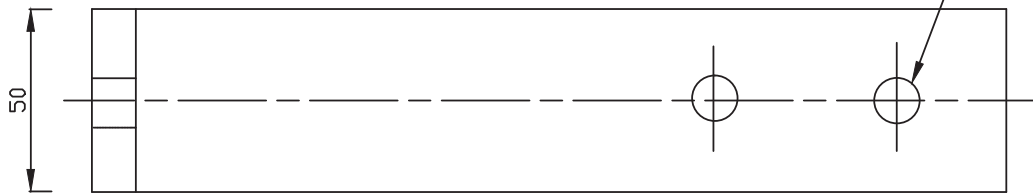
ELEVATION



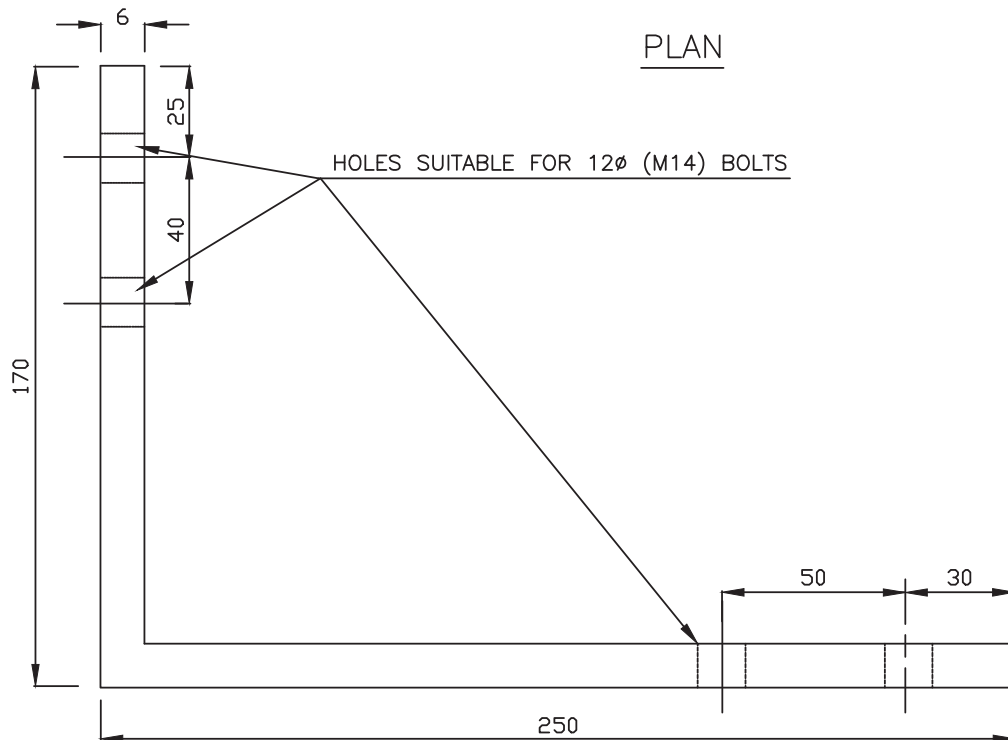
PLAN

G.I. TEST LINK

HOLES SUITABLE FOR 12 $\phi$  (M14) BOLTS

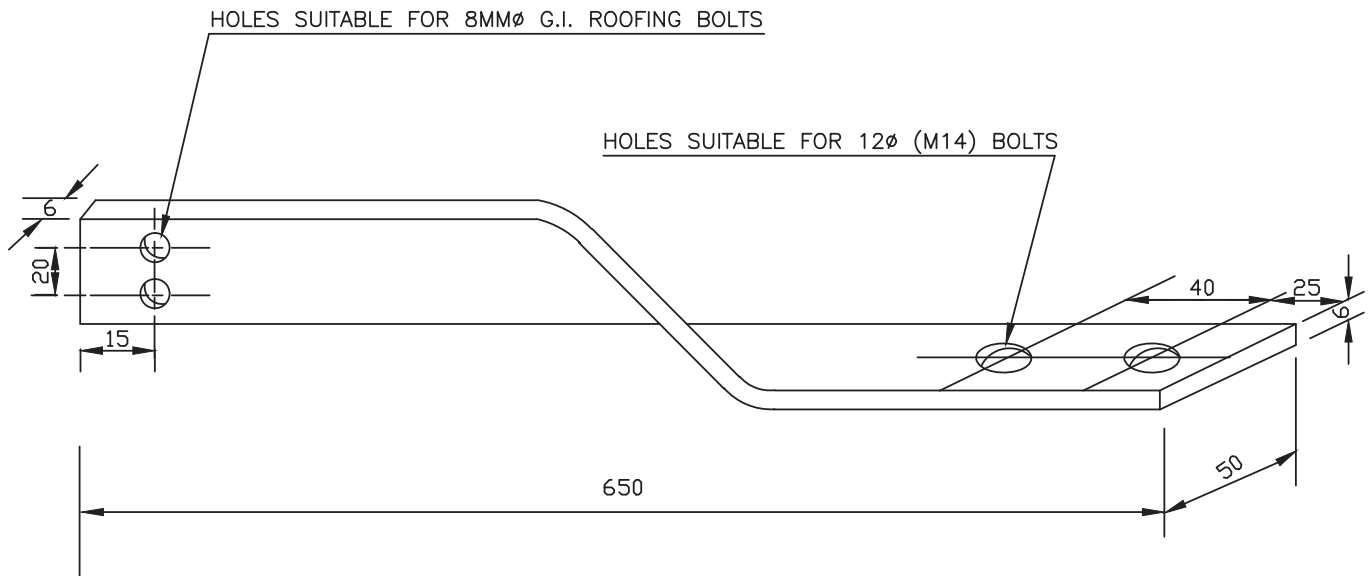


PLAN

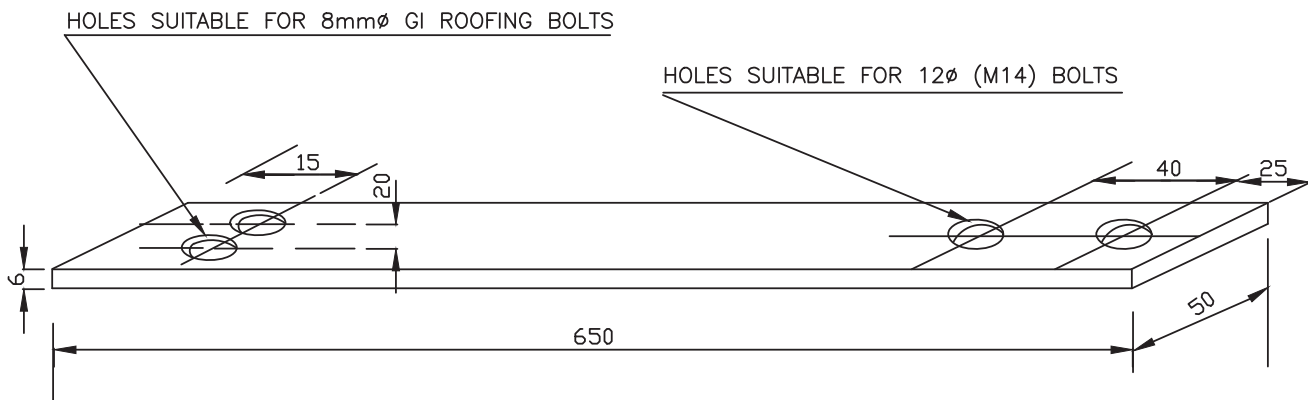


ELEVATION

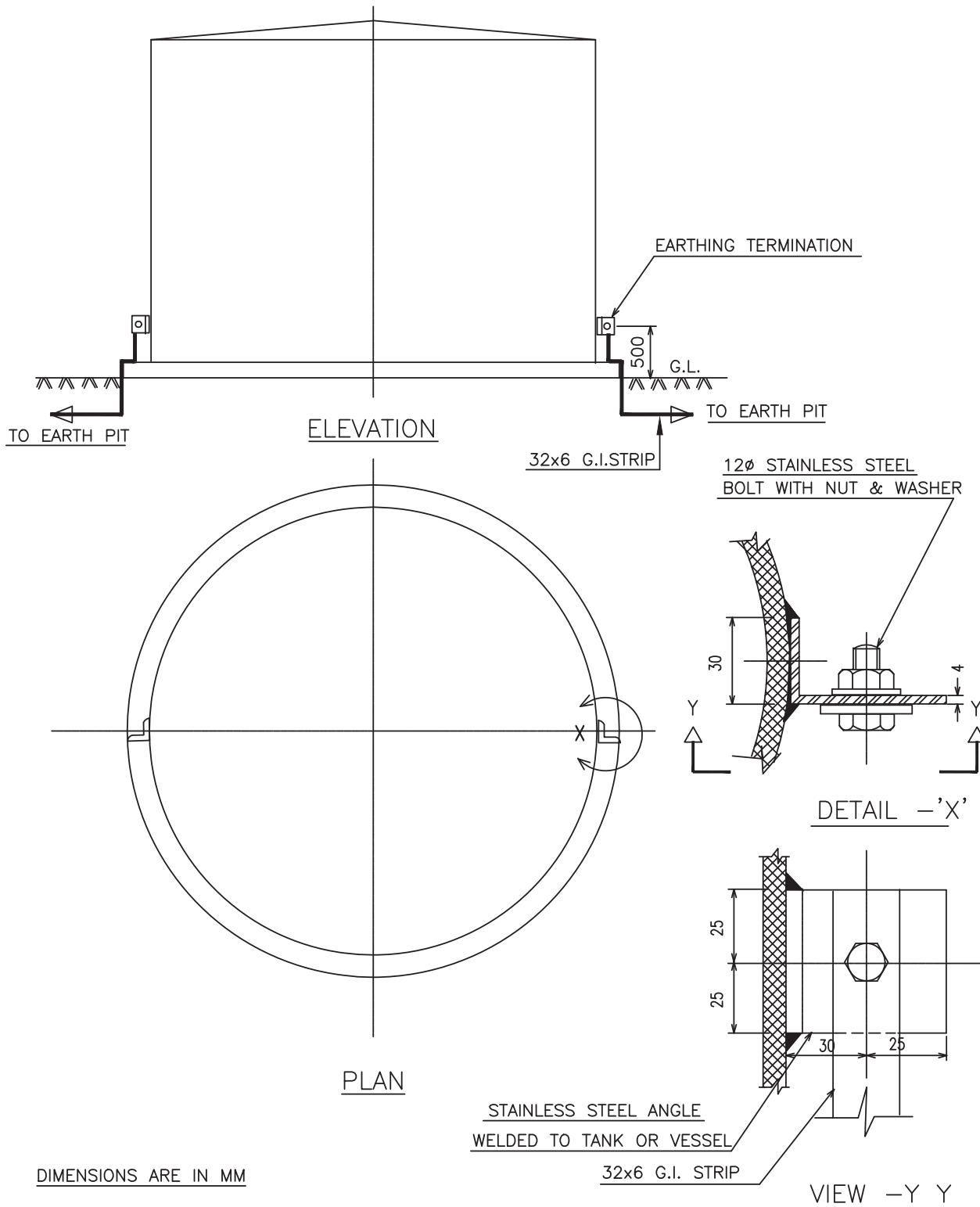
G.I. 'L' PIECE



CONNECTING TWISTED ALUMINIUM FLAT PIECE

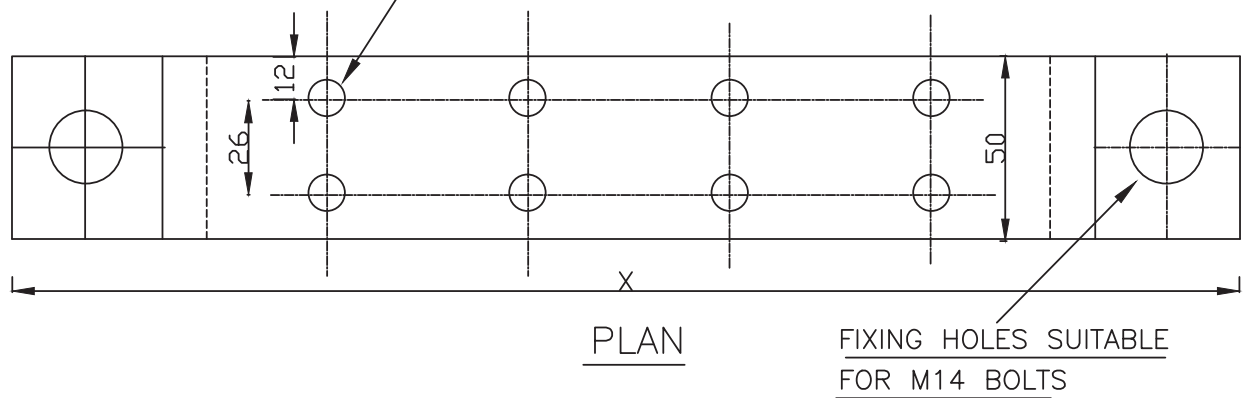
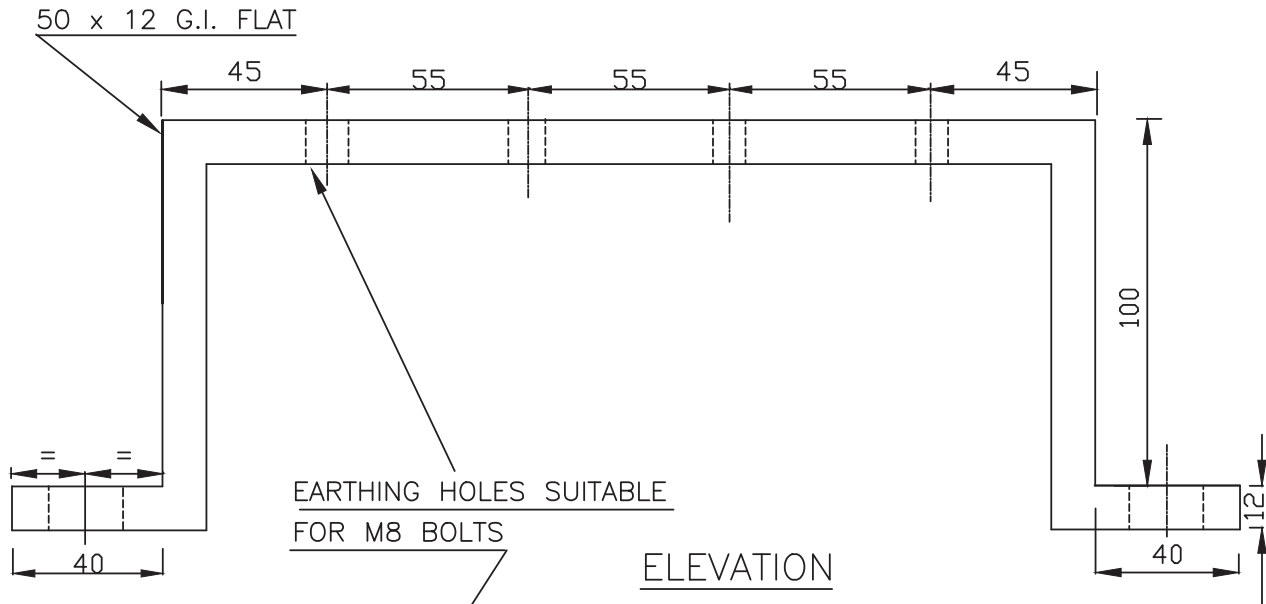


CONNECTING ALUMINIUM / G.I. FLAT PIECE



THE NO. OF EARTH CONDUCTOR SHALL BE AS FOLLOWS

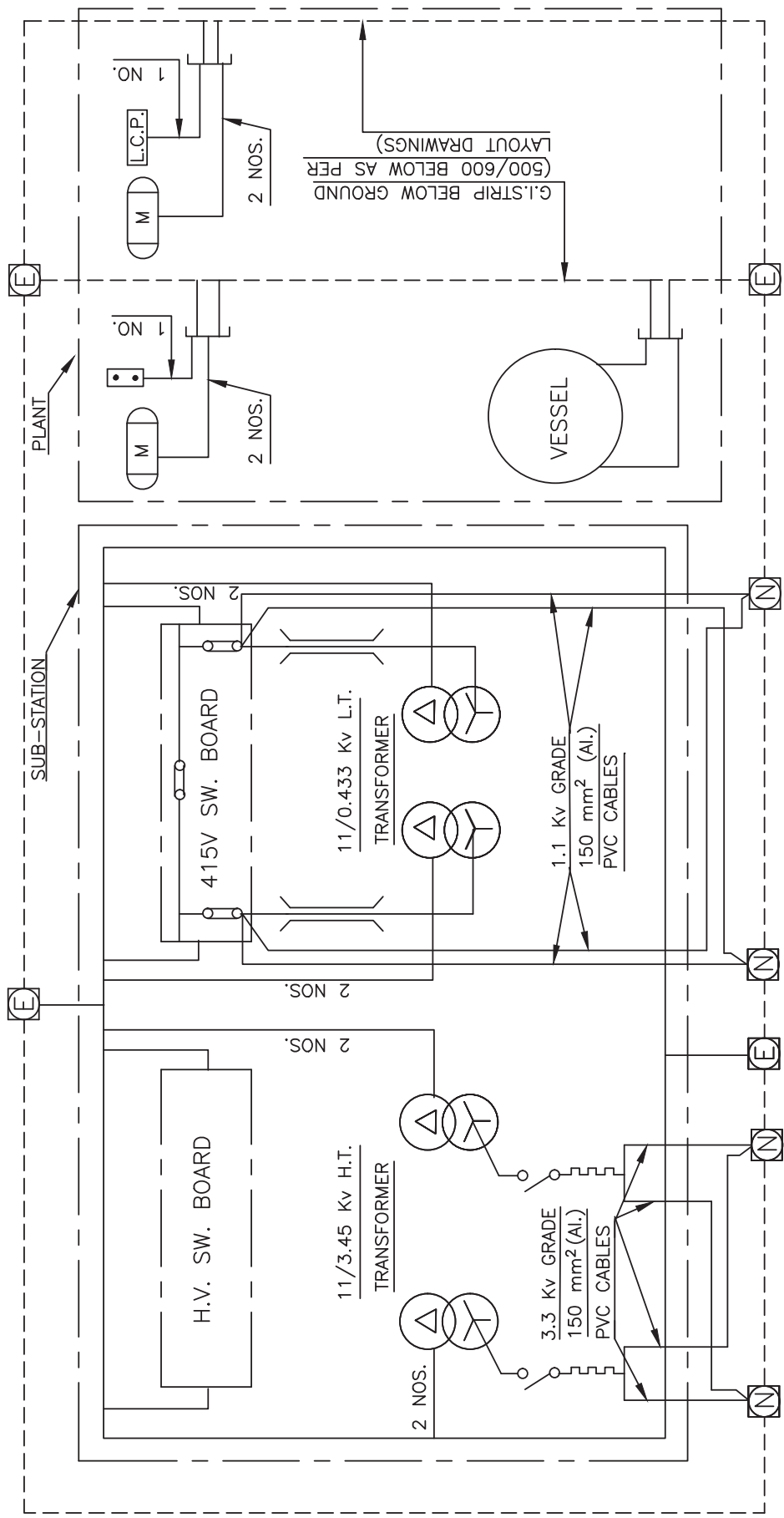
EQUIPMENT WITH ANY DIMENSION	HAZARDOUS AREA	NON-HAZARDOUS AREA
≤ 3 Mts.	1	1
> 3 Mts. ≤ 30 Mts.	2	1
> 30 Mts.	3	2



TYPE OF EARTH BUS	NO.OF EARTHING HOLES	OVERALL LENGTH x (mm)
1	8	335
2	10	390

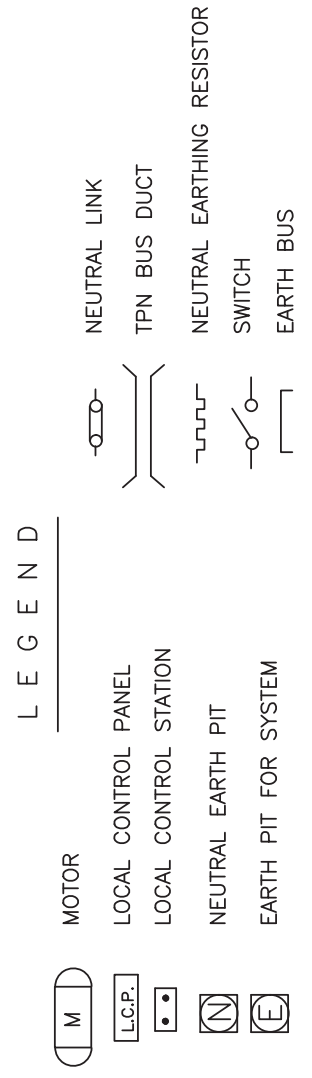
NOTES:-

1. LOCATION OF EARTH BUS TO BE DECIDED AS PER EQUIPMENT POSITION AT SITE.
2. EARTH BUSES SHALL BE LOCATED ON STRUCTURES/COLUMNS WALLS/EQUIPMENT FOUNDATION ETC.
3. MOUNTING HEIGHT OF EARTH BUS SHALL NOT BE LESS THAN 500mm FROM FINISHED FLOOR LEVEL
4. ALL DIMENSIONS ARE IN mm



REF. DRGS.  
 1. EARTH PIT DETAILS - PDS:E 605  
 2. EARTH CONDUCTOR SIZES - PDS:E 602 (2 SHEETS)

NOTE :-  
 EARTH BUS SHALL BE 500 ABOVE FROM FLOOR LEVEL



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## SECTION VI –5.0

### DESIGN PHILOSOPHY – INSTRUMENTATION

### SUPPLY & CONSTRUCTION OF ASH POND AND ALLIED SERVICES


**PROJECT: INTEGRATED COAL BASED FERTILISER  
COMPLEX AT TALCHER, ANGUL DISTRICT,  
ODISHA (INDIA)**



 <b>पी डी आई एल PDIL</b>	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER, ANGUL, DISTRICT- ODISHA, INDIA DESIGN PHILOSOPHY – INSTRUMENTATION</b>	PC183/E/206/S-VI/5.0	0	
		DOCUMENT NO	REV	
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CONTENTS

SECTION NUMBER	DESCRIPTION
1.0	Instrumentation And Controls Philosophy
2.0	Documentation
3.0	Control Philosophy (General)
4.0	Instrumentation Code And Practices
5.0	Hazardous Area Classification & Electrical Execution
6.0	Electrical Supply
7.0	Field Instruments
8.0	Control system
9.0	Local Control Panel
10.0	Pneumatic transmission
11.0	Installation
12.0	Storage Tank
13.0	Training
14.0	FAT/SAT
ANNEXURE NUMBER	DESCRIPTION
ANNEXURE-1	Instrumentation Accuracies
ANNEXURE-2	Instrument Process Connections
ANNEXURE-3	System Configuration
ANNEXURE-4	OS/ES/SOE specification
ANNEXURE-5	Hardwire Console
APPENDIX	Cable Sizes

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>AT TALCHER, ANGUL, DISTRICT- ODISHA, INDIA</b> <b>DESIGN PHILOSOPHY – INSTRUMENTATION</b>	PC183/E/206/S-VI/5.0	0	
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## 1.0 INSTRUMENT AND CONTROL PHILOSOPHY


### SCOPE

The description and requirements contained in this specification are concise by necessity and cannot include all details. However, it is the responsibility of the contractor to execute the job on a turnkey basis in accordance with the specifications and internationally recognized good engineering practices for smooth and successful operation of various units of the plant. Any activity specifically not listed in this document, does not absolve the contractor of their responsibility to include such activities in their scope of work and supply, which otherwise is necessary, to complete instrumentation work for SUPPLY & CONSTRUCTION OF ASH POND AND ALLIED SERVICES. All such activities shall be carried out by the contractor without any implication.

This section outlines the general requirements and specifications for Instrumentation and Control System for Design, engineering, procurement, fabrications, supply, inspection, testing, painting, transportation, calibration, supervision of erection and commissioning supervision of ASH POND AND ALLIED SERVICES with associated facilities at TFL.

This section outlines the general requirements and specifications for Instrumentation and Control System for Design, Engineering, Manufacture, Shop test, third party Inspection, Supply, erection and commissioning of the Package along with associated facilities. The Instrumentation and Control System shall consist of but not limited to the following



- ASH POND AND ALLIED SERVICES shall be provide as per below mentioned Control System:
- **ASH POND AND ALLIED SERVICES** shall be provided with DCS/PLC based control system. This control system will accommodate all control/trip and monitoring signal/functions for the unit
- Common DCS/PLC has been considered for the package and bidder to ensure segregation of individual plant level signals at AI/AO/DI/DO card level so as to ensure the reliability of the system.
- 1 no. OS with dual LED monitors and 1 no. OS cum Engineering having the feature of SOE also (placed in console area of engineering room), shall be provided by the bidder.
- One no. Aux. Console with Ann. window, push buttons, switches for critical trip and alarm shall also be provided.
- RIO shall not be considered anywhere in the package.
- All the required protections & interlocks shall be carried out in DCS/PLC. All the features such as graphics, alarms, and process parameters display diagnosis for

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plant equipment shall be displayed in package's operator station installed in the CCR.



- Network securities shall be provided by Vendor in control room as per IEC 62443 for protection of the system from both internal and external threat. The requirement includes all USB port blocking (including all monitors / CPU), provision of sufficient firewalls, and antivirus update for one year, patch update; unauthorized logging recording with events etc. must be addressed by Vendor.
- Bidder to note that all the Operator /Engineering Console & printer table etc. supplied by Bidder shall preferably match with the Client's installed consoles in the Main Plant CCR. Details regarding existing consoles shall be provided to the bidder at later stage.
- The package shall be provided with complete instrumentation & control system that performs the safety and protection of the packages.
- Package vendor shall be responsible for supply of instruments, controls, local panels, trays, cable, termination to junction boxes and multipair cable termination from junction boxes to Central control room etc.
- All the instruments on skid (if applicable) shall be supplied as installed items, no lose supply of instruments shall be acceptable for any type of skid.
- For important operating data and indications required for surveillance and monitoring, a provision shall be made to repeat the signals in Client's DCS/ ESD from the Package unit Control system, wherever applicable. For this bidder to provide communication redundant port (MODBUS TCP/IP) / OPC server for communication to Client's DCS. Bidder to provide necessary interfacing cards to achieve the purpose. It is preferable to offer Control system of the same make as the existing DCS/ESD in central control room. Existing DCS/ESD make shall be discussed during detail engg. Any Hardware / software required for seamless integration for interfacing from Package Control system to CCR, shall be in the scope of bidder.
- Bidder shall supply, install & commission all field instruments, local cables, junction boxes, cable trays, Air Distribution Pots. All local cabling shall be terminated in Field Junction Boxes/Local Panels by the bidder and the same from JB/Local panel shall be taken to Central Control Room through Multi-core cables by the Bidder. Supervision for erection/commissioning shall also be provided by the bidder at site.
- Bidders shall provide necessary support for interfacing till the control room.

		Supply	Installation/ Erection/Commissioning	Assistance Erection/Commissioning
--	--	--------	---	--------------------------------------



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1.	Field Instruments	By Bidder	By Bidder	By Bidder
2.	Control system	By Bidder	By Bidder	By Bidder
3.	Package Battery Limit to Central Control Room through multi-pair cables & cable trays	By Bidder	By Bidder	By Bidder
4.	Interface Control system (Hardware/Software)	By Bidder	By Bidder	By Bidder
5.	Earthing/Earthing cables & Earth Pits	By Bidder	By Bidder	By Bidder



- All the required, control function, logic function, protections & interlocks shall be carried out in the control system. All the features such as process Cause and Effect graphics, Logic functions, alarms, and process parameters display diagnosis for plant equipment shall be displayed in package's operator station installed in the Central Control room with local interruption facility.
- All operating conditions including necessary data logging, alarms etc. process Cause and Effect graphics etc. shall be communicated to control system. Changes in 'Operating Modes' (for generating either liquid or gaseous Nitrogen) shall be carried out by control system.
- Planned shut-down and 'Emergency shut-down' caused by plant trips, shall be managed through control system..
- The plant shall be capable of fully automatic operation once started. The control and monitoring of parameters along with over-ride features shall be incorporated for part and full manual operation.
- The system shall be capable of operating on a continuous or intermittent basis and shall be completely automatic, requiring no operator attention, with all cycle control valves actuated by a control system.
- The operation shall be from control system only, however the complete plant could be started manually from local control panel.
- Emergency stopping shall be possible from control system, & local control panel.
- Analyzers shall be designed for continuous monitoring

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- The Instruments in general shall be Electronic Micro processor based type with latest revision of software. The field instrumentation i.e. Flowmeters, Transmitters, Smart Positioner, etc. shall have latest HART protocol as minimum.
- All equipments/instruments/system oriented items (with all its sub-systems) shall be of field proven quality both with respect to design and materials. Prototype instruments or instruments of an experimental nature shall not be offered or supplied. In general, all the supplied items by supplier shall have a well proven performance record of operating satisfactorily in an Acid /Pharmaceuticals /Oil and Gas sector/Power/Chemical/Fertilizer Plants for minimum of one year. No instrument requiring special maintenance or operating facilities shall be offered or supplied as far as possible. PTR for field instruments shall be considered min for 2 years.
- Bidder to carry out :
  - Preparation of engineering and construction documents like functional schematics, I/O list, logic diagrams for interlocks as per ISA 5.2 with functional descriptions, configuration diagram, electrical load list, cable schedule, cable tray/trench layout, instrument air requirement, nameplate schedule, JB schedule, instrument location layout, electrical instrument signal interface, instrument index, layout drawings, loop diagrams, primary and secondary sketches and bill of materials.
  - Preparation of all engineering documents for control system like graphic schemes, instrument loop data base, log formats and any other documents necessary to carry out the system engineering of control system.
  - Co-ordination with Control system vendor for system engineering, implementation, software testing, supply and final commissioning supervision and site acceptance tests.
  - Co-ordination with all instrumentation vendors for obtaining sufficient information in the form of documents, drawings for engineering and approval from OWNER.
  - Preparation of specification for erection materials like cables (Signal, power, control, Optical fiber etc), cable trays, pipe & pipe fittings, air tubing, junction boxes, air distribution pots etc.
  - Bidder to provide all sufficient information in the form of documents, drawings for engineering and approval from OWNER.
  - Bidder to supply complete instrumentation system with all necessary erection material like valves, fittings, tubes/pipes, cables, cable glands and cable trays Junction box and any other erection material for the completeness of the job.

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- All system cables/fiber optic cables in the field (including communication between CCR and CR) shall be routed in HDPE Hard pipe. Fillings shall be used for joining the HDPE pipe. HDPE pipes shall be ORANGE in colour with BLACK fillings. All system cables/fiber optic cables shall be routed in the middle 150mm portion of the tray. Wherever it is absolutely necessary to route these cables underground, it should be routed in the RCC Trenches only. Separate route should be followed for redundant system cables. Supply of Cable trays and laying of cables through trenches upto CCR are in bidder scope.
- No copper or copper alloy shall be used for the parts coming either in contact with process fluid or outside atmosphere.
- All instruments and equipments shall be suitable for use for specified site climatic conditions and industrial environment in which corrosive gases and/or chemicals may be present. As a minimum, all instruments and enclosures in field shall be dust proof and weatherproof to IP-67 as per IEC-60529 or equivalent NEMA 4X enclosure rating or better and secure against the ingress of fumes, dampness, insects and vermin. All external surfaces shall be suitably treated to provide protection against corrosive plant atmosphere.
- All Inst. JB's shall be of FRP material with minimum 4 mm thickness with proper support to protect against corrosive environment and cable entry shall be from bottom only.
- The design of electronic instruments shall be in compliance with the electromagnetic compatibility requirements as per IEC 61000-4 "Electromagnetic compatibility for Industrial Process measurement and Control equipment".
- Process switches, shall be realized through field transmitters only. If for some packages, process switches are unavoidable same shall be provided with sealed micro switch contacts rated for the specified application. Contacts shall be 1 no. DPDT preferably. Otherwise 2 nos. SPDT can be considered. All switch contacts except those used in intrinsically safe circuits shall be silver plated. Contacts used in intrinsically safe circuits shall be suitable for the applications. Switches shall be hermetically sealed type. Switches shall be connected through interposing relays.
- All Field transmitter supports should be properly clamped with SS304 accessories to the pipe for pre-fabricated wherever required and closed couple installation. No air gap shall be kept between support clamp and pipe.
- All Solenoid valves shall be Intrinsically Safe type (24 V DC), SIL3 certified with details inside the design basis. Solenoid valve body material shall be SS316. All critical loops must have redundant SOV's.

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- Other specification like panel earthing, instrument earthing, MCT material, temp monitoring inside panels, inside CR the scope of vendor shall still be as per contract, UPS monitoring alarms in Control system, H2 detector in battery room etc. shall be as specified elsewhere in this tender.
- In the event of any conflict between this specification, related standards and codes, any other attachment to this package or process packages, the contractor shall follow the following documents in the order of their priority:
  - ✓ Design Philosophy –Instrumentation
  - ✓ General Standard specification attached
  - ✓ Licensor’s recommendation
  - ✓ Statutory requirements and codes & standards

The package shall be provide as per below mentioned Control System

#### OPTION 1

DCS based control system for Control & ESD function also with applicable redundancy as specified in this tender. This control system will accommodate all control/trip and monitoring signal/ functions. One redundant controller with I/O cards (redundant cards to be considered only for closed loops signals) for control & monitoring application and one separate redundant controller with redundant I/O cards for trip/shutdown functions. Scan time of the controllers shall not be more than 250 msec.

Control system for Package plant shall be placed in CCR (Central Control Room).



(Detail specification of DCS shall be share with the bidder on later stage.

#### OPTION 2

PLC based control system (DMR)

Scan time of the controllers shall not be more than 250 msec. *(Other requirements for PLC system shall be per NIT)*

- 1 nos. OS, 1 no. ES cum OS with SOE, with dual LED monitors will be used for controlling the Package
- One no. Aux. Console with Ann. window, push buttons, switches for critical trip and alarm shall also be provided.

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Dedicated SOE work station is not required. Engineering station shall have feature of SOE.



## 2.00 DOCUMENTATION

SL No	Document Description	Document to be submitted		
		With Bid	After order for approval	Final
1	List of Instruments (tag wise) indicating type of Instrument, make, model no., quantity etc.		Yes	Yes
2	Instrument mounting and connection details		Yes	Yes
3	Instrument layout drawings			Yes
4	Catalogue of Instruments & System			Yes
5	List of spares (item wise and quantity) for Commissioning and 2 years of operation		Yes	Yes
6	Specification of Instruments		Yes	Yes
7	Detail wiring/ interconnection diagram		Yes	Yes
8	P and I Diagram		Yes	Yes
9	I/O list		Yes	Yes
10	Loop Diagram		Yes	Yes
11	Logic Diagram for interlock & safety (if any)		Yes	Yes
12	J.B. termination drawings		Yes	Yes
13	Instrumentation, operating, maintenance manuals			Yes
14	Instrument Test Certificate			Yes
15	Vendor to indicate power requirement (if any) for the control system		Yes	Yes
16	Other documents necessary to have a clear understanding of the system		Yes	Yes
17	List of alarms		Yes	Yes
18	Schematic drawings for controls		Yes	Yes
19	Control room layout/System Architecture		Yes	Yes
20	Field Operator Room layout		Yes	Yes
21	System Architecture	Yes	Yes	Yes
22	Instrument Air Consumption Requirement		Yes	Yes
23	Control Philosophy	Yes	Yes	Yes
24	UPS power & Heat Load Requirement		Yes	Yes
25	Bill of Material		Yes	Yes



## 3.0 CONTROL PHILOSOPHY (GENERAL)

3.1 Design and installation of instrumentation shall comply with codes and recommendations listed in item 4.0.



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- 3.2 The instrumentation shall be designed to provide stable and accurate plant control ensure safe plant operation and to facilitate plant maintenance, Control and Monitoring. The operating interface to the process shall be colour dual screen 22” LED TFT Color (Minimum) display units with touch facility, presenting overview, group and point displays as well as process graphics with live data. The operator will manipulate all facilities through dedicated operator’s keyboard and using the touch panel. All operating consoles for control system shall be located inside the Central control room.
- 3.3 I/O units, marshalling cabinets, power distribution cabinets shall be housed in Rack room in the Central control room.
- 3.4 ES cum OS (Dual Stacked) with SOE feature, shall be placed on the console of engineering room.
- 3.5 Package Unit Control System :
- Bidder to provide Control System with redundancy at all levels and with latest model. It shall have provision to communicate with main plant control system placed in CCR (Central Control room) through Modbus protocol and connected by Serial cable in redundant mode. Control System for the package including marshalling cabinets, relay cabinets, MCC Interface cabinets, power supply distribution cabinets, instrument isolator, alarm cards, terminals, relays with accessories duly mounted, wired & tested to meet specified requirements.
- 3.6 DIs/DOs from MCC to Control System or from Control System to MCC shall be with relays only. Separate panels for DI/DO and AI/AO. The details will be discussed during detailed engineering.
- 3.7 Alarm and Annunciation System (LED type only):
- Annunciation system is used to indicate and sound alarm for any process abnormality, trip/status change of Electric drive. Annunciation system shall be of modular design & programmable type. Electrical circuit is designed to read the change of state of discrete signal and generate the output to illuminate the window and give the alarm. The alarm can be silenced by acknowledge switch. Window light can be reset after acknowledgement and, when the state of signal returns to the prior alarm state. Annunciation system can be configured for any of sequences of ISA standard. There shall be a provision in circuit design to change the state of signal required to generate alarm (from Open to Close or

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vice versa) simply by changing the jumper position on circuit board. Lamps in window shall be replaceable from the front.

Hooter in general, shall be solid state type with audibility of the order of 100 dB at the distance of 3 meters. An interruption of power supply up to 20 msec shall not affect the functioning of unit.

- 3.8 The minimum instrument accuracy shall be as defined in Annexure-1.
- 3.9 Universal HART Protocol with Latest Revision shall be used in all cases.
- 3.10 SIL certification rating for all the instruments shall be minimum as per following list :-
- All Smart Positioners - SIL 2
  - All Transmitters - SIL2
  - All Solenoids - SIL 3
  - All Gas Detectors - SIL 2
  - All switches - SIL-3 or maximum SIL rating available
- 3.11 Card mounted Relays are acceptable but cards must have redundant power facility, with it power healthiness indication in diagnostic graphics.
- 3.12 Cable entry to control room, analyser shelter, substations shall be through MCT blocks with SS MOC only.
- 3.13 Entry into the Marshalling Panels in the control room shall be through bottom mounted MCT blocks or SS316, DC, ET glands.
- 3.14 General Earthing & Instrument Earthing shall be provided separately (Panel and power earthing, Control System earth and Instrument signal earth is minimum envisaged).
- 3.15 All wetted part materials for all instruments (sensing elements) shall be min SS316L.
- 3.16 The instrument item like control valve, pressure relief valve, orifice flanges, level instrument, thermowell etc., coming on pipe and vessel under IBR services shall be certified by IBR or IBR authorised representative, even for SS metallurgy.
- 3.17 Turbine flowmeter shall not be used.
- 3.18 All Contacts shall be 2 SPDT or 1DPDT.
- 3.19 No Direct Process Switches (Pressure / Level/ Flow / Temp.) shall be used.

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- 3.20 All field transmitters for pressure, d/p, level and flow shall be microprocessor based (dual compartment) SMART transmitters with “UNIVERSAL HART” protocol with latest revision. The transmitter selection shall be such that the operating maximum upper limit shall be around 70% of the total measurement range of the transmitter. All Field transmitters for pressure, d/p, level and flow shall be provided with 10 years stability with accuracy (0.1%).
- 3.21 The control system and its software must be of latest version and supplied with latest anti-virus software.
- 3.22 All equipment/materials supply shall include spares required for 2 years operation and separate consumable for commissioning.
- 3.23 Motor / electrical equipment control philosophy
- a. Field :
- Ready to START (Lamp)
  - START
  - STOP
  - L/R Switch
- b. For Package PLC
- STOP Command
  - Discrepancy Alarm
  - Running Indication
  - Motor Fault Alarm
  - Current Indication ( All motor > 5KW)
  - L/R Switch Indication
  - Ready to START F/B
- c. For start / stop of all electrical equipments, local/remote selector switch shall be located in field, A/M (Auto/ Manual) and stop push buttons on consoles in Central control room. Local stop push button on LCS (local control station) shall be always effective.
- d. In remote mode, motor can be stopped from control system.

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e. In LOCAL mode, both START and STOP shall be possible only from LOCAL. Only in REMOTE, stopping is possible from control system.

f. Auto / manual selection shall be in Control System /local.

3.24 For all motors current indication shall be provided in control system for rating more than 5 KW.

3.25 For Auto start/stop signal to pump, 1oo2 philosophy shall be considered.

3.26 All Instruments including volume bottle must be painted with Corrosive resistant epoxy paint.

3.27 Local indicators, start /stop switches, emergency stop switches shall also be provided near package units/rotating machines where local start up of the equipment is advisable.

3.28 For instrumentation electrical interface, input and output contacts shall be in separate multicables (should be signal cables).

3.29 All trip solenoids shall be dual redundant, and configured and hooked up properly in such a way that failure of one solenoid doesn't initiate a false trip. Trip solenoids shall be normally in energised condition and shall be de-energised to initiate trip.

3.30 All trip interlocks must be designed on 2oo3 philosophy.

3.31 Emergency stop and critical stops must have transparent protective cover.

3.32 PB's , Annunciator , EPB must be available on console placed in Central Control Room.



3.33 Air fails to open, Close or Hold of any control valve shall be as per process requirement , to take care of process, plant and human safety. For Piston actuators necessary air volume chambers and lock up relay shall be provided to achieve the fail-safe condition.

3.34 All Analysers shall be Ex.proof (Minimum IP65 or better) irrespective of area of installation.

3.35 All control valves / On – Off Valves / MOVs shall be flanged type.

3.36 Control valve / on-off valve, pneumatic valve shall be designed for minimum 4 Kg/cm<sup>2</sup> air pressure.

3.37 Actuator design shall be of 1.5 times of shut off pressure with guidelines as below:-



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Vendor shall ensure that the actuator torque produced at maximum air supply pressure (MAWP) does not exceed the shear torque of the valve stem/shaft. As a guideline, actuator torque values shall be in accordance with the following :



Minimum actuator torque of 1.5 x required highest starting torque to commence movement of the ball in the case of maximum differential across the valve.

Shear torque of stem/shaft greater than 1.5 x maximum torque produced by actuator at maximum air supply pressure



- 3.38 Valve body MOC in steam service shall be of WCC or better irrespective of pipe class.
- 3.39 Air distribution pots shall be of stainless steel (SS304). Inst. Impulse pipes for process parameters shall be in accordance with piping specifications.
- 3.40 Hart Compatible gas-detectors to be provided. Electrochemical type gas detectors shall not be considered. Bidder to submit suitable gas detectors as per OEM recommendation/ as per ITB as specified elsewhere. Bidder to submit gas detectors quantity calculation along with layout. Bidder to provided hooters (electric type) & beacon ( rotating type with light flash).
- 3.41 All line mounted instruments like in-line SOVs, Magnetic flow meter, Rotameter, Mass flow meters etc shall be provided with block & bypass arrangement, with their indications in system as per requirement, which will be discussed in detailed engineering.
- 3.42 Separate Sample handing system shall be used for each analyzer. Multi Channel with stream selector can be used, provided the total system including sample handling system shall be imported. Necessary sequence shall be inbuilt in the analyzer for draining the condensate.
- 3.43 For double acting valve, air accumulator (with MOC as SS304) shall be used for achieving fail safe operation.
- 3.44 FRP Canopies (UV stabilized 3 mm thick), 2" Pipe mountable, are required for Transmitter, JBs, LCPs, Control Valve positioner, Temp Elements, Proximity level switch, remote mounted electronics, mass flowmeter, ultrasonic flowmeter etc. FRP Canopy shall be Prefabricated type. Canopy for transmitters shall cover top and 3 sides. SS canopy instead of FRP, if offered by package vendor, shall also be acceptable. No separate canopy shall be required for instruments located under shed like compressor shed etc.

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- 3.45 System / Marshalling/ Packages cabinet size shall be 2100 (H) X 1200 / 800 (W) X 800 (D) Rittal make.
- 3.46 Separate Tapping shall be used for each instrument coming for trip, control & monitoring, local display. No More than 3 set of taps allowed.
- 3.47 Smart positioner shall be considered for all Control Valves. For high temperature services (Above 200 Deg C) remote feedback shall be used for the smart positioned ( i.e positioned shall be installed remotely).
- 3.48 Positioner shall be of valve OEM or as per approved vendor list.
- 3.49 For all Local panels rain cover to be provided. The gasket of local panels must be acid resistant preferably Silicone/EPDM or better which will be discussed during detailed engineering.
- 3.50 For Analysers separate feeders to be directly taken from UPS. No sub-branching is allowed at any place.
- 3.51 No Switches to be used. If in pump seal plan, if level measurement is requirement, GWR to be used.
- 3.52 Fibre optic cables shall be armoured, multicore type. All fibre optics cable must be laid through HDPE conduit. The make of fibre optic cables shall be Belden / Leoni.
- 3.53 All cables inside package battery limit shall be supplied and laid by Package vendor through instrument cable trays supplied by Package vendor. All cables inside skids/modules shall be supplied in pre-wired & pre-tested condition.
- 3.54 All Instrument Hookups shall be approved by owner/PMC.
- 3.55 All fittings shall be SS316 and in inch only.
- 3.56 All tubing shall be SS316 and must be made from hot extrusion process only.
- 3.57 The manifolds (3 valve/5-valve/2 valve) material shall be SS316L.
- 3.58 All the soft parts of Local panels/JB/SOVs etc shall be of acid resistance, preferably silicone, EPDM or better which will be discussed during detailed engineering.
- 3.59 Level measurement in the acids tanks shall be of ultrasonic type.

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- 3.60 LO auto start (if applicable) should be designed on 1oo2 principle and if Run feedback is taken as one process input in trip logic then it must be designed on 2oo3 logic using two inputs as other process parameters.
- 3.61 One emergency push button be placed near the compressor and it must be directly connected to MCC for stopping the compressor i.e. without routing through Control System logic. However, its spare contact must be connected to Control System as DI signal so as to get its actuation feedback in Control System as a SOE event.
- 3.62 Load and Unload SOV must be of SIL3 and redundant.
- 3.63 Suitable vibration measurement system shall be considered by the bidder for vibration measurement in the machines. (Detail shall be discussed during DE stage). In case of any trip action is required because of machine high vibration; interlocks must be design on 2oo3 philosophy or 2oo4 philosophy. Key phasor for speed measurement shall be provided in compressors.
- 3.64 All absorber swing valves (if applicable) must be rugged and proven for high frequency cycle operation. They must have both position and limit switch feedback. Logic designing on position feedback will be preferred instead of limit switch feedback.
- 3.65 All drier change over valves must operate in auto mode and must have both position and limit switch feedback. Logic to be designed on position feedback instead of limit switch feedback.
- 3.66 The drier operation should be automatic without any manual interventions.
- 3.67 For all Diaphragm Seal Type DP Transmitters/Gauges on Vessels, min size and rating shall be 3" 300# RF.
- 3.68 The vessel having two LT's shall be based on two different principles.
- 3.69 Flushing ring for remote diaphragm seal shall be provided where extended diaphragm seal cannot be provided for pad type nozzles.
- 3.70 For LT,PT, DPT, PG proper vent /drain facility using manifold/drip ring shall be provided.  
For vent, drain ,1/2" gate isolation valve shall be provided
- 3.71 For ON/off Valve, open/close indication, SOV(either redundant or 2oo3),PST, feedback of SOV if 2oo3 ,if any signal from switch is going to ESD ,2oo3 shall be provided.

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3.72 For control Valve, open/close indication, SOV(either redundant or 2oo3), feedback of SOV if 2oo3 shall be provided.

3.73 For MOV, open signal, close signal, open/close command, position feedback, fault , if any signal is going to ESD ,position feedback 2oo3 shall be provided.



#### 4.0 INSTRUMENTATION CODE AND PRACTICES

IEC 13	Diagrams, Charts and Tables, Preparation of Logic Diagrams
IEC 534	Industrial - Process Control Valves
IEC 584	Thermocouples
IEC 605	Equipment Reliability Testing elements
IEC 611-12	Part 12 Graphical Symbols for Diagrams. Binary Logic
IEC 654	Measurement and Control equipment
IEC 751	Industrial Platinum Resistance Thermometer Sensor
IEC 801	Electromagnetic Compatibility for Industrial Process measurement and Control Eqpt.
IEC 848	Preparation of Function Charts for Control Systems
IEC 902	Industrial Measurement and Control Terms and Definitions
ISA S-5 .1	Instrumentation Symbols and Identification
ISA S-5.2	Binary Logic Diagrams for Process Operation
ISA S-5 3	Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Symbols
ISA-S20	Instrumentation specification formats
ANSI/ISA S 5.1	Process Instrumentation Terminology
ANSI/ ISA S71.04	Environmental conditions
ANSI/ ISA S75.01	Control Valve Equations
ANSI/ ISA S75.02	Control Valve Procedure Capacity Test
ANSI/ ISA S75.03	Face-to-Face Dimensions for Flanged Globe Style Control Valve Bodies



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ANSI/	Quality Control Standard for Control Valve Seat
FCI 70.02	Leakage
BS 6020	Instruments for the Detection of Combustible Gases
DIN 43760	Measurement Standard for RTD.
DIN 19243	Measurement and Control Electrical Sensors, Electrical Position Sensors and Signal Converters used for Intrinsically safe two-wire DC System.
EN-50-014/020	Electrical Apparatus for Potentially Explosive Atmospheres
EN 54 Part I	Components of Automatic Fire Detection System Introduction.
EN 54 Part 5	Heat sensitive Detectors - Point Detectors containing a Static Element.
ISO 3511.1	Process Measurement Control Functions and Instrumentation Representation Part I: Basic requirements.
ISO 3511.2	Process Measurement Control Functions and Instrumentation Representation Part 2: Extension of Basic Requirements.
ISO 3511.4	Process Measurement Control Functions and Instrumentation Representation Part 4: Basic Symbol for Process Computer, Interface and shared Display/Control Systems.
ISO 4200	Plain End Steel Tubes, Welded and Seamless - General Table of Dimensions and Masses per Unit Length.
ISO 5167	Measurement of Fluid by Means of Orifice Plates, Nozzles and Venturi Tubes Inserted in Circular cross-section Conduits Running Full.
API RP 520	Sizing, selection and Installation of Pressure relieving devices in Refineries
API RP 521	Guide for Pressure Relieving and Depressuring System
API RP 2000	Venting Atmospheric and low-pressure storage tanks
API-RP-550	Manual on Installation of refinery Instruments Part I and Control System
ANSI - B 16.104	Control Valve seat leakage
ISA-S 75.01	Control Valve sizing
ISA S 18.1	Specifications and guides for the use of general Annunciators.
IEC 529	Environmental Protection of equipment

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ANSI B 2.1	Pipe threads
ANSI B 16.5	Steel pipe flanges, flanged valves and fittings
IEC 79.11/	Intrinsic safety code and practice
IEC-79.14	International Boiler Regulation
IS 2148	Flameproof enclosure of electrical apparatus

## 5.0 HAZARDOUS AREA CLASSIFICATION & ELECTRICAL EXECUTION

5.1 Irrespective of area classification, the execution of instrumentation shall be as per area Zone 2, group IIC, T6, Exia and Protection.

Electrical / Electronic instruments	IP 67
Sensors; RTD, T/C, etc.	IP 65
Local Gauges; PG, etc.	IP 55
Pneumatic instruments	IP 54
Solenoid valves	IP 67
Local Panel / Skid Mounted Panels	IP 55

EMC compatibility and electrical safety as per latest IEC standard.



5.2 Electrical instrument equipment shall be designed for and supplied as intrinsic safe certified.

Analysers, solenoid valves and other equipment that cannot be classified intrinsic safe shall be ex-proof in accordance with the above mentioned electrical specification.

Certification for installation in hazardous areas in accordance with IEC 60079 series is shown below:

Transmitters, Positioners, Limit Switches , etc.	Ex ia IIA/IIB T6
Field Switches:	Ex de IIA/B T6
Analysers and Panels:	Ex p IIA/B T6
Solenoid Valves:	Ex ia IIA/B T6 (Ex md not allowed)
Junction Boxes and Cable Glands:	Ex e/Ex d



## 6.0 ELECTRICAL SUPPLY

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The electrical supply will be as follows:

S.No	Description	110 V AC 50Hz UPS	110 V DC	24V DC	110 V AC Non UPS	240V AC 50Hz (Non UPS)	415 V AC-3 phase	Remarks
1	Control System	YES						
2	Package Units	YES				YES		Non UPS for Lighting
3	Alarm Annunciator	YES						
5	Solenoid Valves			YES				
6	Smart Positioners, I/P, Transmitters			YES				
7	I/P Interrogation Voltage			YES				
8	Gas Detectors			YES				
9	Analyzers and Analyzer System	YES						
11	Level Gauge Illumination					YES		
12	Cabinets Fan					YES		
13	Cabinets Lighting					YES		
14	Control Room					YES		
15	Local Panel	YES		YES		YES		Non UPS for Lighting
16	Analyzer Cabinet Air Conditioning	YES						
17	Analyzer Shelter HVAC						YES	

Where 24V DC is needed, it will be generated by local rectifier units (bulk power supply), which are part of the instrumentation supply. The power supply to these units shall be taken from the UPS.

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Where 24V DC are used for Safety Circuits, the rectifier units shall be duplicated and with high reliability and form a part of Control System vendor. The bulk power supply shall be with MOSFET O-ring.

There shall be minimum 4 (two no. Of each type; total 8 nos.) separate earth pits for signal (IS) , Non IS, Panel and chassis (system) grounding for DCS/PLC Earthing system at Central Control Room with different cable colour codes. All earth shall be less than 2 Ohm or OEM specific, if better. The size of Earthing Cable shall be 50 sq.mm minimum and should be routed in proper HDPE conduit, outside the control room building. All above instrument earth pits shall be separate from Electrical earth pits and must have separate colour identification from electrical earths. Minimum 2 nos. Of earth pits of each type (total 8 nos) shall be constructed by the bidder.

Supply of earth electrodes, grounding cables (separate for signal grounding and instrument grounding) and other related accessories required for barrier earth, system earth and installation shall also be in the scope of work Contractor. Copper conductor shall be of 1Cx10 Sqmmas minimum. For surge protection devices separate earthing shall be used.

UPS supplies shall not be used for utilities supplies cooling fans, panel/cabinet lighting etc. A separate non-UPS supply shall be used for the same.

A summary of all critical UPS alarms, 24V DC supply, Panel supplies, diode o rings healthiness shall necessarily provided in Control System and hardwired annunciation in control room or any manned location



Only copper cables & tin-plated copper lugs shall be considered for instrumentation power distribution system.

Supply of UPS and its battery is in the scope of Bidder

Protection coordination with respect to fuse/MCB ratings from the supply source ACDB/DCDB to downstream distribution panels shall be thoroughly studied by the system designers/OEM and documented as a part of the system documentation and be implemented accordingly.

MCB's must have DI contact's which must be wired to Control System and available in diagnostic graphics.

## 7.0 FIELD INSTRUMENTS

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## 7.1 Flow Instruments

### 7.1.1 Flow Transmitters



D/P cells shall have measuring method on the floating capacitance technology. The signal transmitter shall normally be a 2-wire system and shall be capable of delivering rated current into external load of at least 600 ohms when powered with 24 V d.c. Protection against short circuit and reverse voltage shall be provided. Bodies shall normally be in stainless steel with SS316L internals. Integral 3- valve manifold similar to AGCO make model 4A shall be used for mounting transmitters on manifold for ease of maintenance. Material of manifold in general shall be SS316L but may vary depending upon service. Digital output indication shall be preferable on the integral output meter with the transmitter. All flow transmitters shall have sq.root extraction function.

Pressure elements in austenitic stainless steel is a requirement. The transmitter shall be furnished with an output meter or gauge with a sqrt scale. Smart type transmitters will be used with Hart V protocol. Overall accuracy for SMART transmitters shall be +/- 0.050% or better. Process connection size shall be 1/2" NPT.

All field transmitters shall be 2 wire type, 24 Volt DC, SMART with HART protocol, and shall be equipped with Local LCD type digital indicator. 2" pipe mounting, SS304 MOC brackets and other accessories, as applicable, Accuracy 0.050% of Span , Rangeability 1:100, Local Display configurable, SS MOC, Double Compression SS 316 cable glands, Exia IIA/B/T6, IP67, Wetted MOC SS316L, SS316L MOC Manifold, Housing Die-Cast Aluminium Epoxy Painted, Universal Hart Protocol with Latest Revision is required.

### 7.1.2 Rota meter with Transmitters

Rotameters or variable area meters may be used in pipe sizes from 1 1/2" and smaller. The meter shall be selected for normal flow at 50 to 60% of the span. In applications with toxic or inflammable fluids, glass tubes must not be used except for low pressure analyser sample flows. They may be used for severe corrosive services and of fluid of high viscosity. The metal tube meters shall be of stainless steel, PTFE lined or any other suitable lining for the service. The Indicator assembly shall be magnetically coupled and mounted with rotameter body. Transmitters or Indicators on float extension are not recommended except for cryogenic services. The switch assembly shall be of proximity type. All Rotameters shall be metal tube type with transmitter. The rotameter transmitters shall have 4-20 mA output at 24V d.c. power on two wire system, which must wired to control system.

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### 7.1.3 PRIMARY DIFFERENTIAL PRODUCERS

#### 7.1.3.1 Orifice Plates

Orifice plates of the square edged concentric type shall be specified except where unsatisfactory for the application. Materials of orifice plate shall normally be AISI 316 unless special materials are required for the service. The maximum ratio of orifice to inside pipe diameter of 0.70 and minimum ratio of 0.30.

Orifice plates dimensions and calculations shall be in accordance with ISO 5167-1980.

The flow range shall be selected such that normal flow rates are between 50% and 70% of the flow upper range value.



Material of construction of orifice plate shall be 316L SS except where this material is unsuitable for the service because of corrosion or erosion considerations, in which case an alloy shall be chosen whose corrosion allowance is equal to or better than line material. Orifice plates dimensions, finishing, flatness, tolerances for dimensions and identification information shall be in accordance with ISO standard. Orifice plate shall be provided with tab handle, which is welded on the orifice plate and engraved with following information on the upstream of the tab handle:

- UPSTREAM or UP
- Instrument tag number
  - Orifice diameter
  - NPS (Nominal Pipe Size) and ANSI flange class
  - Material of the orifice plate
  - DP range & Meter ( Flow) range

The tab shall also be in line with the Drain or Vent hole and shall indicate the direction of flow.

BIDDER shall submit the sizing calculations for orifice plates for review.

Pressure drop for orifice sizing shall generally be selected among the following values: 125, 250, 500, 625, 1250, 2500, 5000 and 10000 mm H<sub>2</sub>O with standard selection at

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2500 mmH<sub>2</sub>O.

Orifice plates shall be installed on horizontal lines when practical. Vertical meter runs may be used for down flow of vapour and up flow of liquids.

Differential ranges for all liquid flow meters shall not exceed 5000 mm water. Typical ranges for gas, steam or vapour meters are as follows:

Static Pressure	Diff. Range
(in Kg/Cm <sup>2</sup> g)	(in mmwc)
0.35 to 2.5	500-1200
2.6 to 6	1250-2500
Above 6	2500-5000

Orifice bore with diameter less than 0.125" shall be avoided.



- a) Flange taps orifice shall generally be used for line sizes 2" to and including 18". Above 18" line size, D and D/2 taps shall be used. Integral Orifice assembly with transmitter shall be used for line size 1 1/2 "or below (as per standard BS-1042)

Orifice assembly shall be provided with two sets of "Flange Taps" located in accordance with latest AGA standards. The orifice assembly shall be provided with jack screw for removal of orifice plate. In case of 2 out of 3 logic requirement, three different transmitters shall be used and no two transmitters shall share the common tapping. In such case six set of taps (independent tapping) shall be provided in orifice assembly. Instrument tapping connections shall be 1/2"NPT (F).

- b) Orifice flanges shall be in accordance with the ANSI B16.36, ANSI B16.36a and applicable piping specification and shall generally be of weld-neck type only. The minimum pressure rating of flanges shall be ANSI 300 lbs.

Flanges larger than 3" shall have a pair of jack-screws. The mating flanged shall be aligned in such a way that jack-screws will be diametrically opposite.

Orifice flanges used at pressure ratings up to 600 lb. shall be tapped 1/2" NPT(F) tap for 900 # above 3/4" NPT(F). Orifice connections for Vena contracta taps or pipe taps 1/2" socket with schedule/MOC as per piping specs

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- c) For line size below 2” Integral orifice with corner taps shall be supplied as an integral assembly consisting of upstream and downstream straight pipes, integral orifice of 316L SS (as a minimum) installed along with H type manifold and SMART, 2 wire 24 V DC, DP transmitters with latest HART protocol (refer 7.2.1 for tx details). End flanges shall be as per piping specifications. Upstream and downstream pipes shall be honed from inside to achieve smooth surface. Integral orifice meters, when used, shall be installed with block and bypass valves.
- d) Upstream and downstream straight length shall be provided based on maximum d/D ratio of 0.70, in general. Where it is difficult to meet this requirement, the actual d/D can be considered for reducing the straight length as permitted by ' recommended practice shall be as per API-MPMS Recommended Practices and AGA Report No.3. The piping layout, where possible, shall be arranged such that straightening vanes are not required.
- e) Orifice plates with RTJ flange connections above 2” shall be supplied with Carrier rings.
- f) Meter taps shall be horizontal for liquids, condensable vapors and steam. The tap shall be on top for gas, non-condensable vapor, or liquids, which boils at maximum design ambient temperature at operating pressure.
- g) The Meter Range flow shall be equal to the 1.5 times of normal flow or 1.3 times of the maximum flow and it shall be nearest higher multiple of 50/100/1000s of units of measure (in Engg. Unit) in round figures. This meter max range criteria specified is applicable to all other type of flow transmitters also.



### 7.1.3.2 Nozzles

ISA 1932 Nozzles may be used in high and medium pressure steam and BFW piping. Materials for nozzle element shall normally be AISI 316L steel unless special materials are required for the service. Dimensions and calculations shall be in accordance with ISO 5167-1980. Generally, branch pipe is required with the nozzle the same shall be machined from higher schedule pipe than the one used for the service or forged branch pipe shall be used if higher schedule pipe is not available. The branch pipe bore shall be same as that of nozzle ID and shall have mirror finish.

### 7.1.3.3 Venturi Tubes

Venturi Tubes or nozzles as per ISO 5167-1980 or similar type elements may be used to measure the flow of low pressure gases or liquids where loss of pressure is an important



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consideration.

**7.1.3.4 Averaging pitot tube/Annubar (Not to be used) The vendor may supply thermal mass flowmeter instead.**

**7.1.3.5 Local Flow Indicator**

Motion balance (Barton cell type) type differential pressure indicator shall be used for local flow indication. Body and internals shall be of 316L SS. Process connection shall be 1/2" NPT(F) . SS316L 5-valve manifold with 1/2" NPT connection shall be used with the meter.

**7.1.4 OTHER FLOW METERS**

**7.1.4.1 Mass Flowmeter**

Coriolis type mass flow meter with local digital display of flow shall be used to measure the process flow where high accuracy is required. Normal accuracy for mass flowmeters shall be 0.15% of span. The sensing element shall be straight/U-tube, matl. 316L in general.

**7.1.4.2 Vortex Meter**

Vortex shedding meters may be used for wide range of flows for gases and liquids. The measured flow shall be temperature compensated.



Insertion type vortex meter may be used in utility services for line size more than 6" in place of Pitot /Annubar/Pitot venturi tubes.

**7.1.4.3 Ultrasonic Flowmeter**

Ultrasonic flow meters (non- insertion probes preferred) based on the "time-of-flight" method shall be used. Meters based on the "Doppler" principle are less accurate and shall not be used. Ultrasonic flow meters shall be considered for large turn downs and where pressure drop is not permitted. Upstream and downstream straight lengths shall be as per standard.

**7.1.4.4 Electro-Magnetic Flowmeter**

Electromagnetic flowmeter with ceramic lining shall be used for the measurement of flow with high accuracy for highly viscous and corrosive services. Instrument shall be suitable

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for Acid and alkaline measurement.

## 7.2 LEVEL INSTRUMENTS



Level Instrument shall be suitable for Acid and alkaline measurement. Guided wave radar type instruments (SMART) shall normally be used for level measurement up to 2400 mm, wherever guided wave radar cannot be used then only external displacer type transmitter to be used.. Differential pressure transmitter (Capillary type) shall be used for level measurement above 2400 mm and for services requiring purge or where liquid might boil in external portion. Capillary type DPTs shall not be used in vacuum services. Internal displacer type of level transmitters shall be not be used. Remote Seal PT/DPT shall be with min 5 mtr Capillary with SS armoured in PVC sheath of Protection with DRIP RING and with Ball type Isolation Valve. For Vessel/Equipment requiring more than 5 m capillary electronic remote seal shall be provided. Process connections shall normally be 3" flanged. Wherever Differential pressure transmitter is considered for level measurement, the element shall be preferably remote seal type with drip ring provision & with welded joint for vent & drain. Remote diaphragm seal type DP shall be taken for level measurement with min size and rating of 3" 300#RF.

Where ever possible C-C Distance shall be same for ESD and DCS level transmitter. If there is any deviation, same shall be discussed during DE on case to case basis.

### 7.2.1 External Displacement

Displacer type level instrument shall be avoided and guided wave radar type or remote diaphragm seal DP shall be used in their place if suitable to process condition.

If unavoidable External displacement type instruments shall generally be used (with owner/PMC approval) for small spans only (The standard ranges shall be: 350 mm, 810 mm., 1200 mm). The cage material shall normally be forged material conforming to the service requirements. Where the vessels are of alloy steel construction, the body material shall be equivalent or of a better material. The displacer shall be in stainless steel (SS316L) and the torque tube in inconel. If LVDT type transmitter in place of torque tube is selected then the range spring of such transmitters shall be Inconel and cannot be used for temp. more than 330 degree C. Process connections shall normally be 2" flanged with side-side connections.

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For high temperature as well as low temperature and cryogenic services, torque tube heat insulation extension or torque tube extensions shall be applied. Radiation fins or extensions shall be used for temperature above 200 degree C or below 0 degree C.

## 7.2.2 LEVEL GAUGE GLASS

### Gauge Glasses

Glass gauges shall be avoided and magnetic type level gauges shall be used if suitable to process condition. If unavoidable Gauge Glasses shall normally be reflex type for all process services, except for boiler drums bicolour types shall be used, and in corrosive services. Where transparent gauges with glass protection and illuminators shall be used, Illuminators shall be explosion-proof in hazardous areas. Gauge glass columns will not exceed 1500 mm. Multiple level gauges shall be used for visible lengths more than 1500 mm.

Transparent type gauge glasses (double glass) will be used for services in which a level may not be distinguishable, such as interface services, between different liquids, where mica shields are required and fluids of high viscosity or high solid content.

For corrosive services, such as strong acids or alkalis, special devices such as magnetic followers or plastic ("Kelf") coated glasses shall be used.

Level gauges shall be supplied with a pair of off-set shut off valves with ball check with SS304, or material suitable to process, as its MOC.



For cold services where temperature is below 0 deg C a non-frosting gauge will be used. Glass tube level gauges shall be avoided.

Gauge glass columns will not exceed 1500 mm. Multiple level gauges shall be used for visible lengths more than 1500 mm.

## 7.2.3 Non Contact Radar/Guided Wave Radar

Displacer type level instrument shall be avoided and guided wave radar type shall be used in their place if suitable to process condition.

Ultrasonic / Radar type Instrument shall be used for large liquid storage tanks. Guided Wave Radar type level instruments, where used, shall be external type with side / side connections and rotatable transmitter head. Vent and drain valves shall be provided.

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Non-Contact Radar type level shall be used on corrosive, congealing, slurry services where diaphragm seal type transmitter cannot be used. Dip tube can be used in above services where radar cannot be used. In case of heavy congealing service (sticky liquid) rigid single lead type GWR shall be used. All guided wave radar will be coaxial type, where high accuracy or interface level measurement is required. However single rod design to be avoided to extent possible).

Guided Wave Radar Level transmitter shall be applicable for liquids or slurries, hydrocarbons too water- based media. In absence of dielectric constant for the process fluid, Bidder shall confirm the suitability of Guided Wave radar Level Transmitter for such applications and Bidder shall suggest the suitable model for the same. Bidder shall suggest the suitable model for Interface applications like oil on water, Hydrocarbon on water, etc. Electronics shall be capable of measuring upper liquid and interface level simultaneously. Selection shall be available for analog output signal from level transmitter corresponding to upper liquid or Interface. Process connections shall normally be 2” flanged with side-side connections.



For sump levels, Guided wave radar for DCS and non- contact type radar level instrument for interlock shall be used within accuracy  $\pm 3\text{mm}$ . For servo gauges where used, calibration chamber with access for removing the displacer for maintenance purpose shall be provided.

SS (or other material as per piping spec) Still Well shall be provided for Non Contact/Guided Wave Radar.

#### 7.2.4 Magnetic Level Gauges

Magnetic type level gauges shall be considered for:

- Cryogenic services
- Fluids that attack glass (e.g., strong acids, alkalies, boiler feed water)
- Light ends services
- Toxic services

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- Pressures above 500 psig (3450 kPa) special consideration must be given to the design of float for high pressure

Magnetic- type level gauges shall consist of a liquid chamber enclosing a float which is magnetically coupled to a rotary wafer-type indicator. It shall be top or side mounted type. The liquid chamber shall be one- piece construction with a minimum internal diameter of 50 mm, provided with a bottom flange for removal of the float, vent and drain connections. Indicator shall be adjustable around the chamber with provisions to indicate float failure.

The indication shall consist of bi-colour (red/white, silver/black) magnetic rollers mounted on outside the magnet chamber. As the float rises or falls with the liquid level each roller rotates 180 Deg and so presents a contrasting colour.

Floats shall be designed and manufactured for suitable to the process parameters. It shall be designed to be adequate for hydrostatic test conditions. Floats shall be hermetically sealed, no vented or pressure equalized construction shall be allowed.



### 7.3 PRESSURE INSTRUMENTS

#### 7.3.1 Pressure Transmitters

Pressure Transmitters and differential pressure transmitters shall be modern inherent motion-free type. Bodies shall normally be in stainless steel with pressure elements in SS316L. Two valve integral manifold of SS316L material in general shall be used with pressure transmitters.

The signal transmission should normally be a 2-wire system and shall be capable of delivering rated current into external load of atleast 600 ohms when powered with 24 V. Protection against short circuit and reverse voltage shall be provided. Pressure transmitters shall normally be electronic type and shall have digital transmitter.. Smart type transmitters will be used with Hart V protocol. Overall accuracy for SMART transmitters shall be +/- 0.050% or better. Process connection size shall be 1/2" NPT.

All field transmitters shall be 2 wire type, 24 Volt DC, SMART with HART protocol, and shall be equipped with Local LED type digital indicator. 2" pipe mounting, SS304 MOC brackets and other accessories, as applicable, Accuracy 0.050% of Span , Rangeability 1:100, Local Display configurable, SS MOC, Double Compression SS316 cable glands, Exib IIA/B/T6, IP67, Wetted MOC SS316L, SS316L MOC Manifold, Housing Die-Cast

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Aluminium .Epoxy Painted, Universal Hart Protocol with Latest Revision is required

### 7.3.2 Pressure Gauges

Gauges for process and utility services shall be industrial SS316L Bourdon gauge/diaphragm or spring bellows type as per process requirement with the case in 316L stainless steel. The gauge for 60 kg/cm<sup>2</sup> above pressure shall preferably be a safety type with solid front where pointer and glass are partitioned off from the sensor by a solid disc. Pulsation dampeners shall be installed with the gauges where pulsating pressure occurs. Process connection shall be 1/2" NPT (M) bottom in general. Bezel rings shall be screw on pattern. Dial Size minimum 150mm

Blow-out discs are required for all pressure gauges except for instrument air services.

Vibration proof gauges or remote seal type shall be used if the surrounding environment is subject to vibration.

Minimum accuracy for pressure gauges shall be +/- 1%,

Pressure gauges for vibrating services and near pump, shall be glycerine filled type or with pulsating dampener device with capillary of suitable length..

### 7.3.3 Pressure Switch (Not to be used)

### 7.3.4 Diaphragm seal



Diaphragms or liquid seals shall be inserted between the instrument and the process for corrosive or highly viscous fluids. For all services element material shall be minimum SS316L.

Pulsation dampeners shall be furnished with pressure transmitters on pulsating services.

All catalyst vessel's dP measurement shall be with ERS (electronic remote seal).

Remote Seal PT/DPT shall be with min 5 mtr Capillary with SS armoured in PVC sheath of Protection with DRIP RING and with SS304 Ball type Isolation Valve. For Vessel/Equipment requiring more than 5 m capillary electronic remote seal shall be provided

DP transmitters with diaphragm seals are envisaged, where condensing leg required to be filled in normal DP transmitters or across filters, at all those locations, remote seal

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type DP transmitters are to be used. Also, wherever there is a control and interlock on level measurement, one transmitter shall be remote diaphragm seal type and one will be guided radar type with Material: Minimum Inconel. Guided Wave radar may be used for non-critical applications. Process connection will be 3” flanged and sealing liquid must be selected as per process requirement.

## 7.4 TEMPERATURE INSTRUMENTS

### 7.4.1 Thermocouples

Thermocouples shall normally be the sheathed type with high purity magnesium oxide insulation. The hot junction shall be isolated from ground. Sheath diameter shall normally be 6mm (1/4”) Inconel 600 sheath material shall be used for design temperatures above 400 degree C, whereas ordinary SS material can be used below 400 degree C. The nominal wire diameter shall be approximately 0.19 x sheath OD. The casing material must be SS316L.

Inputs from thermocouples shall be provided with cold junction compensation and downscale burns out feature for high temperature shut downs and vice versa for low. A passive alarms shall warn about the burn-out.



In general type K thermocouples shall be used according to IEC 584, class-1. All temperature elements shall be duplex type, one connected and the second one shall be used as spare.

Thermocouple head must be of die cast aluminium with epoxy paint to with stand the corrosive environment.

Unless otherwise specified, thermocouples cable color coding shall be in accordance with the latest edition of ANSI-MC 96.1.

The type of thermocouple shall be selected based on the following guidelines as minimum:

Copper-Constantan (ISA-Type-T)	(-) 200 to 200°C
Chromel-Constantan (ISA-Type-E)	(-) 200 to 600°C
Iron-Constantan (ISA-Type-J)	(-) 40 to 750°C
Chromel-Alumel (ISA-Type-K)	(-) 180 to 800 °C

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NiCrSil - NiSil (ISA-Type-N)

0 to 1200 °C

Platinum Rhodium-Platinum (ISA-Type-S or B)

600 to 1600°C

#### 7.4.2 Resistance Temperature Probes

Resistance Temperature Probes shall be considered for applications where very narrow spans and high accuracy are required as well as low temperature service. They shall be 6mm (1.4”) stainless steel sheath type similar to the thermocouples and with a Pt 100 ohms (0 degree C) element. The sensors shall be duplex type and shall be spring loaded for vibration proof. The elements shall conform to DIN 43760 or IEC 751. The casing material must be SS316L. RTD head must be of die cast aluminium with epoxy paint to with stand the corrosive environment.

Class 'A' / Class '1' tolerance as per IEC 751 / 584-2 shall be specified for all RTD and thermocouple sensors in complete temperature measurements for all open/closed loops and interlocks/Logic.

#### 7.4.3 Temperature Transmitters

Temperature transmitters shall be Remote mounted type (on 2” Pipe), Smart with latest HART protocol and integral digital output meter, dual compartment type.

Head mounted transmitters shall not be used.

Conventional transmitter shall have universal input for thermocouple / RTD and output 4-20 mA DC for 2 wire system.



Transmitter output signal shall be linear and directly proportional to the measured temperature with overall accuracy of +/- 0.1% FS. TT body must be of die cast aluminium with epoxy paint to with stand the corrosive environment

Thermocouple transmitters shall have cold junction compensation and thermocouple linear characterization. Resistance temperature transmitters shall have resistance element linear characterization.

Burnout protection (selectable Up Scale / Down Scale) must be provided for all temperature transmitters.

No temperature switches are to be used. The same is to be achieved through transmitters which shall be directly connected as analog input to DCS / PLC.



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Temperature transmitters are to be provided for all temperature measurement (closed/open/interlock) loops. All process temperature measurements shall be done through Temp. Transmitters. No temp. Input shall be connected directly to ESD/PACKAGE UNITS. MUX is not allowed.

#### 7.4.4 **Thermometers**

Thermometers shall normally be bi-metallic, heavy duty, weatherproof (IP 65), adjustable angle connected type with 150 mm dial as a minimum, dials of smaller size may be used for auxiliary services on machinery. Casing material shall be SS316L.

Liquid filled indicators will be used only where indication is required to be remote Case and stem shall be in stainless steel. Dials shall be of white, non-rusting metal with black figures.

For local temperature control upto a maximum scale range of 530 deg C, liquid filled sensors with capillary extension shall be used.

Filled system instruments when used shall be fully compensated for ambient temperature variations.

Capillary shall be SS armoured and length of which will not generally exceed 3 mtrs.

Range should be selected so that normal operating temperature is approximately 70% of full scale, and the maximum expected temperature is approximately 90% of full scale.



#### 7.4.5 **Thermowells**

Thermowells shall normally be made from bar stock material.

Flanged thermowells shall be used of 1 1/2" size, threaded thermowells shall not be used, except where accepted by piping specifications, in such case they shall be 1" NPT(M) and real welded. Flanges rating, facing and material shall be in accordance with the equipment or piping standard. Thermowell flange rating shall be 11/2" 300# minimum.

Thermowell shall be used for thermocouples, bimetallic thermometers, filled system and for temperature test points (TW).

Thermowells in vapor-liquid applications, inside columns, shall be located in the liquid phase, unless otherwise dictate by process requirements.

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Test wells shall be equipped with threaded plugs and chains.

The preferred mounting position of thermowells, in horizontal pipelines, shall be in the upper half of the pipe.

For lines up to 2 inch size, the pipe shall be enlarged to 4 inches.

Thermowell material in general shall be of AISI 316L SS.

Immersion length of thermowells for different line sizes shall be as follows:-



<u>Line Size</u>	<u>Immersion length (U)</u>
4" to 6"	280 mm
8" and above	320 mm
Vessels	400 mm

Immersion length is based on 200 mm length between flange face and inner well of pipe and approx. 60% insertion in the pipeline. In vessels, where fouling with vessel internals is expected, the immersion length shall be suitably modified. Other sizes and immersion lengths may be considered based on special condition/actual requirements.

The design of the wells shall be verified by means of stress analysis, resulting from stream velocity condition. The wake frequency shall not exceed 66% of the thermowell natural frequency. Wake frequency calculation is required for all thermowells. Bidder has to submit Wake frequency calculations for all thermowells as per latest PTC 19.3. Velocity collars not to be used.

## 7.5 CONTROL VALVES

Valve types shall be selected, pneumatic diaphragm/piston operated globe, ball or butterfly shall be selected taking into account such factors as piping, operating and design conditions, fluid being handled, tangibility required, allowable leakage, noise and other special requirements. The valves shall have smart electropneumatic positioners of same OEM make as the valve. All control valves shall be provided with SMART valve positioner with valve position signal feedback connected to DCS system by 4 to 20 mA analog signal. It shall be HART compatible. Seat Leakage shall be chosen in accordance with process demands and safe operation of the plant and in accordance with AISI B16.104-1976. However, in general, the globe valves used shall be of class IV leakage

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minimum as per ANSI B6.104 in general. Metal seated valves shall be preferred instead of soft seated valves. Soft seat requirement shall be evaluated by PMC/Client on case to case basis. However, in general, the globe valves used shall be of class IV leakage minimum as per ANSI B6.104 in general. For vent services the leakage class shall be class V or VI depending upon process requirement.

Safety shutoff valves must not be used in throttling service during normal operation.

Noise abating devices shall be provided with valves where noise level at the outlet of valve at a distance of 1 metre all around is more than 85 DBA for valve which have operating times of 5 minutes or more in general and which are only working during start up and in upset conditions. For continuous operation the allowable sound level shall be 85 dBA. All noise abating plates, expanders, flanges, gaskets, studs & nuts shall be in the scope of valve manufacturer. The noise abating plates shall be of wafer design for easy removal for maintenance. Source treatment for noise shall be preferred over path treatment and for high noise vent applications “DRAG” type trim shall be specified.



All valve bodies shall be cast or forged. Stainless steel bodies shall be acceptable in place of alloy steel bodies, if not available, for low temperature application.

The valve body, positioner and actuator body material shall be suitable to corrosive environment. Suitable lining shall be provided inside wetted parts as per application.

Flanged bolted type gland packing boxes shall be used, unless other specified. Gland packing shall normally be self-lubricating type. Packing shall be PTFE type up to 200°C. For temperature above 200 °C, grafoil is to be used. Usage of asbestos is not allowed in any part.

Bellows seals shall be used wherever gland leakage is not permissible like toxic / hazardous product like carbon monoxide gas, etc.

As a minimum, trim MOC shall for all control/on-off valves shall be SS316L. By default, all Guide MOC shall be hardened stainless steel like 440 C, 17.4 PH. For erosion service, high pressure drop, cavitating service hard surfacing of plug and seat material, satellite shall be used for all cases as specified in above point 22.1. Special cases valve may require 17.4PH seat and 440C solid plugs or other material like Hastelloy, Monel, Zirconia, duplex steel, etc. for severe services like steam, urea grade, carbamate solution, acid, etc.

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Mechanical stopper shall be provided as per process recommendations for min. Flow condition.

On line replaceable trims shall be considered for all high pressure valves of butt-weld or socket weld connections. Trim characteristics shall be equal percentage, unless otherwise specified. For high erosion service or in steam service where, the delta P is higher than 5 Kg/Cm<sup>2</sup>, hardened trim with stellinging shall be used. When this alone is not sufficient, in such cases, special Anti-cavitating trim or shall be selected. In general, for all trims, hardened full stellinging shall be used, as a minimum.

All on-off valves shall be ball type on-off valves only. The ball valves of up to 4", 150# size shall be floating ball design with full bore design, unless otherwise specified. Other ball valves (higher size and rating) with higher size can be trunnion supported ball type design type.

For all shutdown valves on fire safe applications, air volume tank shall be supplied for the storage of air volume for minimum 3 stroke operation.

Oxygen service valves shall be de-greased completely and certified for oxygen service use. MOC for body shall be Monel and trim shall be Inconel 600 only.



Control / Ball valves bodies used in steam services should be A182 F22/ A217 WC9.

Split body design for ball valves acceptable where top entry ball design has not been considered for economical reasons. Mufflers shall be provided on ball valve vent air lines for noise suppression. Spring loaded seat and hard chrome plated ball shall be a standard feature for ball valves, in general. Wherever springs come into picture, vendor to ensure corrosion resistant spring steels are provided.

All control valves/ Actuators (pneumatic & Motorised) shall be painted with corrosive resistant paint. SS bug screen shall be provided for the exhaust ports.

All valve actuators shall be selected for a minimum operating air pressure of 4.0 kg/cm<sup>2</sup>. The actuators shall be diaphragm or piston actuators in general. Diaphragm actuators with single or concentric multi-springs shall be used. volume tank with airlock relay , booster relays shall be avoided as far as possible.

Rotary rack and pinion pneumatic actuators may be used with ball and butterfly valves for on-off services.

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In general, if otherwise not specified in the valve data sheet the time for full travel shall not exceed 10 seconds.

Wherever handwheel is required with a valve the same shall be side mounted type.

All split range functions for valve operations shall be carried out in control system and split range provision in valve positioners shall not be necessary.

Butterfly valve bodies shall be of wafer design. Lug type body shall be considered for size above 12". Face to face dimensions shall conform to ANSI B 16.10 and ANSI B 16.47 wherever applicable. Butterfly valves shall be used for high flow, low pressure drop below 10 kg/cm<sup>2</sup>.

All instrumentation butterfly control valves shall be triple offset type only.

Non destructive test like radiography, ultrasonic, die penetration and magnetic particle shall be carried out for cast and forged bodies conforming to procedures laid down in ANSI B16.34. Radiography or ultrasonic test, if not specifically mentioned in the data sheet, shall be carried out for cast or forged bodied of rating 900 lb. or above.

Valve bonnets shall be in general of bolted bonnet design as per ASME B 13.3 par 307.2 with minimum four bolts.

Smart E/P positioners with position transmitter along with valve signature software to be provided for all control valves. It shall be HART compatible, The software shall be provided for remote configuration and diagnostic analysis too.

Actuator sizing shall be done at 4 Kg/cm<sup>2</sup>.



Handwheel (Side-mounted) for All regulating control valves to be provided

By-pass valve provision shall be as per process licensor requirement.

The control valve % opening shall be at minimum flow 10-20%, for normal flow 50 to 70%, for maximum flow 75 to 85%.

All on – off application valve shall be fixed with necessary limit switches.

Valve Sizing shall be used on a maximum flow rate of approx. 1.5 time normal flow or 1.3 times the max. flow, whichever is greater, and the process conditions that exist at the increased flow (Pressure and differential pressure). Valve lift shall be approximately 70 %

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for equal percentage and 60 % for linear characteristic plug design at normal flow. It shall be checked that the calculated and the selected valve also covers start-up and stop conditions. In cases where over sizing shall not apply, it will be specifically mentioned in the Instrument Data Sheets.

The fluid velocity at outlet flange shall not exceed 6 m/sec for liquids whereas the velocity of gas or vapor shall not normally exceed 0.3 Mach under operating conditions. To meet this, valves shall be selected having reduced trim, labyrinth plug or cage trim as manufacturer standards.

Bidder shall submit the sizing calculations for all control valves.

Face to face dimensions of the control valves shall be as per ANSI/ISA-S75.03.



Direction of flow indication shall be engraved or embossed on the body.

Stroke time of the antisurge valves shall be 2-3 seconds and for critical services shall be as defined by process licensor or as mentioned in individual data sheet.

#### 7.5.1 **Control Valve Test and Inspections**

Valves shall be tested in accordance to individual specification which shall cover but not limited to:

- Visual Inspection and dimensional check
- Liquid Penetrants examination on stellite coating as per ASME B16.34 ann D.
- Radiographic, ultrasonic, magnetic particle as per ASME B16.34
- Hydrostatic Body Test - Duration 3 min. (including all parts in assembled condition like body, gland, all joints)
- Impact test
- Seat leakage test as per ANSI B16.104/FCI 70.2
- Performance tests and Functional tests
- Leakage test from actuators and seals and packings
- Diaphragm head test

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- Complete actuator leak test
- Helium leak test for control valve with bellow seals
- Stroke calibration
- Stroke speed test

### 7.5.2 Limit switches / Position Switches:

- 7.6.2.1 All type of limit switches shall be 2 wire, proximity type, intrinsically safe certified. Limit switches shall be provided both for close and open positions for all shutdown valves.
- 7.6.2.2 The make shall be P+F only. The sensor shall be generally cylindrical NAMUR sensor type proximity switch. The diameter and sensing range shall be selected based on application.

The MOC of sensor shall be SS316 or acid resistant body.



All limit switches sensor shall be adjustable with the threaded length and check nut arrangement.

Flying lead type loose connections for NAMUR sensors are not acceptable. All these NAMUR sensors installed on any instruments to sense the position shall be housed in a closed box certified for weatherproof to IP65. The gland size shall be ½” NPT(F).

- 7.5.2.3 All ON-OFF type application valves taking in part in interlock/shutdown shall be provided with Open and Close type NAMUR sensor as limit switches. The sensors along with enclosure shall be installed in control valve in such a way that it can be removed with ease for maintenance.
- 7.5.2.4 Limit switches shall not be used for Control Valves.

### 7.5.3 Actuators

- 7.5.3.1 Generally, control valve actuator shall be of the spring and diaphragm, pneumatically actuated type. Standard air control signal to positioner shall be 0.2 to 1.0 kg/cm<sup>2</sup>g. For larger dP shut offs, higher spring range/higher areas shall be considered.
- 7.5.3.2 Actuators shall be single acting type for all valves.
- 7.5.3.3 All valve actuators shall be designed with 1.5 times factor of safety.

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7.5.3.4 Piston type actuators (spring return type) with or without fail-safe capacity tanks (minimum of 2 strokes to be possible in case of air failure) shall be considered for high-pressure drop services or if actuator force requirements fall beyond the normal range of diaphragm actuators. All actuators shall be adequate to fully stroke the valve under the maximum differential pressure specified by the process requirements.

7.5.3.5 Air filter Regulator filter to be 5 micron. Miniature type, SS316L body & drain assembly etc as parts of air filter regulator are not acceptable.

7.5.3.6 Actuators must be painted with corrosion resistant paints and all its springs must be corrosion resistant spring steels. SS bug screen shall be provided for the exhaust ports.

## 7.6 PRESSURE RELIEVING DEVICES

### 7.6.1 Pressure Relieving Devices

All Pressure Relieving Devices shall be sized in accordance with applicable local and national code requirements. Formulas shall be in accordance with API RP 520, 1990 and ASME Codes section I and VIII.

7.6.1.1 Percent Overpressure and Accumulation used in calculation of sizes of relieving devices shall be :

Overpressure

3% - Steam services where ASME Power Boiler Code applies.

10% - Gas or Vapour service.

15% - For liquids and pump discharge lines with 6% system accumulation (Power Boiler Code) and with 10% system accumulation (Pressure Vessel Code)

21% - Fire exposure on unfired pressure vessels.



10% - Liquids for thermal relief of pipelines or vessels Accumulation

10% - Gas , Vapour and liquid where ASME Pressure Vessel Code applies

16% - Gas , Vapour and liquid where ASME Pressure Vessel Code applies and the system is protected by means of multiple valves.

### 7.8.1.2 Nomenclature



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Nomenclature used shall be in accordance with API RP 520.

### 7.6.1.3 Safety and Relief Valves

Safety and Relief Valves shall normally be direct spring loaded type. Balanced bellows valves shall normally be furnished for relief into closed flare and slowdown systems, if the developed back-pressure exceeds 10% of the set pressure. Bellows shall also be specified where leakage of gas from the seals are not permitted during normal plant operation. Steam jacketing may be considered necessary to keep some valves and lines warm at all the times to avoid the solidification of the lading fluid.

Full nozzle types of valves shall be specified for sizes 1" or above.

Test gags shall be furnished on all safety and relief valves. Test gags shall be removed and transferred to Owners possession after testing, clearly labelled with the tag number of the valve.

Lifting levers shall be furnished for exposed spring bonnets on valves on steam and hot water services, on air valves and hot water service valves with closed bonnets.

Bonnet construction shall be plain closed bonnet for toxic and inflammable gases as well as vapour and liquids. Exposed bonnet shall be specified for steam service and in Boiler feed water service above 200°C. Bonnet extension shall be used above 400°C.



Springs shall be of carbon steel for normal process operating temperature of (-) 25°C to 200°C and tungsten alloy or high temp. alloy steel above 200°C. Stainless steel spring may be used for services below (-) 25°C. Carbon steel is permitted above 200°C for open bonnets.

Blowdown shall be between 5% to 7%. For steam services under Power Boiler Code as per ASME the blowdown shall be 3% - 4%

All connections shall be flanged in general with facing and rating in accordance with the piping specification or API 526 whichever is higher.

Centre to Centre dimensions shall be in accordance with API 526

### 7.6.2 Rupture Discs

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Rupture discs may be used in lieu of or in combination with safety and relief valves, where applicable or required. For disc rupture trip or alarm disc shall be with bursting sensors.

### 7.6.3 **Pressure and Vacuum Relief Valves**

Pressure and Vacuum Relief valves for storage tanks shall normally be of the weight loaded or pilot operated type, and sized in accordance with API RP-2000 Tank Venting Code, or Local Codes if they govern.

### 7.6.4 **Thermal Relief Valves**

For thermal relief of accumulated liquids in pipelines and vessels 1" x 2" size valves shall be used in general.

### 7.6.5 **Centre-to-Face**

Centre-to-face dimensions shall be in accordance with API 526.



## 7.7 **SWITCHES AND SOLENOID VALVES**

### 7.9.1 **Switches**

Process switches, shall be realised through field transmitters only. If for some packages, process switches are unavoidable same shall be provided with sealed micro switch contacts rated for the specified application. Contacts shall be 1 no. DPDT preferably. Otherwise 2 nos. SPDT can be considered. All switch contacts except those used in intrinsically safe circuits shall be silver plated. Contacts used in intrinsically safe circuits shall be suitable for the applications. Switches shall be hermetically sealed type. Switches shall be connected through interposing relays.

### 7.7.2 **Solenoid Valves**

Solenoid valves shall normally be used to actuate other instruments/valves connected directly to the process. The SOVs shall be SIL3, direct acting type (3/2 external pilot operated, universal type, low power intrinsic safe type, with manual override and LED indication). Protective enclosure shall be IP 67 and the coil insulation H class or better suitable for continuous operation in 85 degree C ambient temperature (max. surface temperature in sun) for outdoor service. Body materials shall normally be stainless steel 316. Solenoid valves will be powered by 24V DC or through barrier, insulation class 'H' and orifice size 9 mm. The D.C. solenoids shall not have in built rectifier to operate with

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A.C voltage. The d.c. solenoids shall be used as an alternative to A/C solenoids only for low current intrinsic safe operations.

All solenoid valves shall be fitted with 1/2" NPT (F) SS 316 double compression cable gland connection. The cable entry should be from bottom only and solenoid coils must be hermetically sealed. SS bug screen shall be provided for the exhaust ports. The sealing medium of the SOV's will be EPDM or better (will be discussed during the detailed engineering).

## 8.0 CONTROL SYSTEM

### DESIGN CRITERIA

#### EXPANDABILITY

Systems shall be designed with 20% installed pre-wired spare capacity for all I/O type cards of each category for project development. The sparing supplied shall be for "complete loop"; i.e. corresponding marshalling, power supply, terminals/barriers, interposing relays, pre-fab cables other accessories, etc. and its space, and panel cut outs where appropriate, etc.

To allow for future expansion 20% spare capacity shall be allowed & terminated in multi core cables, junction boxes, marshalling racks, etc,



Communication networks and cables shall have a spare load capacity of 50% as a minimum.

Plant wide networks shall have a node connection spare allowance of 50 % as a minimum.

Local networks shall have a node connection spare allowance of 30% as a minimum.

#### Operators' Keyboard

This shall be used by plant operators along with each Operator station display unit for operation of the plant. It will have multiple assignable keys to directly open pre-programmed display as well as few other system typical templates for selected tags including controller group display, trend, configuration display, alarm summary pages, etc. There shall be both numeric and alphabet keys and dedicated function keys on membrane type operator keyboard each of which must be freely programmable. There shall be one no. of operator keyboard with each of the operator stations.

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This shall be membrane type fully dust proof and spill proof & corrosion proof.

Key lock switch / password switch shall be provided for operator/supervisor/engineer security levels.

Dummy Consoles/Filler Panels shall be provided to maintain aesthetic and mounting instruments like indicators, annunciators etc. as well as for push buttons, lamps, key switches, paging system hardware.

Entry into the Marshalling Panels shall be through SS316 ET double compression cable glands only.

## PLC CONTROL SYSTEM

### 8.1 General

The operation and control of Plant shall be through Process PLC based Control system. The system shall be microprocessor based programmable logic control (PLC) with fault tolerant redundant processors based on DMR/TMR technology.

The PLC will be used to provide protection and controls for the entire plant.

Following minimum functions are provided on the OS (Operator station).


1. Area wise display of the plant.
2. Operation of the plant from the OS.
3. The schematics will be having dynamic parameters like valve open / close and motor running/ fault indications

The Control system shall perform any of the following functions for safety of the plant from control room.

- Total Shut Down
- Unit Shut Down

It will perform following functions also:

- Data Display
- Process Control
- Process and system alarms

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Logging

Real Time trends & Historical trend

Dynamic Graphics

Report Generation (shift, daily, weekly, monthly and on demand)

System diagnostics



The following shall be adhered to while selecting the TMR/DMR system

- a) TMR/DMR CPU's shall be applied.
- b) If a CPU fails, the other(s) shall continue to operate. Single CPU operation system to be certified to operate without any time limitation of faulty CPU repair.
- c) TMR/DMR buses shall be applied.
- d) TMR/DMR analogue inputs and outputs shall be applied.
- e) TMR/DMR digital inputs shall be applied.
- f) TMR/DMR digital outputs shall be applied.
- e) Redundant communication interfaces shall be supplied.
- f) Redundant Power supplies (at least three in parallel) shall be supplied.
- g) In the event of a failure of a fault tolerant component, power supply or other function, of the system shall change over to "single mode" operation without causing nuisance trips and also generate alarm on Operator and Engineering console.
- h) In case of failure of complete processor system, i.e., system outputs shall take fail safe state automatically unless otherwise specified.

Operator interface for critical trips shall be mosaic display with illuminated push button for trip, reset, inactivation etc. and LED indication for each element of trip & actions.

The operator will be informed about a trip situation by a warning sound (to be different from the audible signal from the alarm system), and a LED display will clearly inform about the alarms in trip position. The first up alarm will flash.

Scan time shall be maximum 250 msec. CPU loading shall not exceed 50%, Bus Communication modules, Power Supply and I/O cards shall have 100% redundancy

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and fail safe certification.

### **System Redundancy**

Following system redundancy shall be available as a minimum.

- |   |     |
|---|-----|
| 1. Controller<br>(CPU for control, I/O communication,<br>network communication)                       | 1:1 |
| 2. Communication Bus  | 1:1 |
| 3. I/O communication modules with CPU<br>(I/O bus between CPU and I/O<br>with all necessary hardware) | 1:1 |
| 4. Main data highway  | 1:1 |
| 5. Communication Cards  | 1:1 |
| 6. System Device  | 1:1 |
| 7. Power supply   | 1:1 |
| 8. (Power supply for all CPUs,<br>9. I/O power supply modules)  |     |
| 10. History   | 1:1 |
| 11. Modbus/Serial interface   | 1:1 |
| 12. OPC server: OPC server, If applicable shall have RAID-5 configuration with firewall.              |     |
| 13. System server (for server based PLC): Redundant (1:1 redundancy)                                  |     |


However, lamp drive cards, supporting mosaic need not be redundant also. Active isolator/barriers need not be certified for fail safe operation.

The operator can bypass trip alarm inputs, which may be necessary in abnormal situations. A lamp shall indicate that the trip alarm is inactivated. The operator will be warned by sound and fast flash if the inactivated circuit goes in alarm status.

The system shall include an event recording system, and it shall be considered to store about 500 events. The system should have SOE backup facility for 30 days. Sequence event recorder (SOE) of 1 msec, resolution to be envisaged.

Display colours shall be in accordance with the following:

- |  |          |
|--|----------|
| Alarm and Trip (safety operations)                 | : Red    |
| Pre-alarm for trip (safety operations)             | : Orange |
| Indication for by pass of trip (safety operations) | : Red    |
| Equipment in operation (alarms and pilot lights)   | : White  |

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Ready (standby of equipment) : Green

The critical trip shall be displayed on a separate graphics available in control system.

All Emergency stop and manual start/stop push buttons shall drive an interposing relay located at IRC. For all critical electrical drives (list will be discussed separately during detailed engineering), the spare contact of final DO command from PLC going to MCC, must be connected as DI into PLC and configured in SOE for confirmation of command to MCC from PLC.

Consumables like printer paper, cartridges, fuses etc shall be supplied along with the PLC control system for a minimum period of one year duration.

#### 8.1.1 PLC requirements

a) All systems' all cards shall be supplied with ISA G3 level or equivalent coating for environmental protections.

b) ISOLATIONS

Analog I/Os to Field : Galvanic Isolation through safety barriers

Analog I/Os Module : Channel to Channel Galvanic Isolation

If individual channel to channel isolation is not available with system vendor, then only Isolation shall be provided in a group of 4 channels as per system vendor design.



Digital Input to Field : barriers + optical isolators on cards

Digital Output to Field : Interposing relays + smart barriers for monitoring purpose

c) PANELS:

All panels shall be either 1200 mm (wide) x 800 mm ( depth) x 2100 mm ( height) or as a special case 600 mm( wide) x 800 mm ( depth) x 2100 mm ( height), RITTAL make, with 100 mm black powder coated metal base frame and with colour shedding of RAL7032 ( Siemens Grey) and removable gland plates at bottom only. This applies to all types of instrument panels to be used in the whole project like various PDB, Electrical / Instrument panels, Third party device panels, etc.

d) All A/D converters of system I/O cards shall have resolution of min. 13 bits and all

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D/A converters of system I/O cards shall have resolution of min. 10 bits

- e) There shall be 20% installed spares minimum 1, installed and wired capacity for I/O cards of each category in DCS, including all peripheral termination modules, prefab cables, Relays, Safety barriers, etc
- f) All marshalling and system panels shall have minimum 20 % wired spare capacity for future expansion (should be possible with the same wiring philosophy.)
- g) I/O cards' Channel density shall not exceed the following limits:

Analog Input	16 Channels
Analog Output	16 Channels
Digital Input	32 Channels
Digital Output	16 Channels
- h) Process override switches (POS) shall be soft type.
- i) All interlock and control transmitters shall be separate right from field junction box to marshalling panels
- j) Those parameters, which are directly or indirectly tripping the plant or may cause production loss, shall be wired with 2 out of 3 transmitter trip voting interlock in PLC. There shall be three separate analog input channels in three different cards. AI cards shall be used for this purpose in system. Same thing is applicable to Digital inputs also including emergency stop and compressor stop DI's.



## 8.2 DCS CONTROL SYSTEM

The control system shall be a modern Digital Distributed Control System (DCS) located in the Central Control Room. The system shall be reliable, fault tolerant and build up in modules from the suppliers' standard components and software. The system shall have facilities for plant control monitoring, alarm handling, shutdown & trip functions. It shall be self- diagnostic, self documenting and contain all the functions necessary for advanced regulatory control and trip functions.

Display colours shall be in accordance with the following:

Alarm and Trip (safety operations) : Red



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Pre-alarm for trip (safety operations) : Orange  
Indication for by pass of trip (safety operations) : Red  
Equipment in operation (alarms and pilot lights) : White  
Ready (standby of equipment) : Green

The critical trip shall be displayed on a separate graphics available in control system.

All Emergency stop and manual start/stop push buttons shall drive an interposing relay located at IRC. For all critical electrical drives (list will be discussed separately during detailed engineering), the spare contact of final DO command from control system going to MCC, must be connected as DI into control system and configured in SOE for confirmation of command to MCC from control system.

The control system shall comprise racks with I/O devices, control cards, CPU cards, hard disk, system buses, and required number of operator stations with colour video display units (VDU) with dynamic graphic generation capabilities to ensure complete access to the process during normal operation, start-up, and upset conditions. The operator shall use dedicated operator keyboards to manipulate the DCS.


The DCS shall have the following main components. Detailed specifications of each of them are given in subsequent sections. The system shall be 100% fault tolerant and dual redundant, except the redundancy at I/O cards levels. This means, all central control processors, all communication processors and all other central rack and individual node's common cards, all the communication cards, networks and cables, etc. shall be 100% fault tolerant and dual redundant, except individual IO cards of the system. All the system hardware of DCS shall have ISA G3 level corrosion protection. Since redundancy at I/O card level is not envisaged, the failure of a single card from complete system shall not affect more than the I/Os supported by that particular I/O card. It means all the hardware except I/O cards shall be 100% fault tolerant. All the hardware including control/communication processors, networks, cables, all type of system cards, all type of I/O cards shall be hot replaceable.

All operating consoles for control system shall be located inside the central control room but their I/O units, marshalling cabinets, power distribution cabinets and engineering station shall be housed in the adjacent room.

### **DCS Functions**

The DCS will perform, as a minimum the following functions:

Data Display

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Process Control & Trip/Interlock  
Process and system alarms  
Logging  
Real Time trends & Historical trend

Dynamic Graphics  
Report Generation (shift, daily, weekly, monthly and on demand)  
System diagnostics

Trend: All the critical parameters (Temperature, flow, pressure, level, speed, vibration etc) as well as the Closed loops (PV,LV, MV etc) the trend shall be recorded for every 1 second with the back up of minimum 4 days. Recording shall be on FIFO basis.

#### 8.2.1 Data Storage and Retrieval

Data storage and retrieval will be provided on hard disc and on DVD or DAT. The trend shall be recorded as follows:

Analogue signals

Last 3 days	Every 1 second.
Last 7 days	Every 1 minute.
Last 45 days	Every 1 hour
Last 1 year	Shift averages
Last 2 years	Daily averages
Alarms	Last 48 hours (Minimum)



#### 8.2.2 DCS Operator Interface

For Details of OS/ES please refer Annexure -3 System configuration

One Emergency Stop push button station directly wired to MCC, should be provided for all critical drives (if applicable). The spare contact of this emergency push button must be mapped to DCS/PLC as a DI contact for SOE punching. All emergency push buttons and stop push station must be provided with transparent safety covers.

#### 8.2.3 Process Controller Cabinets

The process controllers will contain the microprocessor based system capable of combining continuous, sequential and discrete functions in order to the requisition of analog and discrete signals, sequential and continuous control.

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The process controller cabinets shall/may have incoming and outgoing cable marshalling facility. All field cables shall be terminated in marshalling cabinets in single tier WAGO make cage clamp type terminals. Isolators shall be provided for all intrinsic safe input and outputs. All thermocouple signal wiring from terminal to respective isolator/input card shall be through extension wires corresponding to the type of thermocouple element used. The signal I/O cards may also be installed in Process Controller Cabinets. Some marshalling/I/O racks may be installed in remote safe areas by extending the system bus, especially in MCC rooms where lot of inputs from drives shall directly be terminated in the marshalling I/O racks.

#### 8.2.4 **DCS Redundancy Philosophy**

In order to increase the system availability and then the continuity of plant operation, redundancy shall be provided as follows:

100% fault tolerance and dual redundancy in DCS shall be for Controller cards, all communication cards and buses, all control buses, all type of common cards in the system, all power supply modules, all I/O modules for closed loops and interlock I/Os, buses, Ethernet modules. The failure of any single I/O module for open loop shall not affect more than the channels being catered by that particular I/O card. Dual redundant power supply modules for each dual redundant controller shall be dedicated.

#### 8.2.5 **Multiloop Controllers and Input/Output Cards**



All multi loop shared controllers will be redundant with 1:1 redundancy. The control processors shall be of fault tolerant type and both shall be active with cyclic changeovers. All I/O cards for close loop applications shall be capable of holding the last value in case of open condition of input. Input cards for specific open loop inputs used for calculation functions must also be capable for holding the last value. As otherwise the same function shall be built up in DCS software.

#### 8.2.6 **I/O Segregation:**

The I/O card segregation for DCS shall be as per physical units of the plant.

#### 8.2.7 **Controller Loading**

Each Controller loading shall not exceed more than 50% (hardware and software load of

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each controller) in any case, after implementation of complete project and running at peak load. In case more controllers are required to meet 50% loading criteria, CONTRACTOR to include additional controllers without any cost implication.

#### 8.2.8 DCS requirements

- a) All DCS/ESD systems' all cards shall be supplied with ISA G3 level or equivalent coating for environmental protections.
- b) All digital output from DCS and ESD shall drive interposing relays of OMRON make, 4 Change over (4 NO/NC) with socket mounted relays with LED indicators and built in surge suppressor. The contact rating shall be minimum 230 V AC/ 5 amps. Any DO Channel from DCS/ESD shall not be directly connected to any devices without interposing relays.
- c) DCS shall be a large and expandable type system available with the vendor.
- d) The system architecture shall be compliant to IEEE 802.XXX with dual redundant and 100% fault tolerant BUS/RING topology. System shall be fully open with DDE/OPC&ODBC compliant. System availability shall be better than 99.95%.
- e) DCS and ESDS I/O cards channel density shall be as per following:

I/O cards' Channel density shall not exceed the following limits



Analog Input	16 Channels
Analog Output	16 Channels
RTD/T/C Inputs	16 channels
Digital Input	32 Channels
Digital Output	DCS-32 Channels /ESDS-16 Channels

- f) All I/O cards in individual category shall be of same type/model/revision only. No diff bulk I/O cards or I/O cards with degraded features shall be accepted in any of the category in a mix mode supply.

#### g) ISOLATIONS

Analog I/Os to Field : Galvanic Isolation through safety barriers

Analog I/Os Module : Channel to Channel Galvanic Isolation

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If individual channel to channel isolation is not available with DCS / ESDS vendor, then only Isolation shall be provided in a group of 4 channels as per DCS / ESDS vendor design.

Digital Input to Field : barriers + optical isolators on cards

Digital Output to Field : Interposing relays + smart barriers for monitoring purpose

h) PANELS:



All panels shall be either 1200 mm (wide) x 800 mm ( depth) x 2100 mm ( height) or as a special case 600 mm( wide) x 800 mm ( depth) x 2100 mm ( height), RITTAL make, with 100 mm black powder coated metal base frame and with colour shedding of RAL7032 ( Siemens Grey) and removable gland plates at bottom only. This applies to all types of instrument panels to be used in the whole project like various PDB, Electrical / Instrument panels, Third party device panels like wood word digital governors, Bentley Nevada system hardware panels, etc.

- i) All A/D converters of system I/O cards shall have resolution of min. 13 bits and all D/A converters of system I/O cards shall have resolution of min. 10 bits
- j) There shall be 20% installed spares minimum 1, installed and wired capacity for I/O cards of each category in DCS, including all peripheral termination modules, prefab cables, Relays, Safety barriers, etc
- k) All marshalling and system panels shall have minimum 20 % wired spare capacity for future expansion (should be possible with the same wiring philosophy.)

**DCS System Redundancy**

Following system redundancy shall be available as a minimum.

- a. Controller (CPU for control, I/O communication, network communication) 1:1
- b. Input / output cards closed loops redundant
- c. Communication Bus 1:1
- d. I/O communication modules with CPU (I/O bus between CPU and I/O with all necessary hardware) 1:1
- e. Main data highway 1:1

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- f. Communication Cards 1:1
- g. System Device 1:1
- h. Power supply 1:1  
(Power supply for all CPUs,  
I/O power supply modules)
- i. Serial (RS-485) Modbus (For Interlock PLC) 1:1
- j. In case of client-server system, 1:1  
server shall be redundant (Raid-6 Configuration)

I/O bus and I/O interface card at controller rack shall be redundant

Connectivity from Upstream redundant device to downstream redundant device shall be through redundant device or cable.

**Loading philosophy ( with 20% installed spares and 20% future expansion)**

Control Processor	50%
Communication Processor	50%
Communication Bus	50%

**8.2.9 Scanning Time**

not more than 250 msec.



**8.2.10 Other requirements**

**Operators' Keyboard**

This shall be used by plant operators along with each Operator station display unit for operation of the plant. It will have multiple assignable keys to directly open pre-programmed display as well as few other system typical templates for selected tags including controller group display, trend, configuration display, alarm summary pages, etc. There shall be both numeric and alphabet keys and dedicated function keys on membrane type operator keyboard each of which must be freely programmable. There shall be one no. of operator keyboard with each of the operator stations.

This shall be membrane type fully dust proof and spill proof & corrosion proof.

Key lock switch / password switch shall be provided for operator/supervisor/engineer security levels

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Dummy Consoles/Filler Panels shall be provided to maintain aesthetic and mounting instruments like indicators, annunciators etc. as well as for push buttons, lamps, key switches, paging system hardware.

Entry into the Marshalling Panels shall be through bottom mounted MCT blocks.

#### 8.2.11 Consumables

One No. Spares like printer cartridges with each printer to be provided.

#### 8.3 System Cabinets

##### 8.1 Interlock Marshalling Cabinet

Marshalling cabinet(s) are foreseen for both incoming to Interlock system and outgoing from Inter ('from' and 'to' field) termination. The interlock marshalling cabinet(s) shall also accommodate the repeater power supplies for the field transmitters, galvanic isolators for all inputs, trip amplifiers, output relays etc.



The termination strips shall be arranged or grouped for inputs/outputs 24VDC, 115VAC, etc. both for inputs as well as outputs.

The terminals shall be of the Wago/weidmuller/Phoniex /Klippon make screwless, cage clamp type, single tier design (double tier design shall be avoided). Terminal stack for each unit shall be supplied with approx. 20% extra terminal points as spare/future provision in addition to the existing inputs and outputs.

Physical separation between the terminal stacks/points shall be maintained for the intrinsically safe and normal termination. Also the termination area shall be physically separated from the electronics area there by sealing the latter from dust ingress.

#### 8.4 Sequence of event (SOE)

Bidder shall provide the Sequence of event recorder function, with a time resolution not above the machine scanning time. This information shall be available, for archiving, filtering and visualization operations to the SOE which shall be feature of ES station. (I.e this feature to be provided in Engineering station) located in the Engineering room in, to aid in diagnosis and recognise the first cause of plant or equipment shut-down.

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Sizing of the system bulk memory capacity shall be done considering for SOE activities a rate of 500 events/day (or shall be discussed during detail engineering).

The SOE package of the offered system must have facility to generate a separate SOE file for critical event trips that is all important events just before and just after tripping event.

Time stamping of the SOE must be generated directly from the controller and it must be as latest ISA standard.

### 8.5 System Clock

The DCS/PLC control system clock shall have facility for synchronising with a Main plant DCS through hardwire DI signal. Bidder shall consider Ethernet port/TCIP for synchronising to Master GPS clock. Additional hardwired or communication connections / networks between DCS/PLC control system and Main plant DCS shall be consider by the bidder.

### 8.6 Power Supply

All instrumentation shall be fed by an Uninterruptible Power Supply (UPS) system.

An uninterrupted Supply to DCS/PLC system shall be provided to the power distribution cabinet of DCS/PLC system at 115VAC +/- 10%, 50Hz +/- 3%. UPS feeders from ACDB to DCS/PLC loads shall be redundant whereas UPS feeders for Non-Control system loads shall Non-redundant, The Contractor shall prepare a list Non-Control system UPS load requirement.



110 VAC UPS Power supply feeder failure alarm before PDB shall be provided in DCS/PLC by using double pole MCB in PDB. One contact of these MCBs shall be wired to DCS/PLC for alarm purpose

In case rectification to DC is involved, rectifiers shall be dual redundant and both shall be 'hot' (on line) so that failure of one rectifier will not cause a system trip. Provision shall be included in the system to annunciate the rectifier/DC power supply failure.

24V DC power supply

- i) 24 VDC power supply required for interrogation voltage, solenoid valve supply, lamp, pushbutton, etc and for other packages shall be supplied by contractor using dual redundant Bulk Power Supply (BPS).



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- ii) Each redundant bulk power supply shall be sized for maximum 50% loading of its capacity in normal time; the maximum loading is to be 70% of its capacity of BPS.
- iii) All bulk power supply (BPS) shall be provided with surge protection capability. BPS shall also provide with cooling fans and with fan failure alarm indications in DCS/PLC system.
- iv) Each BPS shall be provided with Mosfet based redundancy with auto-current balancing and equal loading on both PS.
- v) Power supply & redundancy module shall be same make .
- vi) Current output (4 to 20 mA) shall be available from the power supply unit and the same shall be wired to DCS for Power supply health monitoring and indication from all BPS.

Philosophy of power isolation and over load protection (switch fuse units) or only over load protection shall be extended upto individual card level, while designing the system, so that, minor card failures can be localised for easy rectification. Also this will avoid major down time on the system.

Earthing /Grounding bus bars for terminating shields of the cables shall be provided on the cabinet.

Power supply (For all DCS/PLC and Vendor Packages):



All BPS Failures shall be connected to DCS/PLC as a separate DI signal.

All MOSFET O rings Failures shall be connected to DCS/PLC as a separate DI signal.

All power feed Modules shall be connected to DCS/PLC as a Separate DI signal.

All MCB healthiness feedback shall be connected to the DCS/PLC as a Separate DI signal. Silver/Cu/humidity/temperature monitoring shall be with 2 nos. of C/R with indication in DCS/PLC.

Healthiness of BPS/MOSFET O ring must have LED indications for indicating the healthiness of the module locally. 110 V AC and 24 V DC supplies must have current and voltage transducer wired to DCS/PLC.

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### 8.7 Annunciator

The Annunciator display stations will consists of:

- LED Lamps
- Split type architecture with lamps and electronics separate
- All connections with interlock system cabinet and interlock marshalling cabinet shall be through plug in connectors.
- About 20% spare capacity shall be there
- All switches and status lights indicated below shall be an integral part of Display Modules.
- Supply shall include mounting accessories and about 20% of unassembled extra LED lamps

### 8.8 Precision & Accuracy

The isolator, repeater modules/trip amplifiers for analog inputs shall have a total accuracy of less than 0.2% of full span for the measurement circuit.

The accuracy and stability for thermocouple trip amplifiers, if applicable, shall be +/- 0.5%.

### 8.9 Control System Spare Philosophy:



Installed Spares	I/O Level	20%
	Marshalling	20%
Spare Space	I/O Level	20%
	Processor	50%
	Marshalling	20%
	Rack	

### 9.0 LOCAL CONTROL PANELS

All local panels under the scope of package vendor shall follow the minimum specifications listed below:



9.1 Panels shall be suitable for acidic environment. Sealings of the panel will be Silicone/EPDM or better, which will be freezed during detailed engineering.

9.2 Panel shall be free standing close cabinets, constructed in sections of min. 1000 mm wide. The panel construction shall be welded or bolted frame construction with upright

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and and additional framing in modular construction. The panel front sheet thickness shall be min. 3 mm. The front of panel shall be stiffened where necessary with profiles tack welded to the rear. Top, sides and doors can be made out of 1.6 mm thick plate.

- 9.3 The panels shall have environmental protection conforming to IP 55 min.
- 9.4 Instrument air shall be provided for purging of local panels.
- 9.5 Panel face, sides and doors shall be sand blasted and cleaned before primer and two coats of paints are applied. The colour of paint shall be bright grey. The final surface shall be semi mat, free from blemishes and paint runs.
- 9.6 115V A.C. +/- 10%, +/- 3% Hz power at one point to the local panel shall be provided by the client. Any other voltage level if required preferably 24 V, DC, the same shall be arranged by the vendor. Redundant rectifier units shall be provided for the generation of d.c.by the vendor.
- 9.7 Earthing lugs for both power and system earthing shall be provided by the vendor.
- 9.8 The wiring shall preferably contained in polymer ducts. Instrument safe wiring shall be laid separately from others. The colour of IS wiring shall be light blue.
- 9.9 WAGO type cage clamp type terminals shall be used for cable termination and wiring. 20% terminals shall be kept as spares in each terminal strip and box.
- 9.10 Gland plates shall be provided alongwith cable glands (ex. proof wherever required) in each panel for cable termination.
- 9.11 A miniature circuit breaker shall be provided for each power supply with DI contact wired to system.
- 9.12 All panels shall be provided with vibration dampening pads.
- 9.13 Each panel section shall be provided with illumination level of 300 Lux min.
- 9.14 Name plate/labels shall be provided for each panel mounted instruments, equipments and accessories mounted in the front or rear of the panel.
- 9.15 Purged panels shall be provided with purge fail alarm. Purge fail trip shall be provided with a bypass switch

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9.16 The panel must have all necessary push buttons, LED displays, field mounted displays for all relevant process parameters (may be mounted separately near panel, if required)

9.17 The compressor status/ Unit operation must be clearly visible from the local panel.

## 10.0 PNEUMATIC TRANSMISSION

### 10.1 Output Signal

Output signal from all pneumatic transmitters shall be 0.2-1kg/cm2g.

### 10.2 Pneumatic Receiver Instruments

Pneumatic receiver instruments shall have receiver elements design for 0.2-1 kg/cm2g input signal.

### 10.3 Pneumatic Transmission Tubing

Pneumatic transmission tubing for local transmission shall be ½”or ¼” OD stainless steel tubing with SS316 fittings (inch).



### 10.4 Instrument Air

Instrument air required is available at 6.5 kg/cm2g and max. 70 degree C. However, the air pressure can be down to 4.5 kg/cm2g for remote consumers. Design pressure is 10 kg/cm2g. Dew point is -40 degree C at line pressure.

Air Distribution Headers shall be as SS 304.

## 11.0 ERECTION , INSTALLATION & COMMISSIOING

The bidder shall be responsible for the installation, calibration & testing, commissioning of the complete instrumentation and controls as defined in this specification as minimum. All the instruments & systems installed by the bidder as per scope subject to inspection, checking, calibration & testing to prove their operational fitness. Testing & calibration shall be done by the bidder, if required , all the required tools, tackles, calibration instruments, qualified skilled manpower for conducting these tests shall be provided by the bidder.

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Testing & calibration may be witnessed by representative Client/PMC and/or manufacturer's representative.

**LETTER WRITING** : LETTER WRITING FOR ALPHA-NUMERIC TAGGING ( WITH SYNTHETIC ENAMEL). :- Letter writing of different sizes on Instrument Panels/misc. Instruments/ Equipments with synthetic enamel paints (Asian/ Jonson & Nicolson/ Berger /Nerolac Make) suitable for a temp. of 100 degree Celsius for writing of letters, figures etc. Job includes cleaning of surface on panels/instruments/misc. instruments etc. All complete with labour and materials as per drawings, specifications, Name plate schedule and directions of Engineer-in-Charge. (Supply of paints is in contractor scope)

## 11.1 INSTRUMENT LOCATION

- 11.1.1 The location of instruments, control valves. Including junction boxes shall permit easy access from grade, permanent platforms or stairways for operation, inspection and maintenance.
- 11.1.2 The use of portable ladder or mobile platform shall be limited to access root valves, thermowells and line mounted flowmeters.
- 11.1.3 Locations shall be decided to minimize the possibility of damage from passing or falling objects and the possibility of tripping hazard or obstruct on walkway.


## 11.2 INSTRUMENT CABLE

### 11.2.1 Overhead Runs

Instrument main cable tray from field junction boxes to main control building shall generally be laid in aboveground cable tray with protection cover. Tray protection cover shall be provided only for the tray on top of tray layer.

Instrument branched cable runs from junction box or local panel to each instrument in the field shall also be routed aboveground and supported with trays, steel angles and channels.

Aluminium perforated cable trays/cable ducts shall generally be used for main cable trays. Single pair cables from instrument to junction box and branch cable tray shall be

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through perforated Aluminium cable trays.

The scope of supply includes Aluminium perforated type cable trays, FRP accessories such as Bends, tees, crosses, reducers & connector plates and accessories like bolts, nuts etc.

Aluminium trays shall be vinyl ester resin based and all tray shall be manufactured using the PULTRUSION process.

For Signal 900mm/ 600mm tray and for power 600mm/ 300 mm tray to be considered or shall be discussed during detail Engineering.

Cable tray segregation shall be based on the voltage level. Cable tray shall be supported at every 3M. 20% spare to be considered in the cable tray filling.

Instrumentation cables that form part of intrinsic safe (IS) circuits, if any, Shall be segregated from other instrument signal cables.

Instrument power supply (AC) cables shall not run in the same tray of instrument signal cables. Cable tray shall be dedicated for laying instrument power cables separately from the signal cable tray.

Alternatively, cable ducts of suitable size shall also be considered for main cables. When common cable ducts are used for running both power and signal cables, necessary air gap partition shall be used to segregate the cables



### 11.3 CABLES

All cables shall have PVC insulated primary insulation of 85°C PVC as per IS-583. Inner and outer jacket shall be made of extruded flame retardant 90 ac PVC to IS-5831

All cables shall be FRLS as per standard IEC 332-3 Part 3 Cat. A. Fire resistance cables whenever specified shall be as per me 331 Cat. A.

The insulation grade shall be 600 V/11000 V as a minimum arid shall meet insulation resistance, voltage and spark test requirements as per BS-5308 Part-2

All cables shall be armoured. Armour over inner jacket shall be of galvanised steel wire/flat as per IS-1554 part I / IEC 502. All the cores of single pair or multi-pair shall be twisted and numbers of twist shall not be less than 10 per metre.

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For signal and control cables, inner jacket colour shall be black. Outer jacket colour shall be light blue, for intrinsically safe application and black for others. For thermocouple extension cables the inner and outer jacket colour shall be as per IS-8784.

L/R ratio of adjacent cores shall not exceed 40  $\mu\text{H}/\text{ohm}$  for cables with 1.5 mm<sup>2</sup> conductor Electrical Properties of Cables shall be in line with EN50288-7:2005.

Contractor shall ensure a minimum of 20% of quantity of each type of cables supplied as spare including any special cable and in each multipair cables 20% pairs shall be kept as spare.

### 11.3.1 Instrument Signal Cable

- a) Single pair shielded signal/alarm cables shall be used between all field instruments including switches and junction boxes/local control panels.
- b) Triad cable shall be used between GDs/RTDs to JB/Transmitter respectively.
- b) Multipair individually and overall shielded signal/alarm cables shall be used between junction boxes/local control panels and control room.
- c) The single pair/triad cables shall be 1.5 mm<sup>2</sup> conductor size made of annealed electrolytic copper conductor of 7 strands with each strand of 0.53 mm diameter. Multipair cables with 1.5 mm<sup>2</sup> conductor size shall have 7 strands of annealed electrolytic grade copper conductor with each strand of 0.3 mm diameter. Multi triad cable or multi pair cable with 1.5 mm<sup>2</sup> conductor shall have 7 strand with each strand of 0.53 mm diameter. Colour of core insulation shall be black blue in pair and black, blue and brown in a triad.
- d) Shield shall be aluminium backed mylar/polyester tape bonded together with the metallic side down helically applied with either side having 25% overlap and 100% coverage. The minimum shield thickness shall be 0.05 mm in case of single pair/triad and 0.075 mm in case of multipair/triad cable.
- e) Drain wire shall be provided for individual pair and overall shield which shall be 0.5 mm<sup>2</sup> multi stranded bare tinned annealed copper conductor. The drain wire shall be in continuous contact with aluminium side of the shield.

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- f) All multi pair cables shall have 6 pair/12 pairs only while multitriad cable shall have 6 triads/8/12 triads only. Size for multipair cable will be 1.5 mm<sup>2</sup> with drain and overlap as above.

### 11.3.2 Cables and Multicore Cables for Solenoids etc.



Cables and multicore cables for such items as solenoid valves and flame detectors shall normally have a conductor size of 2.5 mm<sup>2</sup>. However, conductor sizes for power cables shall be co-ordinated with the Electrical Group to avoid too many different cable types.

Signals (4-20 mA or switch 'contact): 6/12 pair individually and over all shielded (screened) and armoured, twisted, 0.75 mm<sup>2</sup> conductor.

### 11.3.3 Thermocouple Extension Wires

- a) Single pair shielded thermocouple extension cables shall be used between thermocouple head and junction boxes transmitters/ local control panel mounted instruments.
- b) Multipair individually and overall shielded thermocouple extension cables shall be used between junction boxes and main control room mounted devices.
- c) The type of thermocouple extension cables shall be compatible with thermocouple used. In addition the colour coding of the primary insulation shall be as per ANSI.
- d) The cable shall have 16 AWG and 18 AWG solid conductors for single and multipairs respectively.
- e) All thermocouple extension cable shall be matched and calibrated in accordance with MC-96.1.
- f) Shield shall be aluminium backed by mylar/polyester tape bonded together helically applied with the metallic side down with either side having 25% overlap and 100 % surface. Minimum shield thickness shall be 0.05 mm for single pair and 0.075 mm for multipair cable. Drain wire shall be 0.5-mm<sup>2</sup> multi-strand bare tinned annealed copper conductor. The drain wire shall be in continuous contact with the aluminium side of the shield.
- g) Inductance shall not exceed 4mH/Km.
- h) All multi-pair cables shall have 6 pairs/12 pairs only.



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#### 11.3.4 Power supply Cables

All power supply cables shall be as per IS-1554 Part I and shall have copper conductors. Minimum conductor size shall be 2.5 mm<sup>2</sup>. The cables shall be PVC insulated and armoured. The higher size conductors shall be used incase of long distance power cable where voltage drops more than 3 volts than required supply.

Any other special cable required for instruments that should also be supplied as per requirements. CONTRACTOR shall ensure that these cables are armoured type and shall meet all other requirements.



#### 11.3.5 OPTICAL FIBER CABLE

The Optical Fiber Cable (OFC) used shall conform to the following specification as a minimum:

- a) The OFC shall be CSTA (corrugated steel tape armored, electrolytically chrome plated low carbon steel) armored cable.
- b) The OFC shall have FRP strength member, loose tubes for single mode optical fibers filled with moisture resistant jelly, moisture barrier of polymer coated Aluminum tape or water swellable tape, inner sheath of HDPE and outer sheath of PVC.
- c) Optical fibers shall be single mode fibers compliant to ITU-TG.652 and fibers colours shall correspond to IEC 793-2 and 304. Optical fibers shall be coated with UV cured double acrylic resin. It should not have any reaction with cladding or core material. The coating should provide maximum resistance to micro-bending & abrasion and ensure mechanical & optical strength. The coating shall be easily stripped with mechanical tools.
- d) The number of fibers in the OFC shall be decided depending upon the requirement with 8 fibers as a minimum.
- e) The cabled fiber attenuation shall be 0.37 dB/km for 1310 nm wavelength range and 0.22 dB/km for 1550 nm wavelength range.
- f) The tensile performance shall be as per . **IEC 60794-1-2 E1** and with tensile load of **9.81 x 2.5 W (Where W= mass of 1 km of cable in Kg)**Newton Or 2670 N whichever is higher.

#### 11.4 JUNCTION BOX

- a) In all JBs, cable entries shall be from Bottom only. Further after commissioning, all JB's should be covered with Aluminum tapes at its periphery to prevent water ingress.

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- b) JB MOC shall be FRP and 4 mm thick sheet. Junction boxes shall be for IEC Zone 2 & Gas group IIA/IIB EExe. with acid resistant gasket (will be freezed during detailed engineering).

In general a junction box shall contain only signal of same class. The signal class is categorized as following type:

- i) Signal Level
- Analog
  - Digital
  - T/C
  - Solenoid Valve
  - Instrument Power
  - Gas Detectors
- ii) Type of protection
- Non IS, Exd
  - IS, Exe
- c) All JB extra entries shall be plugged with SS316 plug. Each junction box shall be provided with 2 multi-cable entries from the bottom of the junction box with one plugged. All Cable entry shall be at the bottom only, and not from side or top.
- d) All spare cable cores shall be terminated in the Junction box, at the marshalling panel end and wired through spare barriers / isolators or relays (as the case may be) right upto the corresponding spare channel of I/O module.
- e) All spares hole of JB's, T/C head etc to be plugged with metallic plugs. The metallic plugs, Junction box hinges, Handle, DIN rail, Allen screws shall be SS 316 material of construction.
- f) For ease of identification shutdown JB's shall be colored should be marked with RED.
- g) Cable glands shall be provided with Cables shrouds. 20% spare terminals shall be supplied in each junction box.

## 11.5 CABLE GLANDS

- a) Contractor shall supply all cable glands required for glanding the above mentioned cables both at field instrument and local control panel side, junction boxes side and at control room side.

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- b) All cables glands shall be of SS316 ex-proof and they shall be double compression type suitable for armoured cables. Glands shall be in line with Area classification
- c) Flame proof glands wherever required 'shall be supplied with EX'd' certification.

#### **11.6 INSTRUMENT VALVES AND MANIFOLDS**

- a) Contractor shall supply instrument valves (miniature type) and valve manifolds wherever required.
- b) Body rating shall be as per piping class or better. All valves and manifolds shall be forged type only.
- c) Valve body and trim material shall be SS 316L unless otherwise specified. Superior trim material shall be selected as requirement by process conditions. Packing material in general shall be of PTFE

#### **11.7 INSTRUMENT IMPULSE LINES**

- a) In general ½" OD annealed seamless SS 316 tubing shall be used in preference to piping.
- b) Tubing standard shall be used upto 600 # only where the same is required as per job specification. For rating above 600 # and hydrogen/lethal service, only piping standard shall be used. The tubing shall be 1/2" OD tube with all fittings suitable for the same. Valves used shall be threaded. At the first isolation / root valve end suitable pipe tag to tubing conversion fittings shall be used. For remote installation suitable unions / couplings shall be used.
- c) Piping standard shall be used for all installation where specified in job specification. For rating upto 600#, the connection to the transmitters shall be with a male connector and tubing 1/2" OD. For rating higher than 600 #, no tubing shall be used. The connection to the transmitters shall be with 1/2" piping with flanges in between piping standard, all pipes shall be 1/2" NB unless higher sizes required to meet the "requirements, with all fittings suitable for the piping. All the joints shall be welded or flanged as required. For instrument end connection i.e root valve of orifices and other items, level gauges vent and "drain connection, seal welding shall be provided. For

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non diaphragm seal instruments and instruments where provided with threaded connection, no welding is required at instrument end

- d) All instruments shall be provided with isolation, drain and/ or vent valves with vent/drain end duly capped. This isolation valve shall be SS304 GATE type. It shall be in addition to the first isolation /root valve provided on the pipe or vessel at instrument take off.
- f) For diaphragm seal type instruments, spacer ring with vent and drain connection along with vent / drain valve with end capped.
- g) Contractor shall supply flareless compression type of tube fitting and of three piece construction with design similar to Swagelok/Parker Hannifen etc.
- h) Socket-weld type forged pipe fittings of suitable material and rating shall be supplied for pipe fittings. The minimum rating shall be 3000 #. Weld neck fittings shall be used where socket weld type are not allowed by piping class.
- i) All pipe fittings shall be according to piping material specification as per piping class of the pipe on which instrument is connected. In case of vessel/equipment / reactor, PMS of equivalent piping class shall be considered.

## 11.8 INSTRUMENT AIR SUPPLY DISTRIBUTION



Instrument air headers, pipes and distributors shall be of S.S 304. Instrument air manifold shall be used for supplying instrument air to control valves and other instruments. These shall be with 10 nos. of tappings and be with ½” NPT (F), SS 304 valves. From the nearby air manifold, instrument air shall be supplied to the control valves. For the purpose, all tubing shall be used shall be of SS316, ¼”, 1/2” OD, seamless tubes, laid in perforated aluminium trays. All intermediate fittings shall be double compression, SS316 MOC, Swaglok or equivalent make only.

Instrument air shall be provided at one point. Package vendor has to develop air distribution scheme.

## 11.9 MCT Blocks

Cable entry to main control room shall be through MCT blocks.

Entry into the Panels in the control room shall be through bottom mounted MCT blocks.

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Bidder shall provide minimum 8+8x6 MCT frame along with multi-dia blocks with peeling of arrangement and centre plug, with wedge, lubricant, stay plate. Bidder shall provide at least 20% installed spares with mult-dia blocks with peeling of arrangement and centre plug. ( Qty of frame shall be submitted by the bidder during bidding stage with typical cable arrangement).

#### 11.10 PROTECTION AND PAINTING

All exposed carbon steel parts to be painted shall be thoroughly cleaned from inside and outside to remove scale rust, dirt and other foreign materials by wire brushing / sand blasting as applicable. Minimum acceptable standard in case of power tool cleaning shall be St. 3 and in case of blast cleaning shall be SA 2. as per Swedish standard SIS 055900-1967.



- Non – ferrous materials. Austenitic stainless steels, plastic or plastic coated materials.
- Insulated surfaces of equipment and pre-painted items shall need not be painted.
- Stainless steel surfaces, both inside and outside. Shall be pickled and passivated.
- Machined and bearing surfaces shall be protected with varnish or thick coat of grease.
- **Depending on the environment the following primer and finish coats shall be applied:**

S. No.	Environment	Description	Minimum Requirements
1	Normal – Industrial	Primer	2 coats of Red oxide
		Finish Coat	Zinc phosphate each 30-35 microns thick 2 coats of synthetic enamel, each 25 microns (min.) thick.
2	Corrosive – Industrial	Primer	2 coats of epoxy zinc chromate, Each 35 microns (min.) thick.
		Finish Coat	2 coats of epoxy high build paint, each 100 microns (min.) thick.
3	Coastal and Marine	Primer	2 coats of high build chlorinated rubber. Zinc phosphate, each 50 microns (min.) thick.
		Finish Coat	2 coats of chlorinated rubber coat paint. Each 35 microns (min.) thick. (Any values refer to dry film thickness).

Colour Band shall be provided on loading arm as per Product colour code at site.

#### 11.11 PACKAGING AND IDENTIFICATION

All packaging shall be done in such a manner as to reduce the volume. The equipment shall be dismantled into major components suitable for shipment. All assemblies shall be properly match marked for site erection.

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Attachments, spare parts of the equipment and small items shall be packed separately in wooden cases. Each item shall be appropriately tagged with identification of main equipment. Item denomination and reference number of the respective assembly drawing.

Detailed packing list in waterproof envelope shall be inserted in the package together with equipment. Each equipment shall have an identification plate giving salient equipment data, make, year of manufacture. Equipment number, name of manufacturer, etc.

## 12.0 Storage Tank

Instrument design Philosophy shall be same as per section above.

2 Nos. of Level measurement of two different principle shall be provided.



## 13.0 Training

Supplier shall train Clients' maintenance engineers as well as operations staff in his works at Vendors Center of Excellence. The training imparted shall be by qualified and experienced staff available. It shall be exhaustive and aimed at making clients' maintenance & operations staff self reliant for most of the day to day applications. For training, supplier shall make available as close a model of the system with all the representative nodes, as the actual system to be installed. It is envisaged that following be covered in the training:

- **Operating Staff Training**

Operating courses include all aspects involved in operating the Control System from operator interface. This shall include operation under normal and abnormal conditions as may result from minor or major system malfunctions such that the trainee can take the appropriate remedial actions. The training shall include but not be limited to the following:

- Overview of the system
- Control philosophy
- User interfaces

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- Messages and alarms
- Operator commands
- Generation of reports
- Predictable events and expected operator action

- **Engineering staff training**

Software Design courses shall be provided which would train the Employer's Maintenance and

Design staff to be able to identify and remedy software faults, upgrade and implement data and software changes, generate/develop new software for the purpose of improving the system and production of revised or new displays. The training shall include but not be limited to the following:



- Overview of the system architecture, hardware and software
- Software design and organisation
- Database structure, generation and modification
- Generation and modification of the VDU screen
- Customization of report/chart/graph format
- Assembly, compilation, linking, editing, debugging, distributing, testing and integration of program modules

#### **14.0 FAT/SAT**

Bidder to consider FAT/SAT for the offered system in his scope of supply. FAT/SAT procedure.

##### **FAT – Factory Acceptance Test**

FAT is inspection for verification that all equipment and devices function properly with integrity.

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Prior to notification of FAT to Client/Purchaser, all the involved contractual documentation shall be completed and all the cabinets, equipment and components of Control system shall be assembled and installed in one area at one time.

Bidder shall demonstrate all the functions of the PLC working properly in FAT. Each test shall be carried out on the procedure reviewed and accepted by Client/PMC/Purchaser after submitting Manufacturing Internal Test Certificate.

FAT certificate shall be issued by bidder at the successful end of the test activities. All the hardware and software failures and problems shall be documented. All the failures and problems shall be resolved before shipment to site, All series of actions shall be taken in accordance with the FAT procedure.

FAT will start with Visual Inspection including the following activities as minimum;

- Quantity of all the cabinets, equipment and components.
- Installation of all the cabinets, equipment and components.
- Tagging of all the cabinets, equipment and components.
- Wiring of all the cabinets, equipment and components.

Once Visual Inspection has been successfully completed, Hardware Testing shall start including the following activities as minimum;



#### Power-On

- Redundancy of Power Supply on failure
- Diagnostics of the main equipment
- Redundancy of the main equipment on failure
- Redundancy of network on failure
- 100% I/O Accuracy Check at 5 point (0%, 50%,100%,50% and 0%) for all the hardwired points (sample check may be allowed if 100% I/O Accuracy has been checked Manufacturer Internal Test)

Once Hardware Testing has been successfully completed, Software Testing shall start including the following activities as minimum;

- I/O Database implementation
- Graphic implementation
- Control implementation
- Logic and sequence implementation



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- Historian implementation
- SER implementation
- AMS implementation

### **SITE ACCEPTANCE TEST (SAT)**

SAT is inspection for checking that all the conditions are good after installation at site.



Prior to notice of SAT to Client/Purchaser, bidder shall submit all the "As-Shipped" documentation incorporating all the FAT correction.

Prior to start SAT, all the cabinets, equipment and components of PLC shall be installed in proper location as designed.

Bidder shall demonstrate all the function of PLC working properly in SAT. Each test shall be carried out on the procedure and its criteria reviewed and accepted by Client/Purchaser.

Test certificate shall be issued by bidder at the successful end of the test activities. All the hardware and software failures and problems shall be documented.

SAT shall be identical to FAT but at reduced amount to check hardware without any damage, installations completed properly and interface working properly. bidder shall provide special tools and test equipments.



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### ANNEXURE -1

#### INSTRUMENT ACCURACIES

The instrument reference accuracies shall be as per the table below. Accuracy of the Instruments shall be minimum as follows.



Type of Instrument	Accuracy
Belt weighers	+/- 0.5 % of range
Differential pressure & Pressure transmitter - SMART	± 0.050% of span within TD ratio of 1: 100 or better
Diaphragm seal transmitter & Pressure transmitter - SMART	± 0.050% of span within TD ratio of 1: 100 or better
Variable area type flow meter with transmitter	± 2.0% FS Note (1)
Vortex flow meter	± 0.7 % FS
Positive displacement flow meter	
- Raw material and Product	± 0.2% FS
- Others	± 0.5% FS
- Turbine meter or Mass flow meter	

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- Raw material and Product	± 0.2% FS
- Others	± 0.5% FS
- Magnetic type flow meter	± 0.5% FS
- Mass flow meter (Coriolis Type)	± 0.1% of reading
- Ultrasonic type flow meter	± 0.5% of reading
- Ultrasonic type flow meter( 5 – path)	± 0.1% of reading
Orifice plate : Normal Application	+/- 2% of flow rate
Orifice plate : Special Application	+/- 1.5% of flow rate
Venturi	+/- 1 % of flow rate
- Displacement type level indicator	± 1.0% FS
- Displacement type level transmitter	± 0.2% FS (Smart)
- Tank gauge (Custody Transfer)	± 1 mm with +/- 1 mm resolution
- Servo type tank gauge	± 2 mm (up to 20 m height)
- Radar type tank gauge	± 1 mm or better for custody transfer ± 5 mm or better for normal application
	± 0.2% of span within TD ratio of 1: 100
- Pressure gauge	± 1.0% of span for Bourdon type , 1.5% for diaphragm
- Temperature Transmitter	± 0.15 % of calibrated span for RTD & T/C
- Filled system/Bimetallic	± 1.0% FS
- Small size pressure gauge	± 3.0% FS
- Draft gauge	± 3.0% FS
- Receiver gauge	± 1.5% FS
- Thermocouple & Resistance Bulb	Applicable Codes/Standards

Note: 1. Vendor's standard accuracy is applied to local indicator type.  
2. Accuracy for custody transfer/mass balance instruments shall be ±% of reading and shall be supplied with wet calibration certification.

**Remarks:** 1. Accuracy of instrument and special articles except for the above mentioned instrument shall be in accordance with the applicable codes/standards, or Vendor's standards as approved by Purchaser.  
2. FS: Full scale.  
3. Overall rangeability of transmitter except for draft range shall be 1: 100. Draft range transmitter rangeability shall be 1: 30 for the accuracy indicated above.

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## ANNEXURE -2

**Field instrument connections shall be as follows.**

<b>Instrument Type</b>	<b>Process / Vessel Connection</b>	<b>Instrumentation Connections</b>
DP Flow Instruments	½" NPT (M)	½" NPT
External Displacer on Vessel ( Min. Rating ANSI 300#)	2" Flanged	2" Flanged
Internal Displacer ( Min. Rating ANSI 300#)	4" Flanged	4" Flanged
External Ball Float on Vessel ( Min. Rating ANSI 300#)	2" Flanged	2" Flanged
Internal Ball Float ( Min. Rating ANSI 300#)	4" Flanged	4" flanged
Magnetic Level Gauge ( Min. Rating ANSI 300#)	2" Flanged	2" Flanged
D/P Level	½" NPT (M)	½" NPT



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D/P Level with Remote Seal Diaphragm ( Min. Rating ANSI 300#)	3" Flanged	3" Flanged
D/P Level Direct Vessel Mounted ( Min. Rating ANSI 300#)	3" Flanged	3" Flanged
RADAR – Direct Mount on vessel ( Min. Rating ANSI 300#)	3" flanged	3" flanged
GW RADAR – Side/Side Chamber Mounted on vessel (Min. Rating ANSI 300#)	2" flanged	2" flanged
Internal GWR on Equipment ( Min. Rating ANSI 300#)	4" Flanged	4" flanged
Special Level Instrument on Equipment (Capacitance/ Ultrasonic/R.F.Probe)	2" flanged	2" flanged
Tank Level Instruments (Servo) on Atmospheric tank/ Pressurized Equipment	6" flanged	6" flanged
Tank Level Instruments (Radar) on Atmospheric tank clean service / Pressurized Equipment	8" flanged	8" flanged
Tank Level Instruments (Radar) on Atmospheric tank viscous service / Pressurized Equipment	24" flanged	24" flanged
Tank Level Instruments (Capacitance/ Ultrasonic/R.F.Probe) on Atmospheric tank / Pressurized Equipment	2" flanged	2" flanged
Pressure Instruments	½" NPT (M)	½" NPT
Press.Gauge	½" NPT (M)	½" NPT
Pressure with diaphragm seal, (Min. Rating ANSI 300#)	3" Flanged	3" Flanged
Pressure Instruments on Vessel	1 ½" Flanged	½" NPT
Diaphragm Seal pressure Instrument gauge on Vessel	2" Flanged	2" Flanged
Thermowell ( Min. Rating ANSI 300#)	1 ½" Flanged	1 ½" Flanged
Multipoint Temperature Element for Tanks	2" Flanged / 3" Flanged	2" Flanged / 3" Flanged
Standpipe	3" Flanged	-

Note:-

- a. There shall be a separate tapping for each of the instruments on any pipeline/vessel. No multiple instruments from one tapping is acceptable (for example PG and PT from single pipe line tapping with single or double mechanical isolation valves are not acceptable). However, as an exception to this, three transmitters on clean gas services from one orifice (with two pairs of tapping) is acceptable, where multiple (2 out of 3, etc.) transmitters are to be installed.

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- b. All type of instrument tapping flange rating shall be minimum ANSI 300#, irrespective of minimum design pressure. However for pressure rating of 600# class and above, RTJ flange shall be used. At few locations, double isolation valves shall be used as per table given below.

INSTALLATION RATING	PRESSURE TAPPINGS	LEVEL TAPPINGS	FLOW ELEMENTS	CONTROL VALVE
300 #	SINGLE	SINGLE	SINGLE	SINGLE
600 #	DOUBLE	SINGLE	DOUBLE	SINGLE
900 # / 1500 # / 2500 #	DOUBLE	DOUBLE	DOUBLE	SINGLE

### **Annexure - 3**

#### **SYSTEM CONFIGURATION**

Control system package (latest model at the time of supply)



1No. Operator Stations with, 22” TFT, COLOR, LED type dual monitors to be placed in control room

1 No. ES/OS having the feature of SOE also, dual personality, 22” TFT, COLOR, LED type

1 no. of Membrane Operator’s Keyboard and 1 no. of QWERTY engineer’s keyboards with mouse with each operator station

All USB ports must be blocked and the system must have latest anti-virus.

*Note: All OS and ES shall be of latest configuration which shall be freezed during detail engineering.*

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Printers

1 No. A3 Heavy duty colour

HP make or equivalent Laser printer

**Annexure - 4**

**OPERATOR STATION SUB-SYSTEM**



\* Model No. By Vendor

**A. General Requirement**

- |   |   |                          |
|---|---|--------------------------|
| 1 | Number of Operator Consoles                   | ONE                      |
| 2 | Inter-changeability between operator consoles | Required                 |
| 3 | On-line system diagnostics on Console Monitor | Required at Module level |
| 4 | On-line configuration change                  | Required                 |
| 5 | Console configuration                         | Dual                     |

**B. OPERATOR CONSOLE**

- |   |                             |   |
|---|-----------------------------|---|
| 1 | Console's basic electronics | Individual electronics for each monitor |
|   | µp Type                     | 64 bit                                  |

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µp Manufacturer/ model  
Memory size /Cache size

Note-1  
16\_GB (Vendor to check the suitability of memory size)

2 Type of Database Functionally Separate

Database Storage Devices:

Sr. No.	ITEM MODEL No.	FUNCTION	REDUNDANCY (Refer Note)	REMARK
1.	HDD	<u>Note-1</u>	REQUIRED	
2.	Combo drive	<u>Note-1</u>	REQUIRED	
3.	Vendor recommended	<u>Note-1</u>	REQUIRED	
4.			REQUIRED	

(Note: Full Redundancy is required if Centralized global database is provided)

STORAGE DEVICES ARE APPLICABLE IN EACH OPERATOR STATION.

3 Number of Devices (per console)

S. No	TYPE OF DEVICE	Description OF DEVICES REQUIRED	NO. OF DEVICES	REMARKS
1.	MONITOR	22" TFT, COLOR, LED type dual monitors (Control system architecture)	1 per console	
2.	KEYBOARD SETS	1 no. of Membrane Operator's Keyboard and 1 no. of QWERTY engineer's keyboards with mouse.	1 per console	
3.	ALARM & EVENT, LOG A4 PRINTER	1 Nos A4 Heavy duty Colour –HP or equivalent make	1	
7.	DVD DRIVE		1 per console	

4 Inter-changeability between Monitors

Required

5 Spare memory requirement

Min. 40%



6. Keyboard Set

a) Keyboard Security against unauthorized access

Required with Key-lock

Note: Key-lock Password shall be provided for each operator console.



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b) Maximum number of keystrokes for accessing views as per standard display hierarchy:

S.No.	TYPE OF VIEW	REQUIRED	OFFERED	REMARKS
1.	GROUP VIEW	TWO		
2.	LOOP VIEW	THREE		
3.	LOOP IN ALARM	TWO		
4.	GRAPHICS VIEW	TWO		

c) Assignable function keys for single keystroke access Required

d) Number of Assignable function keys per Monitor 64

7 a) Number of devices for cursor control Two/Monitor

b) Devices for cursor control Keyboard **[X]** Mouse **[X]**

8 Monitors and Displays

a) Size of Monitor 22" diagonal

b) Type of Monitor TFT LED

c) Surface Treatment Hard Coating anti Glare

d) Length of tag number (characters) 16 alphanumeric

e) Length of description (characters) 24 alphanumeric



f) Display update rate 2 s

g) Dynamic graphics Required

h) Multi Window Capability Required



i) Control through dynamic graphics Required

j) Screen displays and Call-up time

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S.No.	TYPE OF DISPLAY	REQUIRED	CALL-UP TIME(S)*	REMARKS
1.	OVERVIEW	YES		
2.	GROUP DISPLAY	YES		
3.	LOOP DISPLAY	YES		
4.	DYNAMIC GRAPHICS	YES		
5.	REAL-TIME TREND	YES		
6.	HISTORIC TREND	YES		
7.	ALARM SUMMARY	YES		
8.	ALARM HISTORY	YES		
9.	CONFIGURATION	YES		
10.	DIAGNOSTIC	YES		

k) Display Hierarchy

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S. No.	DESCRIPTION	REQUIREMENT	SYSTEM CAPABILITY	REMARKS
1.	NO. OF OVERVIEW PAGES	AS REQD.		
2.	NO. OF GROUPS/OVERVIEW	AS REQD.		
3.	NO. OF LOOPS / GROUP	8		
4.	NO. OF GRAPHIC PAGES	AS REQD.		
5.	NO. OF POINT IN ALARM SUMMARY	AS REQD.		
6.	NO. OF POINTS IN ALARM HISTORY	AS REQD.		
7.	NO. OF TRENDS PER DISPLAYS	AS REQD.		
8.	NO. OF MULTI-TREND DISPLAYS	AS REQD.		
9.	OTHERS	AS REQD.		

l) Multi Windowing facility

Required

Note: Opening of more than four windows on the same Monitor shall be restricted by the system.

m) Trending functions: Each Operator Console shall be capable of trending all analog points.

n) Real-time trend

Number of parameters Required for ALL TAGS ( AI trip signals trends must be configured in a separate group with 0.5 sec trending)

o) Historical trend

Number of parameters Required for ALL TAGS

Time period 1 year

9) Logging Function

a) Number of tags to be logged Required for ALL TAGS



b) Number of log reports:

Alarm History per shift

Event logging

Hourly logs

Shiftly logs

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- Daily logs
- Weekly logs
- Shutdown report
- Trip initiated log
- Others (Note)

Note: Other log reports as required shall be furnished during execution stage.

c) Log formats User definable

10 System boot-up from Engineer console

11 Auto boot-up on power On Required

12 Storage disks

a) Type of storage disk HDD Optical (DVD)

b) Number of disks and capacity

Sl. No.	TYPE OF DISC	NUMBER (MINIMUM)	MEMORY CAPACITY PER DISK	REMARKS
1	HDD	One Per Monitor	AS per latest configuration	
2.	OPTICAL	One Per Monitor	AS per latest configuration	
3.	Other			

13 Any other feature available as a standard:

a) \_\_\_\_\_



b) \_\_\_\_\_

14 CPU Loading 60 %

15 Memory Utilization 60 %

16 Operating System Latest must have validation with the system

17 Antivirus/Network Security Required as per latest IEC standard

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### **ENGINEERING Cum OPERATOR STATION with SOE Facility SUB-SYSTEM**

- Model No. \_\_\_\_ By vendor

1. Number of Engineering cum Operator Station One
2. Number of Monitors per Engg. Station One
3. Type of electronics Individual per Monitor
  - µP type 64 bit
  - Memory size NOTE-1
  - Model No. NOTE-1
4. Number of engineering keyboards One per Monitor
5. Number of Operation keyboards One per Monitor
6. Functional Capability Same as operator station subsystem
7. Basic functions of Engineering Console
  - a) System configuration and reconfiguration
  - b) Group & multi-groups alarm inhibiting
  - c) Plant views with/ without plant operation
  - d) Graphic page compilation
  - e) Setting/ resetting real-time clock
  - f) Loop tuning on selectable basis
  - g) System maintenance and diagnostics
8. Monitor specification As per operator station subsystem
9. Keyboard specification As per operator station subsystem
10. Data storage Devices and capacity

Sr. No.	TYPE OF DISC	NUMBER (MINIMUM)	MEMORY CAPACITY PER DISK	REMARKS
1	HDD	One	As per Latest configuration	
2.	DVD writer	One		
3.	OPTICAL(DVD)	One	As per Latest configuration	
5.	OTHER			

11. Antivirus/Network Security Required

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## ANNEXURE -5



### HARDWIRED CONSOLE

- Model No. \_\_\_\_ By vendor

1. One no. of Hardwired/Aux. console:
2. Instrument Located on Hardwired consoles: (AS REQUIRED)

INSTRUMENT TYPE	NUMBER REQUIRED ON HARDWIRED CONSOLE WITH	
		CONSIDERED BY VENDOR
ASSIGNABLE RECORDERS	N.A.	
HARDWIRED ANNUNCIATORS	AS REQUIRED	
INDICATING LAMPS	AS REQUIRED	
SWITCHES	AS REQUIRED	
PUSHBUTTONS	AS REQUIRED	
OTHERS	AS REQUIRED	

- 3 Power supply Alarm/Annunciator 110 V AC, 50 Hz [X]
- 4 Power supply for switches, lamps, pushbuttons etc. 24 V DC [X]

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### APPENDIX –1

Type of Signal	Inst to JB (1P,1T)		JB to Control Room (6P/12P/6T/8T/12T)		Control Room to MCC/MCC to Control Room (Multi-conductor cable)	
	Size (mm <sup>2</sup> )	Type	Size (mm <sup>2</sup> )	Type	Size (mm <sup>2</sup> )	Signal
AI	1.5	Signal	0.75	Signal	1.5	Signal
AO	1.5	Signal	0.75	Signal	1.5	Signal
DI	1.5	Signal	0.75	Signal	1.5	Signal
DO	1.5	Signal	0.75	Signal	1.5	Signal
RTD	1.5	Signal	0.75	Signal	1.5	Signal
TC	1.5	Signal	0.75	Signal	1.5	Signal
GD	1.5	Signal	1.5	Signal	-	-
SOV	2.5	Signal	2.5	Signal	-	-
POWER	2.5	Power	2.5	Power	2.5	Power
TC Extension cable	Special compensation cable between Element to transmitter					
RTD Extension cable	Triad cable between Element to transmitter of 1.5mm <sup>2</sup>					
Analysers	1.5	Signal	0.75	Signal or serial communication as the case may be.		

**\*Note:** Above size is minimum. Further cable size may be increase based on voltage drop calculation.



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**SCOPE OF WORK**  
**&**  
**TECHNICAL SPECIFICATION**  
**FOR**  
**MECHANICAL ERECTION WORKS (PIPING & EQUIPMENTS)**  
**FOR**  
**SUPPLY & CONSTRUCTION OF ASH POND AND ALLIED SERVICES**  
**AT**  
**TFL TALCHAR, ODISHA**

0	10.06.22	ISSUED FOR ENQUIRY	JKY	DKC	RRK
<b>REV</b>	<b>REV ATE</b>	<b>PURPOSE</b>	<b>PREPD</b>	<b>REVWD</b>	<b>APPD</b>



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## CONTENTS

### DESCRIPTION

Scope of works & Technical Specification for erection of equipments / machineries, Fabrication & Erection of Piping works.

1. Scope of Work
2. Obligation of Owner/Consultant
3. Obligation and responsibility of Contractor
4. Technical conditions of Contract
5. Statutory Approvals
6. Pre-commissioning & commissioning activities.

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## 1.0 SCOPE OF WORK

The scope of work covers Supply of Piping materials, Valves, Flange, GASKET, STUDS & NUTS FOR ALL SIZES as per Technical specification to complete the work related to this projects erection of Equipments/machineries/SKID/EOT Cranes, fabrication & erection piping and structural's, works related to ASH POND, TFL.



Any item/activity which is not listed here but is required for completion of job as per enquiry's scope of work, Technical Specifications and drawings shall be under Contractor's scope without any cost implication to Owner.

**In this erection enquiry the following Philosophy has been considered Contractors:**

1. Supply of Piping material & it's fitting, Valve, GASKET, STUDS & NUTS FOR ALL SIZES as per Technical specification/SOR to complete the work related to this projects.
2. Supply of Rotary Equipments/EOT as per NIT SPEC.
3. Fabrication and erection of piping (aboveground /under ground piping) works.
4. Supply & Application of rubber lining works as per spec.
5. Unloading and transportation of items (Equipments & Piping).
6. Erection of new equipments/Machineries/EOT.
7. Supply & Installation of Steel structure work.
8. Supply & Erection of Instrumentation items if any.
9. Supply & Application of Painting of Piping & Equipments/Tanks.  
& Equipments.
10. Pre-commissioning and commissioning activities

**The scope of work shall include, but not limited to, the following:**

- 1.1 Loading/Unloading and transportation of equipments / materials/skid from the storage yard or directly from trailer / truck will be the responsibility of the contractor. Suitable lift machinery/equipments should be available with the contractor for lifting and erection purpose. The dedicated team should be identified with proper credentials at the work place.
- 1.2 Receipt of all other materials including equipments & its accessories, SKID, piping, structural and instrumentation material, storage yard and unpacking these from

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packages/boxes, checking and reporting the defects/damages and shortages, if any by the Contractor in writing to the Owner/Consultant. The lifting and transportation of materials shall be done by the Contractor to their site stores/yard, storage and protecting them as per relevant specification and instruction of Owner/Consultant's representative. Saddle/skirts, foundation bolts, equipment internals, davits, prefabricated structural, etc. may come in loose supply from equipments vendors. If required, Contractor shall open the boxes, remove stiffeners, bracing and any other means of protection used for transportation without any additional cost to Owner/Consultant. No separate payment shall be made for transportation of these items.



In the event of non-reporting by Contractor, of the defects/ damages and shortages of the items issued by Owner/Consultant within a prescribed time from the date of issue, the Contractor shall be responsible for any eventual consequence resulting there from and shall repair/ replace the defective/damaged items at his own risk and cost.

After opening the packing boxes Contractor shall record the items available in individual case. In case spares / tools etc. are issued to the Contractor along with equipment / accessories by virtue of having been packed in the same case, Contractor shall return to Owner's store immediately, the items which are not required by them.



If materials to be supplied by the Contractor for erection use (piping material, package items, instrument's, steel etc.), contractor shall make necessary arrangement for their storage by constructing temporary storage/sheds. Necessary arrangements for unloading and packing, lifting, shifting and transportation inside the plant shall be done by the Contractor.

**1.3 Before start of any erection activities the following shall be checked by Contractor:**

- a. Thorough initial surveying of the SITE shall be done with regard to the proper laying/ routing of the equipment/pipe lines/package items and instrumentation work. It is responsibility of contractor to generate the fabrication & erection front depending on availability of Drawings, material and site condition to co-up the progress of the work. Any delays due to this reason are solely attributable to the contractor.
- b. Checking of foundations/structures including anchor bolts for their correct dimension, levels, co-ordinates etc., with reference to bench marks, well before the actual erection is planned. Discrepancies, if any, are reported to Owner for his decision so that any rectification, if required, can be carried out earlier than planned erection date. Anchor bolt's sleeves shall be free of water and debris.

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- c. Chipping (up to 100 mm) & removal of old grouting materials, wherever required and cleaning the top of foundation, inside the pocket for equipments, machinery, structural and pipe supports, etc. In case where epoxy grouting is required, the pockets are to be cleaned first with water and then with dry air. Compressor required for this purpose shall be arranged by the Contractor. For supports coming directly on floor, the Contractor shall be required to chip the floor and then make necessary pipe support pedestals (of concrete) as per drawing/ specification and instruction of Owner/Consultant.
- d. Prior to installation of Equipments, Machineries, package items, piping & structural etc., the Contractor shall ensure the following:
- i) Foundation bolts are clean.
  - ii) Nuts fit properly over the entire threaded length.
  - iii) Foundation bolts are coated properly with GREASE MIXED WITH GRAPHITE POWDER and wrapped with polythene (Threaded part only).
  - iv) To ensure the correctness of existing holes/slots in structure and to rectify existing holes/slots or to make new ones, if required.
- e. Necessary grouting space shall be maintained by Contractor by putting packing plates (to be supplied by Contractor) as per requirement. If more than one packing plate is used to build up the required thickness, the packing plates must be tack-welded to each-other. The packing plate may be retained in their place by grouting or by tack welding (using MS/TOR steel rods) to each other. Number of packing plates should be kept as minimum as possible. Packing plates shall be free from burrs and high spots. Providing & fixing of packing plates is the part of erection & alignment of equipments without extra cost to Owner.
- g. Certain equipment's platform, valve's operating platform and their gratings, indicated or not indicated in the drawings, may have to be fabricated and installed (including grouting wherever required) at site as per site requirement or as per instructions of Owner/Consultant.
- h. Structural steel fabrication and erection as per requirement of site. Detailed structural drawing preparation shall be included in the rates of fabrication Refer Schedule of Rates.
- i. To deliver pre-fabricated piping, supports and structural to painting yard/shop and pick up and bring back the same to erection site after shot blasting and primer paint application.
- j. Carrying out Dye-penetrant examination, Radiography and other Non-destructive tests etc. where ever required as per Instruction of Engineering In charge/Owner.
- k. In addition to piping designed and engineered by Consultant, Contractor shall be required to fabricate and/or erect pipelines designed, engineered and/or supplied by package vendors etc. as per instruction of Owner/Consultant.

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#### 1.4.0 FABRICATION & ERECTION OF PIPING (AG)

Pipes and pipe fittings in random length/No, flanges and valves etc. shall be supplied by Contractor's As per TS/ SOR/SPEC.

- 1.4.1 a) All piping shall be assorted and marked for identification to avoid mix up of different materials, as per colour code provided by Owner / Consultant.
- b) Prefabrication of piping as per convenient spools from pipes supplied in random commercial lengths (in some cases pipes may be supplied in painted condition). Contractor shall mark spools on isometrics and layout drawings in consultation with Owner/Consultant.

#### 1.4.2 PRE-FABRICATED PIPING

Pre-fabricated (painted or unpainted) pipes & spools pertaining to supplied by Vendor's or by package item supplier etc. shall be supplied by Owner as free issue material for their erection as per drawing and instruction of Owner if applicable.

- 1.4.3 Erection of fabricated and prefabricated piping including those of all on-line items such as but not limited to valves, control valves, flow nozzles, in line filters, basket strainers, Y-strainers, safety / relief valves, orifice flanges, etc. by welding, bolting or screwed joints as per drawing, specification, standards, codes and instructions of Owner/Consultant. Orifice plates, control valves, piping spools may have to be removed and re-installed after hydro-test, cleaning & blowing of pipe lines.

- 1.4.4 Erection of piping after cleaning from inside and joining by bolting, welding or screwing etc. at site as per drawings, specifications/standards/codes and instruction of Owner/Consultant.

The fabrication and installation of internal spacers, SS wrapper plates and swage jacket, if required, shall be done by Contractor within his quoted rates for pipes and nothing extra is payable on this account.



- 1.4.7 Carry out dye penetrates examination, radiography, and submission of films.

- 1.4.8 **For radiography use of Close Proximity Camera with Selenium Source is preferred.**

- 1.4.9 Modification of certain existing erected piping as per site requirement by "Dismantling and Reinstallation as per instruction of Owner/Consultant.



- 1.4.9 **All activities listed below shall be covered under the scope of this CONTRACT. These activities shall be covered in the unit rates for pre-fabrication, fabrication and erection of piping nothing extra shall be paid on this account unless indicated otherwise specifically :-**

- i) Cleaning, edge preparation, welding, Non-Destructive Tests (radiography shall be paid separately as per SOR), wherever required as per specifications/standards and

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codes including supply of manpower machinery, consumables, and necessary arrangements for execution of all works. Wire brush with SS bristles only shall be used for the purpose cleaning the welding joints of CS/SS piping.

- ii) PSV/TSV Testing to be done by contractor without any extra cost to owner before installation. Pressure setting of Safety valve shall be set at respective pressure for mounting on equipment and or piping after hydro-testing flushing and cleaning of system. Checking of all rupture discs, breather valves, flame arrestors etc., shall be done prior to their installation.
- iii) The Contractor shall be required to make stub-in connection for branches from main line for piping as well as instrument tapings. Stub-in connections shall include fabrication, installation and welding of reinforcement pads wherever required as per drawings, documents and standards. The fabrication and welding of these items shall also be in the scope of Contractor. However the pads and rings materials shall be made from free issue pipes/plates as per drawing, document, Standard, specifications and instruction of Owner/Consultant.
- iv) Cutting & chipping of floors and making holes in walls, if required to facilitate pipe laying and supporting and/or fixing of sleeves. After lying of piping the cut-out holes shall be filled and finished as per instructions of Owner without any extra cost to Owner.
- v) Threading the ends of C.S., GI etc piping shall be done up to 1-1/2" size, if required. Seal welding of screwed joints of C.S., GI etc. piping shall be done wherever required as per instruction of Owner/Consultant without any extra cost to Owner.
- viii) All the flanged valves, except control valves shall be hydro-tested, at Contractor's shop prior to their erection. The defective valves shall be rectified by lapping, etc. The valves shall be suitably dried after hydro-testing.
- ix) Normally for plant piping of sizes 2" and above, isometrics, shall be supplied to the Contractor by Consultant. Normally for below 2" piping isometrics are not made. In case referred to above, when isometrics are not available, piping work shall be executed as per latest revision of piping layout drawing. However, if Contractor requires isometric drawings, he may prepare the same from layout drawing and the same shall be approved at by Owner/Consultant prior to execution.
- xi) DELETED.
- xii) Some equipment/machinery nozzles may be without flanges and require welding with pipes directly. In such cases piping may be tested by taking equipment/ machinery in the loop. But if this is not possible, the piping shall be tested by welding an end blind plate prior to final welding with equipment/ machinery; final weld testing shall be done by 100% radiography. The thickness of such blind has to be calculated by the Contractor & got approved by Consultant/Owner for fixing.

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- xiii) Lapping if necessary shall be done on the machined seats of the mating surfaces of flanges prior to putting metallic ring gaskets.
- xiv) The Contractor will be required to take up pre-fabrication of piping even prior to receipt and erection of equipment/machinery. There may be some deviations in equipment/machinery dimensions or levels and co-ordinates. This should be taken care of while prefabricating the piping spools & field joints accordingly for site adjustment. In shop fabrication as far as possible, margins for field adjustment in three planes shall be kept. Nothing extra shall be paid for cutting/welding etc. for such adjustments i.e. change in piping spool length due to site condition or change of level/coordinates will not be considered for modification and contractor shall complete the job without any extra cost to owner.
- It will be responsibility of the Contractor to verify the Isometrics by physical measurements & required field joints prior to prefabrication of piping spool pieces. Contractor shall promptly inform any discrepancy in drawings to Owner/Consultant. Though the payment shall be made as per actual measurements, nothing extra shall be payable for cutting, welding / or extra joints needed because of site adjustment.
- xv) The supply and application of anti-seize lubricating compounds such as **MOLYKOTE, NEVER SIEZE, and GREASE** etc. for the protection of threads of valve stems, studs, bolts and nuts etc.
- xvi) All permanent gaskets shall be fixed in the piping system just after all testing; blowing or pickling etc. operations are over, and just before leak testing / seal testing of the piping system. The temporary gaskets for testing shall be arranged by the Contractor without any extra cost to OWNER.
- xvii) During bad weather, the Contractor shall make suitable and adequate arrangement by way of providing protection against rain and wind for carrying out welding and other fabrication and erection jobs smoothly at SITE, necessary rain protection hoods shall be prepared for each welder to enable him carry out the job under owner/consultant instructions.
- xviii) 100% PMI of SS & AS material is in scope of contractor including supply of PMI M/c, without any extra cost to owner.
- xix) All instruments pressure taping, temperature taping, thermo well taping, threading for nipples and installation of welded thermowells (except instrument) shall be in the scope of the Contractor. Installation data sheets for carrying out the above jobs shall be provided at Site. Threaded/Screwed joints, if and wherever required shall be seal-welded as per the instructions of Owner/Consultant without any extra cost to Owner.
- xx) In case of dissimilar thicknesses at any weld joint, the internal surface of thicker member shall be beveled for proper matching of I.D. The beveling slope shall not exceed 1:4. In such cases, for dissimilar thicknesses, no extra payment will be made.



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- xxi) Piping having threaded nozzles and threaded flanges may require chasing of flange/nozzle threads on a lathe at site to avoid interference, if any.
- xxii) DELETED
- xxii) Removal and re-erection of all on-line instruments/valves during testing is in scope of contractor, if so required, at SITE. Calibration and functional testing is excluded from the scope of this contract.
- xiv) Carrying out hydraulic/pneumatic testing of the erected piping in loops after stress relieving if required, which shall be done only after the joints have been tested and found acceptable. Any temporary piping, temporary spool pieces, required drain and vent for hydro test and temporary supports required for carrying out hydro testing shall be supplied and erected by the Contractor within his quoted rates, nothing extra is payable on this account. Contractor is required to carry out the test, required hydrostatic drain and vent, tightening of bolts, and replacement of gaskets shall also be done without any extra cost to Owner. Equipment flanges shall be considered as part of piping system for this purpose. Making suitable arrangement for fixing of target plates shall be part of the scope of Contractor.
- xxv) After hydro testing, pipe lines of sizes 2" and above shall be cleaned by air blowing and card board blasting or steam blowing, for efficient and proper cleaning of line as per instruction of Owner/Consultant. If compressor is required for these activities, the same shall be arranged by the Contractor without any extra cost to the Owner/Consultant. During this activity, the piping shall be adequately supported. Temporary piping spool shall be fabricated by the Contractor from the materials taken from the Owner and erected as per site requirement. Fabrication and fixing/removal of all spool pieces, blinds etc. required for carrying out hydro-testing/blowing shall be Contractor's sole responsibility without any extra cost to Owner. Nothing extra shall be payable on this account. For card board blasting, all materials shall be arranged by Contractor without any extra cost to Owner. Making suitable arrangement for fixing of target plates shall be part of the scope of Contractor.

#### 1.5 **SUPPLY, FABRICATION & ERECTION OF SUPPORTS**

Supports falling under the scope of this enquiry shall consist of:-

- a. Resting supports
- b. Guide supports
- c. Anchor supports
- d. Axial stopper support

All structural steels required for fabrication of above supports shall consist of angles, channels, beams, plates, flats etc. including bolts, nuts and washers to be in the Contractor's scope of supply.

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- 1.5.1 Supply and fabrication of supports as per drawings, sketches, specifications, standards and instructions of Owner/Consultant. All materials required for supports shall be in the Contractor scope except pipes for Trunion (Dummy supports).

Supply and fabrication of piping support shoes/clamps shall be done by Contractor as per support bill of materials outside the premises.

- 1.5.2 Erection of all supports supplied and fabricated by Contractor as well as supplied by Vendors of various packages, equipments and machinery. Contractor may be required to fabricate and install additional supports, if required, up to the time of and including pre-commissioning and trial runs of machinery. **Erection of supports shall include making of support pedestals (of concrete for all types) including grouting etc.**

1.6.0 ERECTION OF EQUIPMENTS & MACHINERIES ETC.

- 1.6.1 Erection of Equipments and Machinery etc. leveling, alignment, finishing, grouting including supply of shims, packing plates, taper wedges etc. as required at site.

a) Checking of the level and alignment for skewness/runout of machineries

- 1.6.2 The following activities shall also be covered under the scope of this contract. These activities shall be covered in the unit rate of erection of equipments as the case may be and nothing extra shall be paid on this account unless indicated otherwise specifically:

- a. First maintenance of Equipments & Machinery.
- b. Flushing of lube oil and Seal oil piping. Lube oil/seal oil will be provided by pump vendor/owner
- c. Supply and application of anti-seize lubricating compounds such as MOLYKOT/NEVERSIEZE etc. for bolts and nuts of equipment.



- 1.7 For machineries, erection ,leveling, alignment, dowelling, drilling tapping in base plate, installation of sight glass/gauges/safety valves directly mounted on machinery supplied by vendors, coupling and decoupling from machineries for no load testing/repair by vendors, etc. and grouting (including supply of all grouting materials) shall be in the scope of contractor. Nothing extra shall be paid on this account.

- 1.8 First maintenance of equipment before pre-commissioning or as and when desired by Owner/Consultant.

- 1.9 Carrying out radiography, other non-destructive tests at site as defined in this tender.

- 1.11 Dismantling and reassembly of structures removed to facilitate erection of some equipment. The job may involve opening of bolts/cutting of structural member by gas and fitting back by bolting/welding.

- 1.12 Fabrication and erection of additional equipment supports, structures etc. shall be taken up by the Contractor and the payment shall be made Schedule of Rates

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1.13 To carry out non-destructive testing. Radiography shall be paid as per unit rates stated in S.O.R. However, all other non-destructive test, as per standards, codes and specification, shall be deemed to be included in the unit rates for fabrication and/or erection as the case may be and nothing extra shall be paid.

## 2.0 OBLIGATION OF OWNER/CONSULTANT

2.1 To provide a plot of land to enable the Contractor to build his office, stores, fabrication shop, urinal and latrine etc., at his own cost. **For Office / Store etc. only Pre-Engineered Porte Cabins to be considered and shall be arranged by the contractor at his own cost.**

2.2 To issue hot and cold safety work permits to Contractor as and when required.

2.3 To facilitate issuance of gate-pass and night/special passes to workmen of Contractor for their entry to work SITE through security gate.

2.4 To facilitate issuance of gate-pass to the Contractor for entry of his materials and equipment including tools and tackles etc. for entry to work SITE through security gate.

2.5 To function as a medium of co-ordination between various Contractors for facilitating smooth progress of work.

2.6 Provide all clarifications in technical matters for expediting the job.

2.7 To lay down the system for issue of materials from Owner / Consultant's stores/ storage yard.

2.8 To provide information regarding availability of fronts and materials to be issued by Owner so as to enable the Contractor to plan and organize the execution of work under his scope as per the overall project schedule.

## 2.9 DELETED.



## 3.0 OBLIGATIONS AND RESPONSIBILITIES OF CONTRACTOR

The Contractor's obligations and responsibilities shall include but not limited to the following:

3.1 Construction power & water shall be as per NIT SCC.

3.2 All permanent gaskets, fasteners, such as bolts/nuts/washers etc. for all size of piping and nuts, bolts, washers etc. required for **structural** works, shall be arranged and supplied by Contractor.



3.3 **Paved floor** and covered shed area shall be made available for piping pre-fabrication and *work shop* without any extra cost to Owner. The pre-fabrication of piping shall not be allowed on loose earth. The Contractor must strictly adhere and built the same during the mobilization stage.

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- 3.4 To deploy skilled, semiskilled and unskilled personnel in requisite numbers and as per scheduled programme so as to complete the WORK as per overall project schedule.
- 3.5 To deploy suitably qualified supervisors and engineers in requisite numbers to assure execution of good quality job as per best engineering practices and to the full satisfaction of Owner/Consultant.
- 3.6 To prepare detailed planning and execution schedule considering the availability of fronts and materials. This shall be reviewed by Owner/Consultant and Contractor shall be required to keep updating the same (as per the instructions of Owner/Consultant) to take care of any changes in the availability of fronts and materials and to complete all jobs as per the overall project schedule. Owner shall in no way be held responsible for such changes because such changes are deemed quite a common feature in any project of this size.
- "To achieve the targeted progress, as required by Owner/Consultant, the number of construction equipments, tools tackles and manpower shall be augmented by contractor without any additional cost to Owner/ Consultant. These numbers shall be based on the actual output achieved in the previous fortnight".
- 3.7 To check for quantity compliance between bill of materials and drawings for piping, structures etc. and intimate Owner sufficiently well in advance regarding discrepancies if any.
- 3.8 Compressed air generation to arrange & provide at site.
- 3.9 To arrange and supply all equipments/machineries, lifting, handling and shifting devices, tools and tackles which are required for the execution of jobs in sufficient quantities, as per the best engineering practices and within the targeted completion Schedule. It must be clearly understood that Owner/ Consultant shall not be responsible for arranging or supplying any tools and tackles. Contractor shall also arrange motorised hydro-testing pump/pneumatic equipment in sufficient nos. for hydro testing/pneumatic testing of pipes.

**LIST OF MAJOR TOOLS AND TACKLES REQUIRED ARE AS LISTED BELOW:**

- a) Cranes of suitable capacity.
- b) Hydra of suitable capacity.
- c) Suitable Trailer with Prime Mover
- d) Motor generator welding sets in sufficient numbers
- e) TIG welding sets complete with all accessories
- f) DG welding machines
- g) Rectifier welding sets
- h) Gas cutting set
- i) Drilling and grinding machines



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- j) Air Compressor
  - k) Portable D.G. Set
  - l) Theodolites/Dumpy level /Master level/Sprit level
  - m) Pipe beveling machine
  - n) Pipe bending machines
  - o) Sufficient pipe fabrication stand for piping spool fabrication
  - p) Non Sparking Tools (Spanners / Hammering Wrenches of different sizes).
  - q) Manual Torque Wrench preferably ratcheting type
  - r) Hydraulic torque/tensioner for piping/equipment nozzle
  - s) Wooden sleepers and scaffolding (metallic only) materials.
  - t) D-shackles, slings, lifting and spreader beams and any other special tools and tackles and facilities required to complete all jobs as per NIT to the engineering practices.
  - u) Viewer for interpretation of radiography.
  - v) Rolling M/c/Bending Machine.
  - w) Blast cleaning & painting equipments.
  - x) Holiday testing m/c for U/G Piping.
  - y) Radiography camera, Radiography source (**For radiography use of Close Proximity Camera with Selenium Source is preferred**), washing & developing facilities for radiographs. To carry-out the radiography activities the Contractor shall fulfill the criteria as follows: -
    1. The Contractor's NDT Engineers / Specialists must be fully qualified by the competent authority i.e. at least ASNT / ISNT Level II in UT, MPT, DPT, RT for carrying out statutory NDT inspection as per Rule 19 of SMPV (U) Rules 1981. The copy of certificates must be submitted to Owner for verification.
    2. The Contractor must have adequate qualified and experienced manpower to undertake the NDT jobs and should be capable to carry out the jobs on round the clock basis, if required.
    3. The Contractor shall have adequate number of NDT equipments and all equipments must be calibrated and in good condition.
    - 4) Central and portable electric ovens for electrode's baking & heating.
- 3.10 To arrange and supply all consumables (required for executing the job covered under the scope of Contractor such as but not limited to the following in adequate quantity of required quality and in time to meet the completion schedule :-

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Electrodes, filler wires, industrial gases such as oxygen, acetylene, argon, water soluble paper, fuel oils, cotton waste, markine cloth, toil stones; emery papers; grinding wheel; cutting wheel; thread petroleum compounds, Teflon sealing tapes, raw dust, sponge, cardboard pickling and Passivation , Asbestos cloth and target plates etc.

- 3.11 To provide proper storage and security arrangements for Contractor's tools, tackles, equipments, materials etc. as well as materials issued by Owner to Contractor. Owner shall not be responsible for any loss or damage to items in the custody of Contractor at site for any reason whatsoever.
  - 3.12 Completion of all repairs arising out of defective work done by Contractor. Owner may at his discretion require the Contractor to rectify certain defects in materials caused due to bad workmanship of supplier and/or during transportation. For such work of course, the payment modalities shall be settled by mutual agreement as per the items already available in this tender before starting such rectification jobs.
  - 3.13 To maintain all the records for manpower, materials and execution of job as required by law as well as Owner/Consultant.
  - 3.14 To get his work approved from statutory agencies such as but not limited to Boiler Inspector, Factory Inspector, and Inspector of Explosives etc., if required.
  - 3.15 To make arrangements for services such as transport, medical, lighting, canteen etc. for working round the clock.
  - 3.16 In addition to safety regulations listed elsewhere in the NIT, Owner /Consultant may issue certain safety directive which shall have to be followed meticulously without any reservation.
- For executing Hot Job the party should possess the following –**
- a. Suitable provision for Water Curtain
  - b. DCP Cylinder.
  - c. Asbestos Clothes
  - d. Plant Air Connectivity system to the booths
- 3.17 To undertake scope of work listed in this enquiry; to follow TECHNICAL CONDITIONS OF CONTRCT listed in Para No. 4.0 and to honor all other obligations listed specifically in other section or subsection of the enquiry.
  - 3.18 Reconciliation of materials issued to Contractor as directed by Owner/Consultant.
  - 3.19 Hand over of the completed works to Owner as per procedure laid down by Owner/Consultant.
  - 3.20 To submit documentation forming part of request for issue of completion certificate.
  - 3.21 Clear the site after cleaning the areas where the Contractor executed the job, stored the materials and built his office / fabrication shop etc.

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- 3.22 For working within booths the contractor should have suitable metallic planks / gratings etc which will serve as the working platform for the executing team. **Use of Bamboo or any wooden structure is strictly prohibited.**
- 3.23 As the work requires working at height and within booths contractor should be equipped with scaffolding pipes of different sizes and in good condition. Scaffolding pipes will be subject to inspection prior to being cleared for erection.
- 3.24 Equipments / facilities for material transportation / erection/ piping alignment works like Chain Pulley Blocks of different capacities. Hydraulic / Screw Jacks of different capacities, Tripod, Platform Trolleys, Slings (Metallic/non metallic), Rope (of suitable length). Master Spirit Level.
- 3.25 Provide the Pre- Commissioning & Commissioning Gang: Non Sparking Tools (Spanners /Hammering Wrench of different size) + Manual Torque Wrench ratcheting type in addition to the normal tools for box up etc.

**Note: - Contractor has to erect welding booths covered on all sides with CGI Sheets so that there is no splash over of welding / grinding sparks outside the booths at the contractor's risk and cost. Only new CGI Sheets will be allowed to be used.**

#### 4.0 TECHNICAL CONDITIONS OF CONTRACT



##### 4.1 WELDER'S QUALIFICATION

Welders proposed to be deployed at SITE shall be tested for welding procedure qualification and welder performance qualification in the presence of Owner/Consultant or his representative or any statutory authority whenever required strictly as per standards, codes and specifications.

##### 4.2 ELECTRODES AND FILLER WIRES

Electrodes and filler wires to be used at site in this job shall be procured from the approved vendors only. Electrodes and filter wires shall be **D&H, Advani Orlikon or ESAB, Mailam and Bohler group make only.**

Selection of electrodes and filler wires shall be as per standards, codes and specifications. Tests required, if any, to satisfy the technical suitability of these electrodes/filler wires shall be arranged by Contractor at his own cost. All electrodes and filler wires shall be supplied by Contractor within their quoted rates. All welding of materials shall be as per Engineering/Technical Standard and shall be of radiographic quality. Electrodes shall be baked as per manufacturer's catalogue at suitable temperature for the requisite time before these are to be used. The ovens (mother as well as field) are to be arranged by the Contractor.

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#### 4.3 ROOT RUN USING TIG

All piping's root run for Carbon Steel weld joints shall be done using TIG welding. Welding of socket joints for all CS and C.S. piping > 600 # rating shall be done by TIG welding only. Further to this if butt weld joints are required to be done by **TIG welding**; only **Argon gas** shall be used both for shielding and purging wherever required.

#### 4.4 FIRST MAINTENANCE

##### A. PIPING

- i) After hydro-testing, all blanks, temporary spool pieces etc. shall be removed, replaced by permanent gaskets and fixtures, as required.
- ii) Cleaning/blowing of piping as per specifications and instructions of Owner/Consultant.
- iii) All piping, dismantled for hydro test, cleaning and blowing etc shall be re-erected in position as per drawings and instructions of Owner/Consultant.
- iv) Seal / leak testing of piping shall be done as per instructions of Owner / Consultant.
- v) Gland packing of valves (where defective) to be replaced. Required packing materials shall be supplied by Owner/Consultant as free issue.
- vi) Removal, inspection and reinstallation of first spool pieces of suction piping of machinery before start up. Removal, cleaning and reinstallation of temporary strainers during pre- commissioning (as many times as required).
- viii) Removal of pre-set pins of spring hangers (after hydro-testing) and hot setting of springs.
- ix) Contractor shall provide their services during start-up of plant or attending leakages.
- x) Temporary piping for pre-commissioning shall be in the scope of Contractor.
- xi) Tapping for instrumentation shall be in the scope of Contractor.



##### B. EQUIPMENTS & MACHINERY

After erection and grouting (but before commissioning) the equipment shall be flushed and/or, cleaned by the Contractor. All temporary arrangements including piping, equipment etc. shall be supplied by the Contractor without any extra cost to Owner. Dismantling and re-erection of piping, manholes, internals (including re-fixing if found displaced or loose) shall be done to the satisfaction of the Owner/Consultant's representative and shall be capable to withstand maximum working pressure.

Oil flushing of machineries Oil circuits shall be carried out by the contractor if flushing is done with water, the equipment shall be dried by through compressed air, inspected by Consultant's representative and then boxed up. All the above jobs shall be done as per the instructions and to the full satisfaction of the Consultant/Owner's representative.

#### 4.5 GROUTING



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Grouting of pipe supports, structures and machineries etc. shall be carried out in general as per approved site work instruction except the following:

**A) SELECTION AND TYPE OF GROUT**

- i) For piping support, ordinary grout mix as mentioned below may be used:  
1:1:2 cement grout to which anti-shrinkage compound is added, such as CONBEX MONOLITHEX OR FERROGROUTE ETC. Pockets/space above grouting thickness to top of base frame pockets of rotary equipments base frame to be filled by lean concrete without extra cost to owner.
- ii) During actual grouting three cubes for testing are to be taken for each batch prepared and to be tested and must meet the strength required as mentioned.

Contractor shall check and ensure that cement containing calcium chloride is not used for grouting and all grouting shall be suitably cured so as to achieve full strength. After the grout has been cured fully, anchor bolts shall be checked for adhesion with the grout by tightening of nuts.



Instructions for grouting received from equipment vendor shall override specification in this enquiry.

**4.6 CONDITIONS OF ISSUE AND RECONCILIATION OF MATERIALS:-**

**4.6.1 CONDITIONS FOR ISSUE OF MATERIALS**

Whenever any material is issued by Owner following conditions for issue of material in addition to other conditions specified in the contract shall be applicable:

- 1.1 Necessary indents shall be raised by the Contractor as per procedure laid down by the Engineer-in-Charge from time to time, when the materials are required for incorporation in permanent works
- 1.2 Materials shall be issued only for permanent works and not for temporary works, enabling works etc. unless specifically approved by the Engineer—in-Charge.
- 1.3 The Contractor shall bear all other cost including lifting, carting from issue points to work site/Contractor's store, custody and handling etc. and return of surplus/serviceable scrap materials to Owner's storage points to be designated by the Engineer-in-Charge. No separate payment for such expenditure shall be made.
- 1.4 No material shall be allowed to be taken outside the plant without a gate pass.
- 1.5 The Contractor shall be responsible for proper storage, preservation and watch & ward of the materials.

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#### 4.6.2 RETURN OF UNUSED MATERIAL/ SCRAP

- 2.1 All unused/scrap materials shall be the property of the Owner and shall be returned in good and acceptable condition category wise by the Contractor at his own cost to Owner's Store(s).
- 2.2 No credit shall be given to the Contractor for return of scrap. The Contractor should quote the rates accordingly. Contractor shall make his own arrangements for weighing the cut offs to be returned to Owner's Stores.
- 2.3 In case the Contractor fails to return unused materials/ accountable scrap, then recovery for such quantity of materials, not returned by the Contractor shall be affected at following penal rates from the Contractor's bills or from any other dues of the Contractor to the Owner:



S No	Material		Penal Rates
1	a.	Penal Rate for non-return of accountable scrap	Issue Rate + 25% OR Landed Rate + 25% (in case issue rate are not indicated in the contract)
	b.	Penal rate for return of serviceable materials in excess of permitted % allowances.	
	c.	Penal rate for issuance of unplanned OFC jointing kits	
2	a.	Penal rates for non-return of Unused material and or penal rate for generating scrap in excess of permitted % allowances	Twice the Issue Rates OR Twice the landed Rates(in case issue rate are not indicated in the contract)
	b.	Penal rate for using excess amount of materials like cement than permitted % allowances	

- NOTE:** 1) Landed Rate shall be arrived from the latest Purchase Order of respective material received at site by Owner/ Consultant.
- 2) In case more stringent penal rates have been indicated elsewhere in the Contract (based on Project requirement), the same shall supersede the above rates.

#### 4.6.3 DELETED

#### 4.6.4 REINFORCEMENT BARS ISTRUCTURAL STEEL/PLATES



- 4.6.4.1 The scrap allowance for the reinforcement bars/structural steel including steel plate issued by the Owner shall be total 3% (2.5% accountable and 05% unaccountable) of the actual consumption as incorporated in the works.

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- 4.6.4.2 All serviceable reinforcement bars/structural steel/steel plates shall be issued is available length/shapes/sizes and no claims for extra payment on account of issue of non-standard lengths/shapes/sizes and bending etc. shall be entertained Reinforcement bars and structural steel shall be issued on weighment basis as per normal warehousing practice. In exceptional circumstances, the reinforcement bars/structural steel, if issued on linear measurement, the IS coefficients for unit weight shall be considered For the purpose of billing and accounting, only linear measurements shall be taken and weight shall be calculated as per IS coefficients in three decimals. The difference in unit weight as per IS and actual as issued, if any, shall be to Contractor's account and Contractor is deemed to have considered the same at the time of bidding.
- 4.6.4.3 Reinforcement bars/structural steel/steel plates shall be issued only for those items where Owner's supply has been specifically mentioned in Schedule of Rates/ Scope of Supply The storage of these items shall be done in such a way so as to avoid rusting/ damage to any kind to the materials.
- 4.6.4.4 All reinforcement bars/structural steel (except M.S. Plates) in length of 2 meters and above shall be considered as serviceable materials provided the material is in good and acceptable condition. Reinforcement bars/structural steel section (except MS Plates) in lengths less than 2M shall be treated as scrap.
- 4.6.4.5 The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.
- 4.6.4.6 For the purpose of accounting of the plates, all plates measuring not less than 1 Sq.m in area and having any dimensions not less than 200mm when returned to Owner's store, shall be considered as serviceable material. All other pieces shall be treated as wastage/scraps The Contractor shall prepare a plate cutting diagram in such a way that the minimum scrap is generated, also the cut plates should be used at proper places to reduce the scrap.
- 4.6.4.7 The serviceable cut pieces as mentioned in 4.4 & 4.5 above shall be considered as unused material for reconciliation purpose. Material appropriation shall be done and wherever applicable, the recovery at penal.

#### **4.6.5.0 PIPING MATERIALS**

- 4.6.5.1 All serviceable pipes shall be issued in available lengths/shapes and no claims for extra payments on account of issue of non-standard length & shape shall be entertained. Pipes shall be issued on linear measurement basis All valves, flanges, fittings etc. shall be issued on number(s) basis, Contractor shall store the materials in such a way so as to avoid mixing of different types of material and shall maintain complete identification and traceability at all times.
- 4.6.5.2 The scrap allowance for pipes issued by the Owner shall be 3% (2.5% accountable + 0.5% unaccountable) of the actual consumption as incorporated in the works.

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- 4.6.5.3 All pipes in length of 2 meters and above shall be considered as serviceable material provided the material is in good and acceptable condition and has clear identification and traceability (Manufacturer's name, heat number/batch number and test certificates). Pipes in lengths less than 2M shall be treated as scrap. The contractor shall strive to avoid generation of out pieces of length 2m and above as far as practicable, by effectively planning & executing the construction works.
- 4.6.5.4 All unused/scrap pipes, valves, flanges, forged fittings like elbows, reducers tees shall be returned by the Contractor category wise duly cleaned, greased and spec. marked at his own cost to Owner's stores.
- 4.6.5.5 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per clause 4.6.2.3 above shall be affected from the contractor.

#### 4.6.6.0 EQUIPMENTS

Various equipment/materials intended for the installation shall be received by Owner in unpacked, skid mounted, crated, packed or loose condition and shall be stored in the warehouses and open yards. In general, materials shall be issued to the Contractor in 'as received' condition, It shall be the Contractor's responsibility to draw, load and transport all materials from Owner's designated places of issue to the point of installation and return all packing materials like steel frames, wooden boxes/scrap etc. to Owner's stores.

All materials supplied by the Owner shall be duly protected by the Contractor at his own cost with appropriate preservative like primer, lacquer coating, grease etc. as required.



#### 4.6.7.0 LINE PIPES

- 7.1 All bare/ coated line pipes as per Line Pipe specifications shall be issued on linear measurement basis. The serviceable line pipes shall be issued in available lengths and shapes and no claim for extra payment on account of issue of non-standard length and shape shall be entertained. Contractor shall store and maintain the line pipes in proper manner to avoid mixing of different classes of pipes. Contractor shall maintain complete identification and traceability at all times. All out pieces when returned to Owner's storage points after beveling shall be considered as serviceable material provided:

- a) Corrosion Protection Coating is intact.
- b) Pipe pieces have pipe specifications, manufacturer's logo/name and heat number duly authenticated with hard stamp of the authorized inspector as per approved procedures

All out pieces of pipes measuring less than 2 M shall be treated as wastage/scrap.

The contractor shall strive to avoid generation of cut pieces of length 2m and above, as far as practicable, by effectively planning & executing the construction works.

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- 7.2 For the purpose of accounting of bare/ coated line pipes, following allowances shall be Permitted:
- Unaccountable wastage (Up to 100 Km 0.1%, 101 to 500 Km 0.07%, Beyond 500 Km 0.05%)
  - Scrap (All cut pieces of pipes measuring 0.25% less than 2 Meter).
  - Serviceable materials (All out pieces of pipe 05% measuring 2 Meter and above). The percentage allowance shall be accounted on the basis of pipe book chain age for main pipeline.
- 7.3 Material appropriation shall be done and wherever applicable, the recovery at penal rates as per above shall be affected from the contractor.

#### 4.7 NON DESTRUCTIVE TESTING

Radiography of weld joints, DP testing (DPT materials is only of ITW Signode/ Ferrochem/Checkmate), shall be carried out by Contractor as per codes/standards/specifications wherever required. **Close Proximity Radiography (CPR) to be used** by using suitable source of suitable strength depending upon thickness shall be used up to 30 mm thick pipes. For more than 30 mm thickness of pipe, DPT at root run will be done, filup up to 30mm shall be tested with radiography and final welding shall be tested with ultrasonic testing. Ultrasonic testing charges are covered in unit rates of piping. The joints to be radiographed shall be selected by Owner/ Consultant. Radiography of repaired joints shall be at Contractor cost.



The decision of Owner/ Consultant regarding interpretation of radiographs shall be final. For higher thicknesses where **CPR** is not possible, ultrasonic testing shall be carried out. Testing being a specialized job, it is mandatory that Contractor must get this job done through approved agencies listed elsewhere in this enquiry. Where less than 100% examinations reveal, unacceptable defects in a weld or welds, two further welds per defective weld in batch, represented by this welder shall be tested. If the tests of these further welds reveal no unacceptable defects, the defects in the first weld or welds shall be repaired and re-tested. However, if the further welds in the batch reveal unacceptable defects, all the remaining welds in the batch shall be inspected, without any extra cost for the increase in number of radiographs on this account.

100% D.P. Testing of root weld shall be done.

Radiography of weld joints shall be as per specification for all piping.

**Note: - For radiography use of Close Proximity Camera with Selenium Source is preferred.**

#### 4.8 HYDROTESTING

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Hydraulic/Pneumatic testing including repair, rectification and retesting of the complete piping system, by making suitable loops in consultation with Consultant's representative, shall be done by the Contractor. The decision to include any equipment in a loop or not shall be taken by TFL representative. All the necessary materials and arrangements required (such as but not limited to blanks, temporary supports, temporary spools in place on on-line instruments, pressure gauges, pumps suitable for required hydro test pressure, including connected piping and accessories for pumps temporary fasteners etc.) shall be in the scope of Contractor. The pressure gauges shall be used after due calibration and certification by the Consultant's representative (a valid calibration test certificate shall be made available at all time of test by the Contractor).



During testing all on-line instruments may have to be removed or blanked as required by Owner/Consultant. If removed, necessary spool pieces are to be fabricated and installed by Contractor without any extra cost to owner. The above instruments shall be installed back in the line only after cleaning and blowing of the line is over. Additional vents and drains, if required for pressure testing, shall be installed by Contractor without any extra cost to owner. But the valves & pipes required for vents and drains shall be supplied by Owner/Consultant as free issue. All the above activities form part of hydro-testing/ pneumatic testing, as the case may be. After hydro/pneumatic testing is completed to the satisfaction of the Owner / Consultant's representative, the piping shall be cleaned and blown with steam/air as per relevant technical specification. All on-line instruments shall be removed, (except if permitted by the Owner / Consultant's representative) and installed back after cleaning of the pipe line. Whenever the on-line instruments are to be removed, supply, installation and removal of spool pieces shall be arranged by the Contractor, without any extra cost to the Owner/Consultant.

#### 4.9 CARD BOARD BLASTING

The pipe lines which are required to be cleaned by air/card board blasting shall be done as per standards, specifications and instruction of Consultant in order to ensure that the lines are cleaned properly. For this purpose, the following points are kept in view:

- i) Lines to be card board blasted shall be properly supported.
- ii) One end of the line shall be blanked with two or three "standard card boards of 1/16" thickness & target plate" using flanges and bolting system.
- iii) Other end of the line shall be connected to the pneumatic pressure system.
- iv) Air pressure shall then be increased till the card board bursts at around 3-4 Kg/cm<sup>2</sup> pressure, thereby expelling out even the tiniest dust, rust and weld slag particles from inside of the pipelines.
- v) Target plates are to be used here to check if the line is fully cleared.
- vi) Supply of target plates and card-board shall be in the scope of Contractor

#### 4.9. a STEAM BLOWING

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**For lines which require steam blowing the following are to be kept in view while carrying out job as per standards, specifications and instructions of Consultant.**

- i) Lines to be steam blown shall be properly supported.
- ii) Temporary lines are required to be laid for proper venting of steam. Such vents shall be properly supported.
- iii) Then open end of vent line shall be provided with suitable arrangement for fixing of target plates.
- iv) The total loop shall be allowed to get heated up with suitable pressure steam for a certain interval after which steam should be vented and line allowed cooling. This alternative heating, cooling and venting shall enable proper cleaning of pipe line.
- v) After some cycles, target plates shall be installed to gauge the status of cleaning. Steam blowing shall continue till satisfactory results are obtained.



#### **4.10 MEASUREMENTS**

##### **4.10.1 FOR STRUCTURALS**

- A) For payment, weights indicated on approved vendor drawings shall be taken. Where weights are not indicated on vendor drawings, net weight indicated on packing lists shall be taken or as per IS hand book (SP-06). However, if weights are neither indicated on vendor drawings nor on packing list, weights shall be calculated from approved vendor drawings. For calculation of weights the following guidelines shall be followed:
  - i) Weld metal weight shall not be considered.
  - ii) No deduction or addition shall be made for opening and for nozzles less than 300 mm diameter.
  - iii) For 300 mm and above openings, nozzles and skews the actual weights shall be added or subtracted.
  - iv) Weights of structures and plates shall be taken as per IS hand book (SP-06).
  - v) For structural / heat exchangers base plates, if the weights are not available in the drawings the same shall be taken as per relevant ISI hand book / code (SP-06).
  - vi) Nut/bolt/washer supply and installation for structure is in scope of contractor without any extra cost to owner.

##### **4.10.2 FOR PIPING**

- i) To make payment for Fabrication/Erection of piping as per SOR, isometric drawing & actual measurements shall be taken at site.
- ii) On-line instruments such as Control valves, Rota meters, Orifice plates and Steam traps, in-line Filters and Strainers, Expansion bellows, Bellmouth, Vortex breaker, Spectacle blind, Relief/Safety valves etc. shall be treated as Valves. For Relief/Safety valves, the size at smaller end shall be considered.

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- iii) Measurement for branch connection shall be taken from the root of Stub-in or Weldolets joint, However separate payment shall be made for RF Pad as per SOR.
- iv) Reducers shall be paid along with piping of larger diameter, except in the case of funnels, where they shall be paid along with drain pipe to which they are connected.
- v) Weight of supports shall be calculated from support sketches, drawings or standards and specifications using ISI hand book.
- vi) Weight of structural steel platforms shall be taken as indicated on drawings. If not indicated on drawings, the same may be calculated using ISI hand book.
- vii) Payment for radiography shall be made based on as per SOR specification weld radiographed.
- viii) The payment shall be made for the weld joints found acceptable and no payment shall be made for defective weld joints. Payment for overlapping of films is not permissible, though overlapping is required.

#### 4.10.3 FOR EQUIPMENTS/MACHINERIES/PACKAGE ITEMS

For payment weights indicated on approved vendor drawings shall be taken. Where weights are not indicated on vendor drawings, net weight indicated on packing lists shall be taken. However, if weights are neither indicated on vendor drawings nor on packing list, weights shall be calculated from approved vendor drawings.

For structural/heat exchangers base plates, if the weights are not available in the drawings the same shall be taken as per relevant ISI hand book/code (SP-06).

#### 4.11 TRIAL RUN, TESTING AND COMMISSIONING

All machines shall be put on trial for 72 hours continuously as per instruction of Owner/ Consultant. The Contractor shall provide his competent personnel during trial run. Final inspection of bearings etc. to be carried out after trial run shall be part of trial run and testing. Trial run, testing & commissioning payment shall be made as per supplied manpower rate covered in SOR. Up to PRE- COMMISSIONING activities, the services of Contractor are covered within the unit rates of erection.



#### 4.12 STANDARDS, CODES & SPECIFICATIONS

The latest revision of the following standards codes and specification shall form part of this enquiry:

#### 4.13 INDIAN & INTERNATIONAL CODES (FOR REFERANCE)

- a) ANSI: B 31.3
- b) ASME SECTION VIII & IX (Latest revision)
- c) IS-800 CODE OF PRACTICE FOR STRUCTURAL STEEL IN GENERAL BUILDING CONSTRUCTION (Latest revision)



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d) IS-554 - DIMENSIONS FOR PIPE THREADS FOR PRESSURE JOINTS

#### 4.14 GENERAL INSTRUCTIONS FOR STORAGE OF PIPING

4.14.1 Following shall apply for the storage of equipments to be supplied to the Contractor, unless superseded by other orders.

##### 4.14.2 STORAGE METHODS

- a) Open-air storage
- b) Open-air storage, area fenced
- c) Roofed, open-air storage, area fenced
- d) Storage in building or rooms provided with lock and key
- e) Storage in unheated rooms

##### 4.14.3 STORAGE OF PIPE

a) PIPES (carbon steel), Suitable storage: open-air storage. Measures to be taken:

The material is to be stored separately by nominal size and wall thickness and appropriately colour-coded. The pipes are to be placed on wooden supports in a manner as to prevent them from shifting. Good accessibility is to be provided for transportation facilities and lifting gear. The end of special pipes (e.g. high pressure pipes) is to be protection against damage.

b) Piping Elements Such As Fittings, valves etc

Suitable indoors storage, Secured 4.15.2 (a)

Special Measures:

The piping materials are to be stored on solid, well accessible and marked shelves, and also care should be taken not to damage the facing when placing the items into or withdrawing them from the stores. Protective covers are to remain on the valves, etc. until commencement of erection without any extra cost to owner.



c) STORAGE OF PACKING MATERIAL:

Suitable storage: open-air storage area

Measures to be taken: To be prevented from coming in contact with the soil, and shall be covered with tarpaulins.

##### 4.14.4 STORAGE OF EQUIPMENTS

Sealing faces area to be protected against damage and corrosion. The equipment is to be protected from incoming contact with the soil by providing wooden supports. The openings are to be covered to prevent rain, snow, sand etc. from entering.

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#### 4.14.5 SPECIAL INSTRUCTIONS

- a) The equipments are to be stored in such a manner that the markings are clearly legible and visible.
- b) Attention is to be paid during storage to any special symbol marked on the packing or equipment (according to the shipping instructions).
- c) Any protections provided on the machinery shall not be removed during storage.

#### 4.15 GENERAL INSTRUCTIONS TO CONTRACTOR



- 4.15.1 All weld joint designs shall be deployed as per technical specifications. For alternative weld joint design, prior approval of OWNER/CONSULTANT is required.
- 4.15.2 Maximum tolerance on line and level of steel work shall be  $\pm 3$  mm on any part of the structure. The structure shall not be out of plumb more than 3.5 mm on each 10 m section height and not more than 7 mm per 30M section height. This shall apply unless indicated otherwise on drawings.
- 4.15.3 The use of existing foundation, structures and supports as a point of anchorage for lifting, pulling and locking purpose is prohibited and shall be allowed only when Owner/Consultant permits in writing.
- 4.15.4 At SITE, Consultant's representative shall have access at all times to all jobs being executed by the Contractor. The Contractor is bound by CONTRACT to provide him with all facilities, access to the jobs etc., in order to enable him to conduct inspection, checking, testing etc. as per his requirements. Regarding interpretation of drawings and technical documents, methodology in which jobs are to be executed, modifications necessary to complete a job or jobs etc. and in all other SITE matters the decision of Owner/Consultant representative shall be treated as final.
- 4.15.5 Prior to connecting, of the two equipments, or an equipment/ machinery with piping, tack welding of joints shall be done and got approved from Owner/Consultant prior to actual welding and completion of the job.
- 4.15.6 The Contractor shall arrange for daily cleaning of his SITE area of execution, including trenches, pits and drains, without fail. If he fails to do so, Owner/Consultant shall arrange to carry out this job through any other agency and cost for this shall be deducted from the running bills of Contractor.
- 4.15.7 The following safety factor shall apply to all lifting equipments:

Hoisting line	- 3.5
Guy wires	- 3.0
Slings	- 5.0
Shackles	- 5.0
Safety factor	- Breaking strength/load

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- 4.15.8 Load test of all lifting tackles of Contractor shall be certified by govt approved TPI.
- 4.15.9 Anchor bolts for sliding saddles shall be kept in the middle of slotted holes. The nuts for sliding saddles are loosened approximately by 3 mm and then counter nuts are tightened.
- 4.15.10 during the bad weather condition, the Contractor shall make suitable and adequate arrangement by way of providing protection against rain and wind for carrying out welding and other fabrication and erection jobs smoothly at site.
- 4.15.11 Lapping shall be done on the mechanical seats of the mating flange surfaces prior to putting metallic ring gaskets wherever required.
- 4.15.12 During alignment of moving machineries, wherever cutting, grinding, minor welding, lapping etc. would be required to complete alignment operations, the same shall be provided and arranged by Contractor without any additional cost. Weights of the machinery in the bill of quantities and schedule of rates are indicative only.
- 4.15.13 However, erection of piping etc. is to be undertaken using mobile cranes of Contractor. Availability of mobile cranes from Owner/ Consultant shall not be considered at all in CONTRACTOR'S offer.
- 4.15.14 Irrespective of the piping class, all welds in CS/SS Pipes of lube oil and seal oil circuit shall be made using TIG welding with Argon gas backing.
- 4.15.15 Quality control procedures and instructions for various supervisions in writing shall be prepared by the Contractor before opening their site. It shall be duty of quality control engineer to see that supervisors are following the same in Toto.
- 4.15.16 some of the equipments may come with blanks welded on the nozzles provided for protection/hydro test. Cutting of such blanks and edge preparation of such nozzles as per direction of Owner/ Consultant of such equipments and nothing extra shall be paid for this activity.
- 4.15.17 Contractor shall ensure that during the above ground welding job, asbestos cloth shall be used to cover instruments; cables etc., so as to avoid damage to these as well assure safe working conditions at lower levels.
- 4.15.18 The Contractor shall make necessary arrangements for transportation to site and safe storage (storage room duly approved by BARC/DOSE) of radiographic source at site without any cost to Owner. However necessary space shall be provided by Owner.
- 4.15.19 Equipment and structural shall be preserved after erection till Commissioning of plants as per instructions of Owner /Consultant. Any damage and/or cost of rectification because on non-compliance of above shall be to Contractor's account.

Even after handing over of the work to Owner/ Consultant if some defects, dirt and foreign materials are found inside the equipment, wrong fitting of any sort etc.; which could not be detected during the time of execution, were noticed; Contractor must make good the

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above mentioned defects; clean the inside of the equipment properly, arrange for proper fitting etc. at his own risk and cost, without any additional cost to Owner/ Consultant.

4.15.20 Machineries shall be stored with adequate care. Direct mounted instruments shall be removed from machine before transportation during storage and erection (to be properly tagged and marked for identification) and shall be mounted just before pre-commissioning. Flanged connections of all machines to be kept blanked or plugged to prevent entry of foreign materials.

#### 5.0 STATUTORY APPROVALS

The Contractor shall be fully responsible for obtaining Statutory Approvals (Like IBR etc) and drawings/documents needed for carrying out dismantling /erection and Hydro testing of equipment & piping coming under different local authority. All drawing/documents needed for the same shall be supplied to Contractor by Owner/Consultant.



#### 6.0 PRECOMMISSIONING & COMMISSIONING ACTIVITIES

Successfully Pre-Commissioning & Commissioning of OSBL plant is in scope of contractor.

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**SCOPE OF WORK**  
**&**  
**TECHNICAL SPECIFICATION**  
**OF**  
**UNDER GROUND PIPING WORKS**  
**FOR**  
**CONSTRUCTION OF ASH POND**  
**AT**  
**TFL TALCHAR, ODISHA**

0	10.06.22	ISSUED FOR ENQUIRY	JKY	DILIP	RRK
<b>REV</b>	<b>REV ATE</b>	<b>PURPOSE</b>	<b>PREPD</b>	<b>REVWD</b>	<b>APPD</b>

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## 1.0 GENERAL

- 1.1 This Construction specification covers excavation in all kind of strata, lifting backfilling, stacking & disposal, within specified limit & as directed by Engineer-in-Charge .
- 1.2 This also covers dewatering, shoring, strutting & timbering, safety of workman/ pedestrians, equipment or adjoining structures.
- 1.3 This specification shall be applied to field construction of various chambers, pits, trenches etc. which becomes the part of work during the alignment of U/G piping or as specified in drawing or as directed by Engineer-In-charge.
- 1.4 This specification shall not apply to the followings
- a) Work, not covered under above Scope of work.
  - b) Temporary installation.
  - c) Specific job requirement, where job requirements are in contradiction to this specification.

## 1.5 Reference documents



The work shall be compliances with all applicable governmental, local laws & regulations, codes & standards, specifications & drawings or as directed by Owner/Consultant.

## 1.6 Earthwork excavation for U/G Piping

**Excavation work shall be carried out in all kind of strata for excavation work.**

## 2.0 SCOPE OF WORK

- 2.1 The scope of work to be performed by the Contractor shall include but not limited to the following: -
- a) Transportation of materials issued by Owner such as pipes, valves, fittings, etc., from Owner's stores to Contractor's shop/site.
  - b) Piping fabrication, shot blasting, supply and application of primer/painting as per specification enclosed in NIT, laying of U/G piping, inter-connection with the existing system/unit, excavation, backfilling, sand filling compaction, hydro test of piping & other works related to UG piping to complete the system in all respect is in scope of contractor.
- 2.2 Fabrication of fittings such as miter bends, reducers etc. from pipes:
- I. Contractor shall be required to fabricate miter bends and reducers etc. out from free issue pipes as per engineering standards/specification attached with this tender document. Miter bends shall be 3 Meters for 90° and 2 Meters for 45°.

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II. Fabrication of Tees is not envisaged. All tapings shall be taken by stub-in connection (with or without reinforcement pads), and these shall be considered part of the piping work and no extra compensation shall be made for making stub-in connections.

### 3.0 PRE FABRICATION OF SPOOLS

3.1 Pipes shall be pre-fabricated in convenient spools in accordance with ANSI-B-31.3 category 'D' Service. (Services related to U/G Piping). Site fabrication shall meet all the requirements of ANSI B 31.3 and ASME Section IX. Prior to start of pre-fabrication, Contractor shall check and ensure that actual site requirements match with the drawings. Discrepancies observed, if any must be brought to the notice of the Owner/Consultant for their appropriate decision before execution of work. While doing spool pre-fabrication, extra lengths shall be kept to facilitate site adjustments.



**The prefabricated piping spool shall be Hydrotested prior to lowering in trenches.**

3.2 The following dimensional tolerances shall govern pre-fabrication and erection work:

- a. Plus/minus max. 3 mm on all dimensions from:
  - i) Face to face
  - ii) Centre to face
  - iii) Ref. line to attachment.
- b. Out of roundness: Not to exceed + 3 mm and – 1.5 mm (In diameter)
- c. Circumference: 0.5% of nominal outside circumference.
- d.  $\pm$  maximum 3mm lateral translation of branches, flanges or connections for normal services
- e. Straightness shall not deviate 3.2 mm from a 3m Straight edge.
- f. Flanges bolt holes to be symmetrically out of centre line.  
Flanges rotation shall not exceed 1.5 mm measured on the bolt circle.
- g. Flange faces misalignment: Max. (1:250) measured across any diameter from normal service (flange connections total 1:125).

### 4.0 EARTHWORK EXCAVATION FOR TRENCHES FOR PIPELINES

- 4.1 Trenching work shall be carried out in all cases of soil.
- 4.2 For Underground piping, earth excavation work shall also be referred the Document ES 6018 – Engineering Standards for Underground Piping.
- 4.3 In case of pressure piping, the trench shall be excavated generally as to provide a cover of 600 mm or dia. of pipe whichever is more. In case of gravity sewers / pipes, the trench shall be excavated to conform to invert levels as per drawings. However in certain cases the pipes may run shallower levels or at deeper levels depending upon drawing, site condition, etc. This

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- 4.4 Work shall be deemed to cover all work connected with trenching, whether trenches with single pipeline or pipelines in common trenches including road cutting.
- 4.4 The width of the trench shall be sufficient to give free working space on each side of the pipe. The free working space shall be as per work instruction. Generally it shall not be less than 150 mm on either side or 1/3 dia. of pipe, whichever is greater.
- 4.5 When pipeline are running parallel whether the trenching shall be individual or common shall be decided by Engineer-in-charge and the Contractor shall follow accordingly.
- 4.6 Excavated materials shall not be deposited within 1.5m from the top edge of the excavation, or within a distance equal to the depth of excavation whichever is greater.
- 4.7 The Contractor shall maintain excavated pit in a dry and trim condition.
- 4.8 In case of road cutting, all material i.e. metal, soling stone etc., shall be taken out carefully and kept separately for reuse and road work shall be redone up to the original level with the excavated road materials, after laying and testing of the pipeline, within 10 days from the date of starting this work. The Contractor shall construct a bye pass road when the road cutting work is been carried out. All this work shall be covered under laying of pipe works.
- 4.9 The trench shall follow the gradient of pipeline as specified in the drawing. The Contractor shall keep the trench in good condition until the pipe is laid and tested and it shall be the sole responsibility of the Contractor to prevent caving or settling down either before or after the pipe is laid.

In case pipe is lowered in caved trench and backfilled before being inspected by the Engineer-in-charge, the Contractor shall re-excavate the trench for inspection and backfill the same under his own responsibility.

5.0 **DELETED**

6.0 **PIPE LAYING AND WELDING IN TRENCHES**

6.1 Pipes shall be laid in trenches after:



- Pipes have been coated and wrapped in the shop and/or at site.
- Coating and wrapping has been tested using high frequency high voltage spark tester (using 12000-16000 voltage)

6.2 Pipe laying shall be undertaken as per specifications, Using of suitable capacity cranes only, taking sufficient care while handling (use of suitable belt type slings is essential) Coated pipe to ensure zero damages during handling.

6.3 Excavation shall be carried out strictly as per specification. Moreover excavation shall be carried out only by suitable excavators with ripper arrangement and not manually unless it is not possible to excavate with excavators.

Vol. of surplus excavated materials = vol. of piping + vol. of sand filled.



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Vol. of sand filled = the min base width x vertical depth of sand filled – vol. of piping.

No additional payment shall be made for excavation done for welding of field joints.

- 6.4 Excess earth shall be carted to a place specified by Owner / Consultant (as decided by EIC). Owner / Consultant may direct the Contractor to transport part of earth even before backfilling is done. The carted earth shall be stacked, spread and leveled properly in the area earmarked.
- 6.5 The trenches shall be filled with fine sand from River up to centre line of pipe line over which ordinary excavated earth (excluding stones, boulders and any other hard materials) shall be used for filling balance portion of the trench taking sufficient care to achieve proper compaction. Before back filling, piping shall be hydrotested; area near field welded joints shall be coated and wrapped as per specifications and to meet quality requirements for coating and wrapping. Only after satisfactory testing of coating and wrapping of the field joints, back filling shall be started.
- 6.6 For welds inspection shall be carried out by Owner/Consultant in accordance with the following:



Visual examinations: All finished welds shall be visually examined 100 percent to check the profile and smoothness of the weld, root penetration etc. visual examination shall show the following features:

- a) Welds shall blend smoothly and gradually into the parent metal with no significant undercutting or overlapping at the sides of the groove. The depth of local undercut shall not exceed 10 percent of pipe thickness of 0.8 mm whichever is smaller.
- b) The welds shall be reasonably smooth and uniform with no excessive high or low spots. External weld reinforcements shall not exceed the following limits:

Component Thickness	Reinforcement thickness (max)
Up to 12 mm	1.6 mm
Over 12 to 25 mm	2.4 mm
Over 25 mm	3.2 mm

- c) The stop and start of each run of weld shall merge smoothly and shall show no pronounced hump or crater on the weld surface.
- d) The weld shall fuse the pipe / pipe fitting at the root suitably without penetrating excessively into the bore of the pipe. The maximum permissible penetration of the root bead into the bore shall be within the limits specified below:

N.B	Maximum penetration	Maximum restriction
	In bore	in bore
-----		

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Under ½"	1.6 mm	1.6 mm
½" – 2"	3.2 mm	3.2 mm
Over 2"	3.2 mm	4.8 mm

- 
- e) The root concavity shall not exceed 1.2 mm and at no point shall the weld be thinner than the calculated design thickness of the pipe.
  - f) The root bead shall merge smoothly into the adjacent surface.
  - g) All the materials which are in Contractor's scope shall be inspected and tested as per relevant material specifications.
  - h) All weld joints made after hydrotest, whether in shop or in the field or in the trenches, shall be kept uncoated and accessible without backfilling till final hydro test is completed.

## 7.0 HYDROTESTING OF PIPING SYSTEM

After all the piping have been laid in the trenches field joints welded, radiograph found OK, the system shall be pressurized and hydro tested as per work instruction of EIC or as per EIC guidelines in convenient loops (as per mutual agreement between Owner / Consultant and Contractors, so as to avoid inconvenience of Owner/other agencies working at site) shall be at a test pressure of 1.5 times the maximum operating pressure in the system. After hydro testing has been completed successfully, the area in the vicinity of the field joints (left uncoated for welding) shall be coated and wrapped with the same specifications and workmanship as defined for the shop coating and wrapping. This coating and wrapping executed in the field must be thoroughly checked using high voltage spark testing to ensure defect-free coating and wrapping.



All materials required for hydrotesting such as but not limited to hydrotest pump, temporary piping, pressure gauges (duly calibrated), blanks, blind flanges, temporary bolts, nuts, vents and drain connection etc shall be supplied by Contractor at his cost. After completion of hydrotesting, blanks and blind flanges shall be removed and ends of pipes, fitting and piping spools shall be suitably prepared.

This hydrotest shall be undertaken in convenient loops as per the directions of Owner/Consultant, without obstructing the other agencies working at site.

## 8.0 ELECTRODES

For welding of root run, electrodes to confirm AWS specifications. However, in case it is all welding shall be as per specifications and shall be of radiographic quality. Electrodes and filler wires to be used at site in this job shall be procured from the approved vendors only. Electrodes and filter wires shall be **D&H, Advani Orlikon or ESAB, Mailam and Bohler group make only**

Electrodes shall be baked at suitable temperature for the requisite time before they are used strictly as per manufacturer.

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## 9.0 NON DESTRUCTIVE TESTING

RT as per PDIL SPEC. Location of radiography weld joints shall be selected by Engineer-in-Charge. The cost of defective radiograph and its repair shall be to Contractor's account and payment shall be made by Owner / Consultant for only for those joints, which are found acceptable refer S.O.R.

## 10.0 WELDERS QUALIFICATION

Welders proposed to be deployed at site shall be tested for procedure and quality in the presence of Owner/Consultant strictly as per ASME Section IX. All such materials and facilities as required for this test shall be arranged by Contractor at his own cost.

## 11.0 MISMATCHING

For making weld joint end preparation shall be carried out as per work instruction of EIC. During end preparation and while making the joint, if internal diameters of pipe and pipe fittings/ valves / flanges etc. do not match with each other for any reasons what-so-ever, Contractor shall be required to undertake necessary rectification for matching internal diameters without any extra cost to Owner/Consultant.

## 12.0 ROAD CROSSINGS

At road crossing, Contractor may be required to provide casing pipe and / or suitable road culverts. At such road crossing number of pipe lengths depending upon the width or road, shall be aligned, welded, hydrotesting and erected independently of the total system to avoid blockages for longer duration.

## 13.0 METHOD FOR MEASUREMENT

13.1 For payment purposes actual measurement shall be taken along the centre line of the pipe line system from end to end which will include pipe fittings, flanges, valves, etc. No additional payment shall be made for instrument tapings.

13.2 Measurement for branch connection shall be taken from the root of stub in connection.

13.3 No additional payment shall be made for instrument tapings.



13.4 Reducers shall be paid along with piping of larger diameter.

13.5 Payment for radiography shall be made on the basis of actual weld length radiographed and payment shall be made for the joints found acceptable. Radiography for defective joints shall not be paid.

13.6 Measurement and payment for excavation shall be worked out based on trench dimensions as mentioned without slope i.e. as per base Width x Depth.

13.7 No additional payment shall be made for excavation done for the welding of field welding/wrapping coating.

13.8 Measurement and payment for sand filling shall be worked out as per work instruction of EIC.

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND</b> <b>AT</b> <b>TFL TALCHER, ODISHA</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b> <b>FOR U/G PIPING</b>	PC183/E/206/S -VI/6.1	0	
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#### 14.0 LIST OF STANDARDS & DRGS & DOCUMENTS

The following standards, drawings & documents form part of this enquiry:

##### INTERNATIONAL STANDARD

- i) ANSI B 31.3 : Process Piping
  - ii) ASME Sec. IX : Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, Welding and Brazing Operators.
- a. NDT work, being on specialized job, must be carried out through approved agencies only.
  - b. The works of underground piping is of specialized nature and as such the same has to be got done through agency specialized in such works. The agency shall be as approved by Owner / Consultant.
  - c. Coating and wrapping being a specialized job must be getting done through approved agencies only.
  - d. Contractor shall be required to submit the following documents as and when asked for by Owner / Consultant:
    - i) Material certificate for materials supplied by Contractor
    - ii) Radiography report with radiographs
    - iii) Test Certificates for coating and wrapping materials
    - iv) Welders performance qualification report part

#### 15.0 BACKFILLING FOR TRENCHES FOR PIPELINES

- a. The Backfilling of underground pipe trenches shall be done as per scope of work, Technical specification and instruction of Owner / CONSULTANT.
- b. The filling shall commence only after approval by Engineer-in-charge is obtained and after the structures or pipes getting buried are tested and approved. Otherwise it shall be the responsibility of the Contractor to uncover the buried portion and refill the same.
- c. Care must be exercised to protect cables, pipes, joints and other features from damage due to backfilling and consolidation.

#### 16.0 DISPOSAL OF SURPLUS EARTH

- a. This work shall be performed according to scope of work, specification and instruction of Owner /Consultant's Engineer-in-charge.
- b. The surplus earth to be transported / disposed shall include the earth generated due to voids in the backfilled volume of earth.

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## 1.0 GENERAL

### 1.1 Scope

This specification covers the technical requirements for shop and site application of paint and protective coatings and includes; the surface preparation, priming, application, testing and quality assurance for protective coatings of mechanical equipment, structural steelwork, plate work, tankage, guards, pipe work, handrails and associated metal surfaces, which will be exposed to atmospheric for the Project.

### 1.2 Definitions

C.S	-	Carbon steel and low chrome (1- <sup>1</sup> / <sub>4</sub> Cr through 9 Cr) alloys
S.S	-	Stainless steel, such as 304,316, 321, 347,
Non-ferrous	-	copper, aluminium and their alloys.
High Alloy	-	Monel, Inconel, Incoloy, Alloy 20, Hastelloy, etc.
DFT	-	Dry Film thickness, the thickness of the dried or cured paint or coating film.

### 1.3 Safety Regulations

Protective coatings and their application shall comply with all national, state, and local codes and regulations on surface preparation, coating application, storage, handling, safety, and environmental recommendations.

Sand or other materials producing silica dust shall NOT be used for any open-air blasting operations.

### 1.4 Material Safety Data Sheets

The latest issue of the coating manufacturer's product datasheet, application instructions, and Material safety data Sheets shall be available prior to starting the work and shall be complied with during all preparation and painting / coating operations.

### 1.5 Materials

All paints and paint materials shall be obtained from the company's approved manufacturer's list. All materials shall be supplied in the manufacturer's containers, durably and legibly marked as follows.

- Specification number
- Colour reference number
- Method of application
- Batch number
- Date of Manufacture
- Shelf life expiry date
- Manufacturer's name or recognised trade mark.



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## 2.0 CODE AND STANDARDS:

Without prejudice to the provision of Clause 1.1 above and the detailed specifications of the contract, the following codes & standards shall be followed. Wherever reference to any code is made, it shall correspond to the latest edition of the code.

### 2.1 Indian Standards:

IS-5: 1994	Colors for ready mixed paints and enamels.
IS-2379: 1990	Color codes for identification of pipe lines.
IS-2629: 1985	Recommended practice for hot-dip galvanizing on iron and steel.
IS-2633: 1986	Methods for testing uniformity of coating of zinc-coated articles.
IS-8629: 1977	Code of practice for protection of iron and steel structures from atmospheric corrosion.
IS:110	Specification for Ready Mixed Paint, Brushing, Grey Filler, for Enamels, for Over Primers
IS:101	Methods of test for ready mixed paints & enamels.

### 2.2 Other Standards:

#### 2.2.1 Swedish Standard: SIS-05 5900-1967 / ISO-8501-1-1988

(Surface preparations standards for Painting Steel Surface).

This standard contains photographs of the various standards on four different degrees of rusted steel and as such is preferable for inspection purpose by the Engineer-in-charge.

#### 2.2.1 DIN: 53151 Standards for Adhesion test.

### 2.3 The paint manufacturer's, instructions shall be followed as far as practicable at all times. Particular attention shall be paid to the following:

- a) Instructions for storage to avoid exposure as well as extremes of temperature.
- b) Surface preparation prior to painting.
- c) Mixing and thinning.
- d) Application of paints and the recommended limit on time intervals between coats.

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### 3.0 SURFACE PREPARATION

#### 3.1 Metal Surface Preparation

##### 3.1.1 Safety

All work in adjacent areas, which may negatively affect the quality of blast cleaning, and/or impose safety hazards, must be completed or stopped before the blasting operation starts.

##### 3.1.2 Pre-cleaning

Prior to surface preparation all weld spatter shall be removed from the surface, all sharp edges ground down and all surfaces cleaned free of contaminants including chalked paint, dust, grease, oil, chemicals and salt. All shop primed surfaces shall be water washed by means of suitable solvent, by steam cleaning, with an alkaline cleaning agent if necessary or by high-pressure water, to remove contaminants prior to top-coating

##### 3.1.3 Surface Decontamination

Surface decontamination shall be performed prior to paint application when uncoated surface is exposed to a corrosive environment or existing paint work is to be repaired.

Existing coatings shall be removed by abrasive blast cleaning, and then high pressure potable water shall be used to clean steel surfaces.

Prior to application of coatings, the surface shall be chemically checked for the presence of contaminants. A surface contamination analysis test kit shall be used to measure the levels of chlorides, iron salts and pH in accordance with the kit manufacturer's recommendations.

Swabs taken from the steel surface, using cotton wool test swabs soaked in distilled water shall not be less than one swab for every 25m<sup>2</sup> of surface area to be painted.

Maximum allowable contaminant levels and pH range is as follows:

Sodium chloride, less than 50 microgram / cm<sup>2</sup>;

Soluble iron salts, less than 7 microgram / cm<sup>2</sup>; and

If the results of the contamination test fall outside the acceptable limits, then the wash water process shall be repeated over the entire surface to be painted, until the contaminant test is within the specified levels.

##### 3.1.4 Abrasive Blasting

All C.S. materials shall be abrasive blast cleaned in accordance with Codes (Ref. Clause 2.0). To reduce the possibility of contaminating S.S., blasting is not usually specified. However, for coatings which require a blast-cleaned surface for proper adhesion, S.S. may be blast cleaned using clean aluminium oxide or garnet abrasives (Free from any chloride or Iron / Steel contamination). When hand or power tool cleaning is required on S.S., only S.S. wire-brushes (including 410 S.S.) which have not been previously used on C.S. surfaces may be used.

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The surface profile of steel surfaces after blasting shall be of preparation grade Sa 2-1/2 of Swedish Standards SIS-05-5900 (Latest Revision) or better according to ISO 8501-1 and shall be measured using the replica tape method or the comparator method.

The roughness (profile) of blast-cleaned surfaces shall be Medium (G) according to ISO 8503-2: 1988 (appendix 1) unless otherwise specified. Medium defines a surface profile with a maximum peak-to-valley height of 60-100 microns, and G indicates that the surface profile is obtained by grit blasting. For the evaluation of surface roughness Comparator G shall be used.

Abrasive blast cleaning shall NOT be performed when the ambient or the substrate temperatures are less than 3° C above the dew point temperature. The relative humidity should preferably be below 50% during cold weather and shall never be higher than 60% in any case.

Abrasive blast cleaning shall be performed with a clean, sharp grade of abrasive. Grain size shall be suitable for producing the specified roughness. Abrasives shall be free from oil, grease, moisture and salts, and shall contain no more than 50ppm chloride. The use of silica sand, copper slag and other potentially silica containing materials shall not be allowed

The blasting compressor shall be capable of maintaining a minimum air pressure of 7 kPa at the nozzle to obtain the acceptable surface cleanliness and profile.

The blast cleaning air compressor shall be equipped with adequately sized and properly maintained oil and water separators. The air supply shall be checked to ensure no oil and water contamination at the beginning of each work shift.

Blast cleaning abrasive shall be stored in a clean, dry environment at all times. Recycling of used abrasive is prohibited.

After blast cleaning, the surfaces shall be cleaned by washing with clean water (Pressure 7kg/Cm<sup>2</sup> using suitable nozzles. During washing broom corn brushes shall be used to remove foreign matter.

Assessment of the blast cleaned surfaces shall be carried out in accordance with reference code.

Blast cleaned surfaces which show evidence of rust bloom or that have been left uncoated overnight shall be re-cleaned to the specified degree of cleanliness prior to coating.

All grit and dust shall be removed after blasting and before coating application. Removal shall be by a combination of blowing clean with compressed air, followed by a thorough vacuum cleaning with an industrial grade, heavy duty vacuum cleaner.

All cleaned surfaces shall have protection from atmospheric corrosion as per IS8629:1977

### 3.1.5 Alternate Methods of Surface Preparation

When open air blasting is not permitted on site, or when space limitations or surface configurations preclude blasting, the alternate cleaning methods listed below may be used with prior approval. Alternate cleaning methods shall consider the degree of surface cleanliness and roughness profile required by the specified coating system.

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- Vacuum or suction head abrasive blast-cleaning,
- Wet jet abrasive blast-cleaning,
- Compressed-air wet abrasive blast cleaning,
- Pressurized liquid blast-cleaning,
- Power tool cleaning,
- Hand or power tool cleaning,

Hand and/or power tool cleaning shall only be used for spot repair where abrasive blasting is not permitted or is impractical, and on items which could be damaged by abrasive blasting. Power tool cleaning shall not be carried out with tools which polish the surface, e.g. power wire brushes.

The surfaces of equipments and prefabricated piping etc. which are received at site Primerised or with finish paints, depending upon their conditions, shall be touched up and painted at site. For these surfaces sand blasting is not envisaged and these surfaces shall be prepared using power brushes, buffing or scraping, so as to achieve a surface finish to St-3 as per SIS-05-5900 . After wash-up the area to be touched up shall be jointly marked, measured and recorded for payment purposes. The type of system & nos. of coat (primer and/or finish paint) to be applied after touch up, which shall be decided by OWNER/CONSULTANT in writing before taking up the job.

When paint is to be applied on damaged painted surfaces of equipments all loose and flaking paint work should be removed to a firm feathered edge. Rusted spots should be cleaned by one of the methods specified in the clauses 4.4.1 & 4.4.2 above. In case the previous paint work is not compatible to the specified one the entire coating must be removed.

It shall be ensured that sand blasted surface/machine cleaned surface is not contaminated with oil and grease. Water shall also not be allowed to come in contact with sand blasted surface.

#### **4.0 APPLICATION**

##### **4.1 General**

The final specification of paint systems to be used to suit the exposure conditions of equipment and steelwork, shall be as specified on the scope of work, equipment data sheets or the drawings.

All coatings shall be in accordance with Indian / International Standards, the coating manufacturer's product data sheets and application instructions and the requirements contained in this specification.

##### **4.1.1 General Requirements for Shop Application**

All work areas which facilitates shop paint application shall be surface prepared for painting and have the paint system applied before installation.

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Equipments assembled at site shall only receive primer coat in the shop and finish coatings will be applied at site.

In all cases, where surfaces will be inaccessible after shop assembly, they shall be prepared and have the paint system applied before assembly is carried out. Drying times between successive coats shall be at least those recommended by the manufacturer.

All known field weld areas shall be given the specified abrasive blast surface preparation but left uncoated for a distance of 50mm from the weld line. Such areas shall be given the appropriate touch-up treatment after installation.

The manufacturer's directions for preparation and application of coatings shall be followed to ensure that the durability of the coating system is not impaired.

The Contractor shall submit the full details of the proposed surface preparation and paint systems prior to the commencement of any surface preparation.

#### **4.1.2 General Requirements for Site Application**

Paint shall be stored only in accordance with the manufacturer's instructions.

All materials used for the specific system being applied shall be products supplied by one manufacturer and details of such product shall be submitted for approval before commencement of work.

The contents of cans shall be thoroughly stirred before being poured into paint pots and shall be thinned only in the specified proportions in accordance with the manufacturer's instructions.

Finish coats may be applied by spraying except where any over spray is likely to affect finished surfaces or where spraying constitutes a health hazard to workmen in the other areas. Brush and roller application will require multiple coats to achieve the specified dry film thickness.

Brush application may be used only with the approval of the company.

Roller application shall only be used on relatively large surface areas ( i.e. > 50m<sup>2</sup>) and only if spraying is not an option.

The Contractor shall complete the application of any one type of paint or each coat thereof, before beginning the next coat on that section.

In cases nominated as critical, the application of each coat shall be approved before application of the next coat can proceed, in accordance with 'hold' points nominated in the Inspection and Test Plans (ITPs)

All fittings within any given area are to be painted with the same system as the area unless otherwise specified.

Where 2 coat of finish paint are indicated they shall be applied in two different shades to ensure that two coat are applied.

Paint shall not be applied in rain, snow, fog or mist or when the relative humidity is such as to cause condensation on metal surface.

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The CONTRACTOR must ensure the availability of a specialist from the paint manufacturer, at SITE during pendency of CONTRACT within his quoted rates to ensure the quality of painting & procedure. Addition of drying agents, pigments or other substances is not allowed unless specifically prescribed or approved by paint manufacturer's specialist.

Name plates/tags attached to the equipments/machineries shall not be painted or removed during painting job. Failing to comply with above, the CONTRACTOR may be required to replace name plates/tags at his cost.

#### **4.1.3 Qualifications and Materials**

All surface preparation, coatings application and inspection, shall be carried out by personnel experienced in that particular field. Contractors shall submit the names of subcontractors to be employed for the specific work together with the brand names of coating materials for approval prior to commencement of application.

#### **4.1.4 Handling and Transport**

All pipe work, steelwork and equipment that have been finish coated shall be handled with care to preserve the coating in the best practical condition.

Painted materials shall not be handled until the coating has completely cured and dried hard Supports in contact with coated steel during transport and storage shall be covered with a soft material to prevent damage to the coating. Appropriate materials shall be used during transportation between coated steelwork and holding down chains to prevent damage to the coating.

### **4.2 Application of Coatings**

#### **4.2.1 General**

The application method and type of equipment to be used shall be suitable for the paint specified and the surface being painted.

Paints and thinners shall be brought to the point of usage in unopened original containers bearing the manufacturer's brand name and colour designation and ready-mixed unless otherwise specified. Two-pack systems shall be mixed at the site of application to the paint manufacturer's recommendations. The mixed amount prepared shall be no more than the amount that can be applied during the stated pot life.

Paint shall be applied so that an even film of uniform thickness, tint and consistency covers the entire surface and is free of pin holes, runs, sags or excessive brush marks. Film finish shall be equal to that of first class brushwork.

Unless it is practical to do so colour shades for primer, intermediate coat and finish coat must be different to identify each coat without any ambiguity

Paint ingredients shall be kept properly mixed during paint application.

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Equipment shall be kept clean to ensure dirt, dried paint and other foreign materials are not deposited in the paint film. Any cleaning solvents left in the equipment shall be completely removed before painting.

To ensure the required film thickness is achieved on angles, welds, sharp external edges, nuts and bolts, a coat shall be applied to such items/locations immediately prior to the application of each coating to the whole area.

Care shall be taken to ensure paint application into all joints and crevices.

The contact surfaces between steelwork to be fastened by means of friction grip bolting shall be abrasive blast cleaned and prime coated only, prior to erection.

#### 4.2.2 Atmospheric conditions

Surface preparation and coating shall not be carried out in inclement weather and shall be carried out such that the surface being coated is free of moisture, wind-borne or blast cleaning dust.

Coatings shall not be applied if:

- The relative humidity exceeds 85%.
- The ambient temperature is less than 5<sup>0</sup>C (depending on local condition)
- The metal temperature is less than 3<sup>0</sup>C above the dew point.
- There is likely hood of an unfavourable change in weather conditions within two hours after painting.

As a general rule, sufficient ventilation, dehumidification and heating capacity to cope with local climatic conditions must be secured before any coating – related work is started.

In any case, humidity, ambient and surface temperature conditions at the time of paint application, and curing and drying time before application of the next coat, shall be in accordance with the paint manufacturer's recommendations. These conditions shall be recorded in the Inspection Test Record (ITR) by the Contractor and be available for review.

#### 4.2.3 Conventional or Airless Spray

Spray equipment shall be equipped with accurate pressure regulators and gauges. Spray gun nozzles and needles shall be those recommended by the paint manufacturer.

Air from the spray gun shall be clean and dry with no traces of oil or moisture.

Coatings shall be wet on contacting the painted surface. Areas of dry spray shall be removed and the correct system re-applied.

#### 4.2.4 Brush Application

The method of "laying-off" shall be suited to the paint specified and shall ensure minimum brush marking.

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#### 4.2.5 Roller Application

A uniform method of application shall be adopted when painting large areas. The rolling direction shall minimise paint joint build up. Edges and areas subject to possible roller damage shall be brush-painted prior to rolling.

#### 4.2.6 Thickness of Coatings

The maximum thickness DFT in any one application shall not exceed that specified in Technical specifications/ recommended by the paint manufacturer.

Wet film thickness gauges shall be used to make frequent checks on the applied wet film. The Contractor shall maintain at the site of painting operations, a dry film thickness tester of an approved type with a valid current calibration.

Coating thickness checks in accordance with reference code shall be performed, and the Contractor shall undertake remedial action if the measured thickness is less than specified.

Build up of each material to required thickness shall be made prior to the application of the subsequent coat; final film build shall be the minimum specified.

#### 4.2.7 Multiple Coat Applications (Except Wet-On-Wet)

Before successive paint coats are applied, intermediate coats shall be inspected for surface contamination. The presence of any grease or oil, shall be removed by a suitable solvent, and any salt and dirt adhering to the surface shall be removed by scrubbing with a solution of non-toxic detergent (except those prescribed by the manufacturer as "wet-on-wet"). Removal of contaminants shall only be performed after an intermediate coat has had sufficient time to cure.

The surface shall then be pressure hosed or dusted down by brush to disturb and remove deposits not apparent on visual inspection.

Coatings shall be applied only under the following conditions:

- The surface has been cleaned and is dry;
- The manufacturer's stated minimum time for re-coat has elapsed;
- The manufacturer's stated maximum time for re-coat has not elapsed. If the maximum time has elapsed then pre-treatment shall be in accordance with the paint manufacturer's recommendations; and

Damaged areas in preceding coat have been made good in accordance with this Specification.

When multiple coat of finish paint are indicated, they shall be applied in different shades to ensure that multiple coats have been applied.

#### 4.2.8 Protective Coatings for Fasteners

Black and galvanised erection bolts/nuts and galvanised holding down bolts/nuts shall be prepared and painted in accordance with Section 4.4 of this Specification.



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Black high tensile bolts/nuts shall be painted after erection to the same paint system specification as the surrounding structural steel.

### 4.3 Hot Dip Galvanising

All galvanising shall be carried out by the hot dipping process and conform to the requirements of IS-2629:1985 and uniformity of coating shall conform to IS 2633:1986.

All welding slag shall be removed by chipping, wire brushing, flame cleaning or abrasive blast cleaning where necessary prior to galvanising

For temporary identification, either water-soluble marking paints or detachable metal labels shall be used. For permanent identification, figures/labels shall be heavily punched or embossed by the fabricator.

For galvanised items after pickling, the work shall be inspected and any defects that render the work unsuitable for galvanising shall be repaired. After such repairs, the work shall again be cleaned by pickling.

The coating mass of zinc shall be as specified on equipment data sheets and the Drawings. Galvanised coatings shall be tested by the methods described in referred code.

After galvanising all material shall be cooled to air temperature in such a manner that no embrittlement occurs.

Galvanised coatings shall be smooth, uniform, adherent and free from stains, surface imperfections and inclusions.

All gratings and fixtures including nuts, bolts and washers that are required to be galvanised, shall be hot dipped galvanised and all nut threads shall be re-tapped after galvanising and a lubricant applied on Cold working of galvanised steelwork shall be avoided.

### 4.4 Damaged or Inaccessible Surfaces

#### 4.4.1 Damaged Paint Surface

Repair of damaged painted surfaces, as well as painting of galvanised and black bolts, and galvanised holding down bolts after erection shall comply with this Clause. The treatment shall be:

- Pre-clean the damaged or unpainted areas in accordance with Section 4.2.1 of this Specification;
- Disc or hand sand to clean bright metal;
- Inorganic zinc primers subject to mechanical damage or weld etc shall be power tool cleaned
- Feather backs by sandpapering or whip blasting the original coatings surrounding the damaged area over a 50mm distance. A rough surface shall be obtained on epoxy coatings;

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- Clean surface to remove all dust;
- Conduct surface contaminant test in accordance with Section 4.2.2 of this document; and

Build up a new paint system over the affected area with paints equal to those originally used and having the same dry film thickness for each coat. As an exception, damaged inorganic zinc primers shall be repaired with epoxy organic zinc rich paint and shall be applied within four hours of blast cleaning.

The new coatings shall overlap the original coating over the 50mm prepared distance and shall be colour matched to the specified colour of the original coating.

#### 4.4.2 Damaged Galvanised Surfaces

Damaged areas caused by oxy-cutting, welding or physical impact shall be treated as follows:

- Prepare the surface by removing any weld slag followed by vigorous power wire brushing of the coating surrounding the damaged area over a 50mm distance;
- Clean surface to remove all dust; and
- Apply two coats of organic zinc-rich primer to a minimum DFT of 100 microns.

The area to be reinstated shall be colour matched to the surrounding finish colour with 40 microns of aluminium paint to the manufacturer's **written instructions**.

#### 4.4.3 Inaccessible Surfaces

Surfaces that will be inaccessible after erection of other elements of the structure, shall be fully painted prior to the installation of the obstructing item.

#### 4.5 Surfaces Not To Be Coated

The following surfaces shall not be blasted or coated unless specifically directed:

Machined surfaces, bearings, seals, grease fittings, adjusting screws and name plates, and identification tags.

- Valve stems;
  - Raised faces on pipe and equipment flanges;
  - Electrical cabling;
  - Instrumentation, gauges and sight glasses;
  - Titanium, stainless steel and non-metallic surfaces; and
- Field weld margins, 50mm either side of weld, on tankage and piping, prior welding.

The rear face of piping flanges shall be shop prime coated only. Flange holes for fasteners shall be fully coated.

#### 4.6 Wash-Up

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All surface of equipments/prefabricated piping etc. Primerised / painted at Vendor shop and received at site if required shall be washed up as follow:

- a) Washing with clean water (Pressure 7 Kg/cm<sup>2</sup>) using suitable nozzles. During washing, broomcorn brushes shall be used to remove foreign matter.
- b) Solvent washing, if required, to remove traces of wash up as per above procedure of all surfaces of equipment, piping, structure etc. completely painted at contractor's shop shall be included in the quoted rates of oil, grease etc. Wash up as per above procedure of all surfaces of equipment, piping, structure etc. completely painted at contractor's shop shall be included in the quoted rates.

#### 4.7 Touch-Up Painting

Prior to the application of any coat, all damage to the previous coat(s) shall be touched-up. Damage to finished work shall be thoroughly cleaned and re-coated.

Surface preparation shall be done as per clause no. 3.0.....

Items supplied with the manufacturer's standard coating system shall be touched-up with the same generic coating system or recoated.

#### 4.8 Paint Storage

The following must be ensured:

- a) All paints and painting material shall be stored only in such rooms assigned for the purpose. All necessary precaution shall be taken to prevent fire. The Storage building shall preferably be separate from adjacent buildings. A sign-board bearing the Words "PAINT STORAGE- NO NAKED LIGHT" shall be clearly displayed outside. The building shall be properly ventilated and shall be adequately protected with fire fighting equipment.
- b) Storage shall be far away from heated surface open flames, sparks & well protected from sun rays.
- c) Ambient temperature at which paints are stored shall be intimated to paint manufacturer & their advice sought regarding precautions to be taken if any, regarding flammability, explosiveness & toxicity.
- d) Maximum allowed storage time for various paint materials shall be clearly indicated on individual containers. Materials which have passed expiry date shall not be used.
- e) Paints in non-original containers and/or in containers without seals, shall not be used.

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## 5.0 COATING SYSTEM SELECTION

### Coating Systems for Structures Piping and Equipment

The following Table 1 shall be used as a general guide for the selection of a paint system suitable for a particular plant area application. Paint systems specified on equipment data sheets and the Drawings shall take precedence over the general paint system area applications listed in Table 1.

**TABLE - 1**

Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
01	Structural Steel work with operating temp. Up to 90° C (Steel structures, Piping support, uninsulated CS piping, flanges, valves, stairways, walkways etc. except grating).	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P2</b> : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  <b>F1</b> : One coat of two packs. Polyamide Cured Epoxy.  <b>F5</b> : One coat of two pack aliphatic acrylic polyurethane	<b>P2</b> : 60 microns  <b>F1</b> : 120 – 200 microns  <b>F5</b> : 60 microns	Total dry film thickness of paint system: 240 microns as per <b>C4 – High durability</b>	Total dry film thickness of paint system: 320 microns as per <b>C5 – High durability</b>
02	Uninsulated CS piping, flanges, valves with operating temp. From Above 90° C to 200° C.	Blast cleaning to near white metal grade Sa-2½, of Swedish Standards SIS-05-5900 (Latest)	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1  <b>F3</b> : Two coats of single pack special Oleo resinous based heat resistant ready mixed Aluminium Paint.	<b>P1</b> : 75 microns  <b>F3</b> : 2 x 25 microns for each coat Total - 125 microns.	Total dry film thickness of paint system: 125 microns.	
03	Uninsulated CS piping, flanges, valves with operating temp. Over 200° C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1  <b>F4</b> : Two coats of Heat Resisting Silicon Aluminium Paint.	<b>P1</b> : 75 microns  <b>F4</b> : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
04	Insulated CS piping flanges, valves with operating temp up to 90° C	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F8</b> : One coat of high temperature epoxy phenolic	<b>F8</b> : 2 x 125 microns	Total dry film thickness of paint system: 250 microns.	



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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
05	Insulated CS piping, flanges, valves with operating temp. From 90° C to 200° C.	Blast cleaning to near white metal grade Sa-2½, of Swedish Standards SIS-05-5900	<b>F8</b> : Two coats of high temperature epoxy phenolic (novolac)	<b>F8</b> : 2 x 125 microns	Total dry film thickness of paint system:250 microns	
06	Insulated CS piping, flanges, valves with operating temp. Over 200° C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F9</b> : Two coats of Inorganic Co-polymer based coating With an Inert Multipolymer Matrix.	<b>F9</b> : 2 x 150 microns	Total dry film thickness of paint system: 300 microns.	
07	Uninsulated CS equipment with operating temp. Up to 90° C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P2</b> : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  <b>F1</b> : One coat of two packs. Polyamide Cured Epoxy.  <b>F5</b> : One coat of two pack aliphatic acrylic polyurethane	<b>P2</b> : 60 microns  <b>F1</b> : 120 – 200 microns  <b>F5</b> : 60 microns	Total dry film thickness of paint system: 240 microns as per <b>C4 – High Durability</b>	Total dry film thickness of paint system: 320 microns as per <b>C5 – High Durability</b>
08	Uninsulated CS equipment with operating temp. From 91° C to 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 <b>F3</b> : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	<b>P1</b> : 75 microns  <b>F3</b> : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
09	Uninsulated CS equipment with operating temp. Over 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 <b>F4</b> : Two coats of Heat Resisting Silicon Aluminium Paint.	<b>P1</b> : 75 microns  <b>F4</b> : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
10	Insulated CS equipment with operating temp. Up to 90° C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F8</b> : Two coats of high temperature epoxy phenolic (novolac)	<b>F8</b> : 2 x 125 microns	Total dry film thickness of paint system:250 microns	

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
11	Insulated CS equipment with operating temp. From 91° C to 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F8</b> : Two coats of high temperature epoxy phenolic (novolac)	<b>F8</b> : 2 x 125 microns	Total dry film thickness of paint system:250 microns	
12	Insulated CS equipment with operating temp. Over 200°C, to be treated at Manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F9</b> : Two coats of Inorganic Co-polymer based coating With an Inert Multipolymer Matrix.	<b>F9</b> : 2 x 150 microns	Total dry film thickness of paint system: 300 microns.	
13	Surface of structural steel for furnaces, external surface of furnaces, external surface of flue duct, metal stacks and similar with operating temp. Up to 200°C. (With exclusion of stair ways, walk ways etc.).	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1  <b>F3</b> : Two coats of single pack special Oleo resinous based heat resistant ready mixed Aluminium Paint.	<b>P1</b> : 75 microns  <b>F3</b> : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
14	For external surfaces of flue ducts, metal stacks, and similar with operating temp. Above 200°C.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1  <b>F4</b> : Two coats of Heat Resisting Silicon Aluminium Paint.	<b>P1</b> : 75 microns  <b>F4</b> : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
15	For surfaces of air cooler heads not galvanized with operating temperature up to 90° C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P2</b> : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  <b>F1</b> : One coat of two packs. Polyamide Cured Epoxy.  <b>F5</b> : One coat of two pack aliphatic acrylic polyurethane	<b>P2</b> : 60 microns  <b>F1</b> : 120 – 200 microns  <b>F5</b> : 60 microns	Total dry film thickness of paint system: 240 microns as per <b>C4 – High Durability</b>	Total dry film thickness of paint system: 320 microns as per <b>C5 – High Durability</b>
		<b>NOTE:</b> All surfaces shall be galvanized at manufacturer's shop with exception of the end header of air cooled heat exchangers that shall be treated as described above at Manufacturer's shop. In case the same surfaces shall not be treated at shop, they shall be treated at site according to environmental and operating conditions.				

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
16	For surfaces of air cooler heads not galvanized with operating temperature up to 91 <sup>o</sup> C TO 200 <sup>o</sup> C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 <b>F3</b> : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	<b>P1</b> : 75 microns  <b>F3</b> : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
		<b>NOTE:</b> All surfaces shall be galvanized at manufacturer's shop with exception of the end header of air cooled heat exchangers that shall be treated as described above at Manufacturer's shop. In case the same surfaces shall not be treated at shop, they shall be treated at site according to environmental and operating conditions.				
18	<b>STORAGE TANKS</b>					
a)	Acid / Alkali CS Storage Tank (External Surface including all stair ways)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P2</b> : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  <b>F1</b> : One coat of two packs. Polyamide Cured Epoxy.  <b>F5</b> : One coat of two pack aliphatic acrylic polyurethane	<b>P2</b> : 60 microns  <b>F1</b> : 120 – 200 microns  <b>F5</b> : 60 microns	Total dry film thickness of paint system: 240 microns as per <b>C4 – High Durability</b>	Total dry film thickness of paint system: 320 microns as per <b>C5 – High Durability</b>
b)	CS Storage Tanks, Excluding indicated in Sl. No. (a)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1  <b>F1</b> : One coat of two pack Polyamide Cured Epoxy.  <b>F5</b> : Two-pack aliphatic Isocyanate cured acrylic finish paint	<b>P1</b> : 60 microns  <b>F1</b> : 120 - 200 microns  <b>F5</b> : 60 microns	Total dry film thickness of paint system: 240 microns as per <b>C4 – High Durability</b>	Total dry film thickness of paint system: 320 microns as per <b>C5 – High Durability</b>
19	Cold Insulated Carbon Steel and low alloy Steel (1-¼ Cr through 9 Cr) Piping and Equipment. (Upto 60 Deg. C)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F7</b> : Two coats of Tar Free Epoxy paint suitably pigmented	<b>F7</b> : 2 x 125 microns	Total dry film thickness of paint system: 250 microns.	
20	Cold Insulated high alloy Steel piping and Equipment (Upto 200 Deg. C)	Lightly Blast cleaned as per Sa 1.0 Swedish Standards SIS-05-5900 (Latest).	<b>F8</b> : Two coats of high temperature epoxy phenolic (novolac)	<b>F8</b> : 2 x 125 microns	Total dry film thickness of paint system: 250 microns	

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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
21	DELETED					
22	Surface (CS) with Equipment with temp. Indicating paint from 220°C to 240°C treated at Manufacturer's shop	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 <b>F6</b> : Temperature indicating paint	<b>P1</b> : 75 microns <b>F6</b> : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
23	<b>PACKAGE:</b>					
a)	Surface(CS) with operating temperature upto 90°C treated at Manufacturer's shop	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P2</b> : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1 <b>F1</b> : One coat of two packs. Polyamide Cured Epoxy. <b>F5</b> : One coat of two pack aliphatic acrylic polyurethane	<b>P2</b> : 60 microns <b>F1</b> : 120 – 200 microns <b>F5</b> : 60 microns	Total dry film thickness of paint system: 240 microns as per <b>C4 – High Durability</b>	Total dry film thickness of paint system: 320 microns as per <b>C5 – High Durability</b>
b)	Surfaces (CS) with operating temperature upto 91 <sup>0</sup> C TO 200 <sup>0</sup> C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 <b>F3</b> : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	<b>P1</b> : 75 microns <b>F3</b> : 2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.	
c)	Surface (CS) with operating temp. Over 200°C, treated at manufacturer's shop.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>P1</b> : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 <b>F4</b> : Two coats of Heat Resisting Silicon Aluminium Paint.	<b>P1</b> : 75 microns <b>F4</b> : 2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns.	
d)	Package in Carbon Steel and low Alloy Steel (1-¼ Cr through 9 Cr) with cold insulated surface treated at manufacturer's shop (Upto 60 Deg. C)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F7</b> : Two coats of Tar Free Epoxy paint suitably pigmented	<b>F7</b> : 2 x 125 microns	Total dry film thickness of paint system: 250 microns.	
e)	Package in Cold Insulated high alloy Steel. (Upto 200 Deg. C)	Lightly Blast cleaned as per Sa 1.0 Swedish Standards SIS-05-5900	<b>F8</b> : Two coats of high temperature epoxy phenolic (novolac)	<b>F8</b> : 2 x 125 microns	Total dry film thickness of paint system: 250 microns	



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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
		(Latest).			
f)	DELETED				
24	For internal surface of shell, roof of CS tanks, with operating temp. Upto 110°C	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F2</b> : Two coats of two pack amine adduct cured Phenolic epoxy (Novolac) epoxy (immersion grade)	<b>F2</b> : 2 x 150 microns for each coat	Total dry film thickness of paint system: 300 microns.
25	For underside (soil side) of the tank bottom (CS) below only of the fixed tanks, bottom & shell shall be treated as follows:	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-05-5900 (Latest).	<b>F7</b> : Two coats of Tar Free Epoxy paint suitably pigmented  <b>OR</b>  <b>F8</b> : Two coats of high temperature epoxy phenolic (novolac)	<b>F7</b> : 2 x 200 microns  <b>OR</b>  <b>F8</b> : 2 x 150 microns	Total dry film thickness of paint system: 400 microns.  <b>OR</b>  Total dry film thickness of paint system: 300 microns.
26	CS Equipment and associated piping subject to cyclic, intermittent or regeneration operating condition (e.g. Molecular Sieve Driers) subjected to very severe corrosion with wide operating temperature range.	Blast cleaning to near white metal grade 3, of Swedish Standards SIS-05-5900 (Latest).	Primer: One coat of Thermal spray Aluminium paint and sealed with a Silicon Aluminium seal Finish Coat: One coat of Thermal spray Aluminium paint and sealed with a Silicon Aluminium seal.	Primer: 125 microns  Finish: 125 microns	Total dry film thickness of paint system 250 microns.

### NOTES:

#### Primers

#### ZINC ETHYL SILICATE PRIMER – P1

The zinc ethyl silicate consists of two packs. One pack contains the ethyl silicate binder with suitable solvents. The other pack contains zinc dust (NOT Paste). Zinc dust shall be ASTM D 520 Type II. They have to be mixed in suitable proportions before application as recommended by manufacturer.

<b>Volume solids</b>	:	Min.64% ±2
<b>DFT Range</b>	:	50 – 75 microns
<b>Theoretical Spreading Rate</b>	:	12.8 – 8.53 sqm/litre
<b>Colour</b>	:	Grey
<b>Application</b>	:	Spray (airless/air)
<b>Drying time ( dry to handle )</b>	:	< 45 mins. @ 30 Deg. C and 65% RH
<b>Curing</b>	:	<16 hrs @ 30 Deg. C and 65% RH
<b>% of total metallic zinc in dry film (As per the ASTM D520 – Spherical</b>	:	<b>(SSPC SP 20 Level 1) &gt;85% by wt.</b>

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<b>size)</b>		
<b>Specific Gravity</b>	:	<b>2.5 Kg/Litre min.</b>
<b>Storage life</b>	:	6 months under sealed conditions

Zinc silicate Material curing shall be checked using ASTM D 4752, minimum Acceptable value is 4.

### **ZINC RICH EPOXY PRIMER – P2**

The zinc rich epoxy consists of two packs. One pack contains the epoxy binder with suitable solvents. The other pack contains zinc dust as per ASTM D520 Type II. They have to be mixed in suitable proportions before application as recommended by manufacturer.

<b>Volume solids</b>	:	65% min. $\pm 2$
<b>DFT</b>	:	50 – 100 microns
<b>Theoretical Spreading Rate</b>	:	13 – 6.5 sqm/litre
<b>Colour</b>	:	Grey
<b>Application</b>	:	Airless spray/air spray/brush
<b>Drying time ( dry to handle )</b>	:	<10 min. @ 30 Deg C
<b>Hared Dry</b>	:	< 1.5 hrs @ 30 Deg C
<b>% of total metallic zinc in dry film (As per the ASTM D520 – Spherical size)</b>	:	<b>(SSPC SP 20 Level 2) 81% by wt. min.</b>
<b>Specific Gravity</b>	:	<b>2.3 Kg/Litre min.</b>
<b>Storage life</b>	:	12 months under sealed conditions

### **Finish Paints**

#### **HIGH BUILD EPOXY FINISH – F1**

This finish paint is fast drying, high build, Two-pack polyamide cured epoxy resin

<b>Volume solids</b>	:	85% min. $\pm 2$
<b>DFT Range</b>	:	100 – 200 microns
<b>Theoretical Spreading Rate</b>	:	7.6 – 3.8 sqm/litre
<b>Colour</b>	:	As per Manufacturer List
<b>Binder</b>	:	Polyamide cured epoxy resin, Lead & Chrome Free
<b>Application</b>	:	Brush or spray
<b>Drying time</b>	:	< 2 hrs @ 30 Deg C
<b>Over coating time</b>	:	< 2 hrs @ 30 Deg C
<b>Storage life</b>	:	24 months under sealed conditions

#### **HIGH BUILD EPOXY FINISH (Immersion Grade) – F2**

This finish paint is high build, Two-pack phenolic (novolac) epoxy

<b>Volume solids</b>	:	68% min. $\pm 2$
<b>DFT Range</b>	:	100 – 150 microns
<b>Theoretical Spreading Rate</b>	:	6.8 – 4.5 sqm/litre
<b>Colour</b>	:	As per Manufacturer List
<b>Binder</b>	:	Amine adduct cured epoxy resin

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<b>Application</b>	:	Brush or spray
<b>Drying time</b>	:	< 1.5 hrs @ 30 Deg C
<b>Over coating time</b>	:	< 6.5 hrs @ 30 Deg C
<b>Storage life</b>	:	24 months under sealed conditions

### **HEAT RESISTANT ALUMINIUM FINISH PAINT : F3**

It is a single pack system based on oleo resinous general purpose aluminium paint with good heat resistance upto 250 Deg. C. and light reflection.

<b>Volume solids</b>	:	25% min. $\pm 2$
<b>DFT Range</b>	:	25 microns
<b>Theoretical Spreading Rate</b>	:	10 sqm/litre
<b>Main pigment</b>	:	Aluminium (ASTM 962), Lead & Chrome Free
<b>Colour</b>	:	Metallic Aluminium
<b>Pigment Volume Concentration</b>	:	15 – 20%
<b>Application</b>	:	Brush or spray
<b>Drying time</b>	:	Surface dry <1hr. @ 30 Deg. C Hard dry < 3 hrs. @ 30 Deg. C
<b>Storage life</b>	:	24 months under sealed conditions

### **HEAT RESISTANT SILICON ALUMINIUM FINISH PAINT : F4**

It is a single pack system based on ambient curing silicone aluminium pigmented polysiloxane paint with maximum heat resistance of upto 600 Deg. C.

<b>Volume solids</b>	:	25% min. $\pm 2$
<b>DFT Range</b>	:	25 microns
<b>Theoretical Spreading Rate</b>	:	10 sqm/litre
<b>Main pigment</b>	:	Aluminium (ASTM 962), Lead & Chrome Free
<b>Colour</b>	:	Metallic Aluminium
<b>Pigment Volume Concentration</b>	:	15 – 20%
<b>Application</b>	:	Brush or spray
<b>Drying time</b>	:	Surface dry < 1hr. at 30 Deg. C Hard dry < 3 hrs. at 30 Deg. C
<b>Storage life</b>	:	12 months under sealed conditions

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**TWO PACK ALIPHATIC ACRYLIC POLYURETHANE FINISH PAINT – F5**

It Consists of Acrylic Resin in Part A. Part B consists of an aliphatic poly-isocyanate with appropriate solvents and additives.

<b>Volume solids</b>	:	51% min. ±2
<b>DFT range</b>	:	50 – 100 microns
<b>Theoretical Spreading Rate</b>	:	10.2 – 5.1 sqm/litre
<b>Main pigment</b>	:	Suitable pigments to get the desired colour, <b>Lead &amp; Chrome Free</b>
<b>Colour</b>	:	Metallic Aluminium
<b>Binder</b>	:	Shall not contain any binder other than acrylic resin; should not contain any <b>alkyd / acrylate alkyds / esters.</b>
<b>Application</b>	:	Brush or spray
<b>Drying time</b>	:	Surface dry < 1hr. @ 30 Deg. C Hard dry < 8 hrs. @ 30 Deg. C
<b>ISO 11507/ASTM G 154, QUV A - Accelerated weathering</b>	:	<b>Gloss retention: approx. 80 % and colour change approx. DE 1.2 after 3000 hours exposure</b>
<b>Storage life</b>	:	24 months under sealed conditions

**TEMPERATURE INDICATING PAINT : F6**

It is a single pack temperature indicating system based on silicone binder. Pigments change colour by heating. The colour change of the coating is permanent. At approximately 200°C, the colour changes from green to blue, above 310°C, the colour changes from blue to greyish white. Maximum service temperature is 400°C.

<b>Volume solids</b>	:	40% min.
<b>DFT</b>	:	25 microns
<b>Theoretical Spreading Rate</b>	:	16 sqm/litre
<b>Main pigment</b>	:	As per shade requirement, Lead & Chrome free
<b>Colour</b>	:	As per manufacturer
<b>Binder</b>	:	Based in silicone Resins
<b>Application</b>	:	Brush or spray
<b>Drying time</b>	:	Surface dry < 1hr. @ 30 Deg. C Hard dry < 4 hrs. @ 30 Deg. C

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<b>Storage life</b>	:	12 months under sealed conditions
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### **TAR FREE EPOXY – F7 (Coal Tar is Banned Globally being Carcenogenic)**

A high build two component abrasion resistant, pure epoxy with anti-corrosive properties meant for excellent performance.

<b>Volume solids</b>	:	Minimum 72%
<b>DFT Range</b>	:	150 – 200
<b>Theoretical Spreading Rate</b>	:	4.8 – 3.6 sqm/litre
<b>Application</b>	:	By brush or airless spray
<b>Drying time</b>	:	Touch Dry within 4 hrs. @ 30 Deg C Hard dry < 9 hours @ 30 Deg. C
<b>Storage life</b>	:	12 months under sealed conditions

### **EPOXY PHENOLIC (NOVOLAC) – F8**

Two Pack epoxy-phenolic (novolac) cured with amine adduct used as an External coating for the protection of insulated (CUI) equipment.

<b>Volume solids</b>	:	68% min.
<b>DFT Range</b>	:	100 – 150 microns
<b>Theoretical Spreading Rate</b>	:	6.8 – 4.5 sqm/litre
<b>Binder</b>	:	Epoxy phenolic (novolac)
<b>Dry Temp. Service</b>	:	Min. -196 to max. 205 Deg. C.
<b>Application</b>	:	Airless Spray / Brush Touch up
<b>Drying Time</b>	:	Surface dry < 1.5hr. @ 30 Deg. C Hard dry < 6 hours @ 30 Deg. C
<b>Storage life</b>	:	12 months under sealed conditions

### **INORGANIC CO-POLYMER COATING – F9**

MIO pigmented single component inorganic copolymer coating which cures to form an inert polymer matrix able to resist temperatures up to 650°C/1202°F and thermal shock/cycling in dry or dry/wet service.

<b>Volume solids</b>	:	74% min.
<b>DFT Range</b>	:	150 microns
<b>Theoretical Spreading Rate</b>	:	5 sqm/litre
<b>Binder</b>	:	Inorganic copolymer coating
<b>Dry Temp. Service</b>	:	Min. -196 to max. 650 Deg. C.
<b>Application</b>	:	Airless Spray / Brush Touch up
<b>Drying Time</b>	:	Surface dry < 0.5hr. @ 30 Deg. C Hard dry < 1.5 hours @ 30 Deg. C
<b>Storage life</b>	:	12 months under sealed conditions

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## 6.0 MACHINERY, ELECTRICAL AND INSTRUMENT EQUIPMENT:

### 6.1 Machinery

Steel surfaces shall be treated with complete paint system at Manufacturer's shop. The paint system shall be according to Manufacturer's Std. However, suitable for operating condition and the environmental condition where the machinery will operate. Where necessary machinery shall be restored at site by Contractor with suitable finish.

### 6.2 Electrical and Instrument Equipment

Steel surfaces shall be treated with complete paint system at Manufacturer's shop. The paint system shall be according to Manufacturer's Std., however suitable for operating condition and the environmental condition where the electrical and instrument equipment will operate. Where necessary Electrical and Instrument Equipment shall be restored at site by Contractor with suitable finish.

## 7.0 COLOURS:

These shall be as required by specification and in particular for:

Description	Colour	RAL	Correspond. Asian Paint colors to be defined – See Note-2
- Piping with temperature less than 90°C	GREY	7035	
- Piping, hot surface, flue gas ducts and stacks with temperature above 90°C	SMOOTH	ALUMINIUM	"
- Cooling Water Piping	SEA GREEN		"
- Fire fighting Piping	Red	3002	"
- Structures	GREY	7010	"
- Stair cases – ladders	BLACK	9005	"
- Walkways	GREY	7010	"
- Handrails assemblies	YELLOW	1004	"
- Equipment	GREY	7035	"
- Hot equipment	SMOOTH	ALUMINIUM	"
- Fire fighting equipment	RED	3002	"
- Valves in general	GREY	7035	"
- Hot valves	SMOOTH	ALUMINIUM	"
- Safety and Fire fighting valves	RED	3002	"
- Valves handwheels	BLACK	9005	
- Electric Rotary Machines	SKY BLUE	5012	
- Electric Static Machines	GREY	7035	
- Machinery (compressors & pumps)	GREY	7035	"

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Description	Colour	RAL	Correspond. Asian Paint colors to be defined – See Note-2
with operating temperature less than 90°C			
- Machinery (compressors & pumps) with operating temperature above 90°C	SMOOTH	ALUMINIUM	“
<b>FURNACES</b>			
- Casing and connected steel works	SMOOTH	ALUMINIUM	“
- Steel work not connected to casing	SMOOTH	ALUMINIUM	“
<b>AIR COOLER</b>			
- High Temperature Surfaces (Temp. > 90°C)	SMOOTH	ALUMINIUM	
- Low Temperature surface (Temp. ≤ 90°C)	GREY	7035	“
- Flare ≤ 90°C	GREY	7035	“
- Flare ≥ 90°C)	SMOOTH	ALUMINIUM	“
<b>TANKS</b>			
- Shell of fixed roof	WHITE	9010	“
- Roof of fixed roof tank	WHITE	9010	
-			

NOTE-1: The colours shall be according to IS2379:1990/International STD. RAL or BS, proposed by Contractor or Manufacturer/Owner

## 8.0 PARTICULAR DESCRIPTION

The abrasive Grit Blasting shall be used for surface preparation. **Sand blasting is prohibited due to environmental regulations.**

Primerized surface shall be faultless and shall not have mud-cracking, dripping over thickness and dry sprays.

Blast cleaning and painting shall not be carried out on wet surfaces.

Blast cleaning shall not be done when surfaces temperatures are less than 3°C above dew point, or temperature is below 5°C.

No acid washes or other cleaning solutions or solvents shall be used on metal surfaces after they have been blasted.

The surface preparation of all steel surfaces to be coated shall be free of all mill scale, rust corrosion product, oxides, paint, oil or other foreign matter

Only dry abrasive blasting procedures will be allowed. The compressed air supply used for blasting shall be free of detrimental amounts of water and oil. Adequate separator and traps shall be provided and these shall be kept emptied of water and oil. Any blast cleaning set up without functioning moisture separators shall be removed from blast cleaning areas.

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All welded areas and appurtenances shall be given special attention for removal of welding flux in crevices. Welding splatter, slivers, laminations and underlying mill scale exposed during sand blasting shall be removed or repaired.

The blast-cleaned or power brushing surfaces shall be coated with primer within four hours of surface preparation.

No primer or intermediate or finishing coating shall be applied without prior notification to the Company.

The application of the products shall be carried out in strict compliance with the paint manufacturer's recommendation.

The Contractor shall provide suitable protection for all adjacent plants or equipment from airborne during spraying and sand blasting.

## 9.0 INSPECTION AND TESTING

The inspection and testing requirements outlined in this section shall be performed for shop and site applied coating systems.

Preference shall be given to manufacturers and applicators that are quality certified to ISO 9001: 2000.

Documentation of coating material manufacturers and applicators shall include daily inspection reports, equipment reports, and shall clearly identify and trace materials supply and testing performed on coated items and areas.

Inspection and Test Plans (ITPs), and quality control procedures used for application of coating systems shall form part of the Method Statement and shall be submitted for approval by the Principal prior to commencement of work.

The applicator shall appoint a certified inspector of coatings for inspection and testing of coating systems.

Tests of coated areas and items shall form part of the ITPs.

- Surface Preparation in accordance to Swedish Standard SIS-05-5900 (Latest).
- Blast cleaning profile shall be checked using a suitable profile meter – Acceptable profile shall be 40 - 60 microns.
- Check of time of top coating and drying in accordance with the direction of the paint manufacturer.
- Check of dry film thickness by suitable non-destructive Instrument such as "MIKROTEST", "DIAMETER" or equivalent.
- Before any coating work is performed on the site, the contractor shall ensure that any works applied by others is acceptable.



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Any defect that are discovered, are to be notified in writing to the owner before proceeding with the contract work. To ensure the good execution of painting work following test shall be performed:

- Surface Preparation
- Surface contaminant tests
- Surface profile tests
- Coating thickness tests
- Tests for cure of coatings
- Adhesion tests
- Continuity testing
- Iron contamination
- Chloride contamination
- Dust Contamination

All Inspection and Test Records (ITRs) shall be submitted with the Manufacturer's Data Report (MDR) at the conclusion of the job.

Defective coated areas shall be suitably marked for rectification work to be performed in compliance with this specification.

Access shall be granted for inspection of all paint work, and witnessing of test work. This shall not however relieve the Contractor of their own QA/QC responsibilities.

#### **10.0 ADHESION TEST RESULTS**

For all type of primer the Contractor shall guarantee the Classification of Adhesion Test Results as per ASTM D3359. The acceptable Rate Adhesion Test Results shall be for sandblasted and primerized surfaces shall be minimum 3A (or Higher)

For primer plus finishing coat(s) the Contractor shall guarantee the Classification of Adhesion Test Results as per ASTM D 3359. The acceptable Rate Adhesion Test Results shall be for blast cleaned and painted surfaces shall be minimum 3A ( or higher).

After test, the surface must be repaired according to the system applied.

#### **11.0 SUBMISSION OF DATA**

Contractor shall submit in phase of bid the original technical data sheet and system for all material supplied by him to apply for the permanent works and test report for the paint in compliance to IS101. This material shall be subject to Owner's approval. The test certificates of zinc silicate shall provide the specific gravity of mixed paint.

#### **12.0 LETTER AND NUMBER INSCRIPTION**

Inscriptions letters, as herebelow indicated, shall be made on equipments, piping, storage tanks, machinery etc.

##### **12.1 Geometric forms and dimensions**

Letters and numbers dimensions shall be orientatively fixed according to following:

(A – Dimension of side of unitary elements of grid)

a) Storage Tanks A – 60 mm

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- b) Equipments and piping with O.D. above 600 mm A– 40 mm and
- c) Equipments and pipings with O.D. from 300 to 600 mm and for machinery of great dimensions A – 20 mm
- d) Equipments and pipings with O.D. less than 300 mm and for machinery with small dimensions A – 10 mm

**12.2** Inscription's Colours

Inscriptions shall be Black ENI 901 (RAL 9005) on light base

Inscriptions shall be White ENI 101 (RAL 9010) on dark base

**12.3** Spaces and Interspaces

Spaces between words and assemblage of numbers shall have dimensions equal to 2A

Interspaces between letters or numbers shall have dimensions equal to A.

**13.0** **Colour Band for piping ;-**

As a rule minimum width of colour band shall conform to the following Table:-

Nominal pipe Size	Width L (mm)
3" & below	25
4" NB-6" NB	50
8" NB-12"NB	75
14" OD & above	100

**14.0** **LIST OF MANUFACTURERS :**

1. M/s Berger Paints
2. M/s Jensions & Nickolson
3. M/s Asian Paints
4. M/s Grauer & Weil (India) Limited
5. M/s Shalimar paints
6. M/s Garware Paints
7. M/s Goodlass Nerolac Paints Ltd
8. M/s. HEMPEL Paints
9. M/s International Paints (Akzo Nobel Brand)
10. M/s Jotun Paints
11. M/s Carboline (India) Pvt. Ltd.
12. M/s Mohan Paints

**15.0** The contractor shall obtain prior approval from Engineer-In-Charge for the brands of paint material proposed to be used. The contractor shall submit the following details of paint material either at the time of bidding or soon after award of work for approval of paints.

- a. Technical data sheet

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- b. Material safety data sheet
- c. Finger printing of paint products as per ISO 20340

**16.0** Owner reserves the right to take random samples and get it tested through reputed labs. In case the supplied paint material do not meet the specified performance requirements then suitable action shall be taken against the paint supplier. The decision of Engineer-In Charge shall be final and binding on the Contractor in such cases.

**17.0 WARRANTY:**

Contractor along with Paint Manufacturer jointly shall develop the paint schemes following the system specification.

They shall jointly provide a performance guarantee for a period 5 years as stipulated below,

After 1 years – Corrosion in 3% of total painted area accepted

After 2 years – Corrosion in 6% of total painted area accepted

After 3 years – Corrosion in 9% of total painted area accepted

After 4 years – Corrosion in 12% of total painted area accepted

After 5 years – Corrosion in 15% of total painted area accepted

**where spontaneous visible corrosion has broken down the paint film to a degree exceeding “Ri 3” (as defined in ISO 4628/3-2003).**



# TECHNICAL SPECIFICATIONS FOR ASH DYKE

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## TECHNICAL SPECIFICATIONS FOR CIVIL, STRUCTURAL FOR ASH DYKE

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## **1.0.0 PREPARATION OF WORK AREAS / CLEARING SITE / JUNGLE CLEARANCE**

### **1.1.0 Scope**

This section covers site preparation of the area as indicated in the drawings and as directed by the Engineer.

### **1.2.0 General Requirements**

The Contractor shall furnish all labour, equipment and materials required for the complete performance of the work in accordance with the drawings and specifications herein and as directed by the Engineer.

### **1.3.0 Clearing Site**

Clearing and grubbing operations shall be performed in excavation areas, embankment areas; (including a strip measured beyond and contiguous to the limit line of the areas) and borrow areas. The sites should be cleared of all vegetation, trees less than girth diameter 30 cm, stumps, roots, bush, rubbish and all other objectionable or organic matter as directed by the Engineer. All materials to be burnt shall be piled neatly and when in suitable condition shall be burnt completely. The burning shall be so thorough that the materials are reduced to ashes. Special precautions shall be taken to prevent fire from spreading and there shall be available, at all times, suitable equipment for preventing and suppressing fires. Trees of specified girth and/or any other cleared materials shall be stock piled and handed over to the Engineer, without being burnt, if Engineer so directs.

## **2.0.0 EXCAVATION, FILLING & BACKFILLING WORK**

### **2.1.0 Scope**

2.1.1 This section of the specification covers the technical requirements for excavation of cut-off trench, trenches for embedding pipes, trench for replacing foundation soil of dyke embankment, foundation of water escape structures, brick masonry panel walls for slope protection, slope drains, toe drain, discharge channel, dowel bank/kerb wall on dyke top, steps on dyke slope etc. and filling/backfilling the gaps around masonry/ RCC structures (except impervious soil filling of cut-off trench, pipe trench, forming impervious core of dyke, etc) and conveyance and disposal of surplus spoils and/or stacking them properly as directed by the Engineer.

2.1.2 The Contractor shall be fully responsible for proper setting out of works, profiling in excavation, stacking, etc., taking adequate safety measures, etc. The Contractor shall carry out all works meant within the intent of this specification even if not explicitly mentioned herein. All works shall be

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executed to the satisfaction of the Engineer and as per the construction drawings.

2.1.3 Existing trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, drains, sewers, or other surface or sub-surface systems/drains/facilities within or adjacent to the works being carried out which are not to be disturbed shall be protected from damage by the Contractor. The Contractor shall provide and install suitable safeguards approved by the Engineer for this purpose.

2.1.4 During excavation, the contractor shall take all necessary precautions against soil erosion, water and environmental pollution, and where required undertake, additional works to achieve this objective. Before start of operations, the Contractor shall submit to the Engineer for approval, his work plan and the procedure he intends to follow for disposal of waste materials etc., and the schedule for carrying out temporary and permanent control works. However, the approval of the Engineer to such plans and procedures shall not absolve the Contractor of his responsibility for safe and sound work.

## 2.2.0 General requirements

2.2.1 The Contractor shall furnish all skilled and unskilled labour, plant, tools, tackle, equipment, men, materials, required for complete execution of the work in accordance with the drawings and as described herein and/or as directed by the Engineer.

2.2.2 The Contractor shall control the grade in the vicinity of all excavations so that the surface of the ground will be properly sloped or dyked to prevent surface water from running into the excavated areas during construction.

2.2.3 All materials obtained from excavation shall remain owner's property. All salvaged materials of archaeological importance or of value (in the opinion of the Engineer) shall be segregated from the other materials and both stacked separately and in a regular manner at locations indicated by the Engineer.

2.2.4 Excavation shall include removal of trees including roots & organic remains, vegetation, grass, bushes, shrubs, plants, poles, fences, etc. that are in the area to be excavated as well as beyond the excavation line so as to ensure safety of the excavated side slopes, and of men and equipment operating in the area. Before start of excavation work, joint measurements of ground level shall be taken after cleaning all grass, vegetation, etc.

2.2.5 Excavation shall include the removal of all materials required to execute the work properly and shall be made with sufficient clearance as decided by the Engineer or defined by payment line to permit the placing and setting of forms, inspection and completion of all works to the satisfaction of the Engineer for which the excavation was done.

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### 2.3.0 Classification of materials excavated / filled

For purposes of work to be executed in accordance with this specification, the following classification only shall apply. In case of any dispute regarding classification of materials excavated/filled, the decision of the Engineer shall be final and binding on the contractor.

#### Soil

- (a) This shall include all types of soils which can be excavated by pick axes or spades or earth moving equipment such as dozer, poclains, shovels, draglines, etc.
- (b) It shall include, but not be limited to, vegetative or organic soil, turf, sand, silt, mud, moorum, shingle, clay, gravel, cobbles, talus, loam, macadam, peat, ash, marsh, brick bats, tar / bitumen surfaces, etc.

#### Rock

- (a) Rock shall include materials, which are not classified under soil above.
- (b) Rock not requiring blasting – rock / boulder / PCC which can be excavated by earth moving equipment, (i.e. without blasting, wedging) such as poclain, shovels, draglines, grafting tools, etc. In case, contractor decides to use blasting for excavation of rock types considered by Owner as 'rock not requiring blasting', the payment for such works shall also be made under the item rock not requiring blasting and nothing extra shall be paid for the blasting.
- (c) Rock requiring blasting - any rock / boulder / RCC for the excavation of which blasting is required (i.e, without blasting excavation can not be carried out)

#### Rock level

After complete removal of soil overburden, the Contractor shall inform the Engineer about the rock level. The excavation in rock by mechanical means shall proceed only after establishing the rock level by Engineer and complete removal of soil over burden by Contractor. The blasting in rock (requiring blasting) shall proceed only after establishing the level of such rock by Engineer and complete removal of upper rock by mechanical means by Contractor.

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## 2.4.0 Excavation in soil

- 2.4.1 Sides and bottoms of excavation shall be cut sharp and true to line and level. Undercutting shall not be permitted. When machines are used for excavation, the last 300 mm before the required level shall be excavated such a manner that soil at the required final level will be left in its natural condition. Suitability of strata (at the bottom of excavations) for laying the foundation thereon shall be determined by the Engineer.
- 2.4.2 Excavation for foundations shall be to the bottom of lean concrete or as shown on drawings for the cut off trench and drains or as directed by the Engineer. The bottom of all excavations shall be trimmed to required levels and when excavation is carried below such levels, by error, it shall be brought back to specified level by filling with concrete of nominal mix 1:4:8 (cement : coarse sand : 20 mm down aggregates) as directed by the Engineer.
- 2.4.3 The Contractor shall ascertain for himself the nature of materials to be excavated and the difficulties, if any, likely to be encountered in executing this work. Cofferdams, sheeting, shoring, bracing, maintaining suitable slopes, draining, etc. shall be provided and installed by the contractor, to the satisfaction of the Engineer.
- 2.4.4 When excavation requires bracing, sheeting or shoring, etc. the Contractor shall submit drawings to the Engineer, showing arrangements and details of proposed installation. The Contractor shall also furnish all supporting calculations as called for and shall not proceed until he has received written approval from the Engineer. However, the responsibility for adequacy of such bracing, sheeting, shoring, etc. will rest with the Contractor, irrespective of any approval of the Engineer.
- 2.4.5 The Contractor shall have to constantly pump out any water collected in excavated pits and other areas due to rain water, springs, etc. to atleast 0.5 meter below bottom of the working level. The contractor shall remove all slush/muck from excavated areas. Sludge pumps, if required, shall be employed by the Contractor for this purpose.
- 2.4.6 The Contractor shall remove all materials arising from excavations from the vicinity to the work either for direct filling, stacking and subsequent filling or for ultimate disposal as directed by the Engineer. In no case shall the excavated soil be stacked within a distance of 1.5 m from the edge of excavation or one-third the depth the excavation whichever is more, Material to be used for filling shall be kept separately.

## 2.5.0 Filling



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**2.5.1** Excavated selected materials to be used for filling purposes shall have the prior written approval of the Engineer.

**2.5.2 Materials**

- a) Materials to be used for filling purpose shall be stone, sand or other inorganic materials and they shall be clean and free from shingle, salts, organic, large roots and excessive amount of sod, lumps, concrete or any other foreign substances which could harm or impair the strength of the substructure in any manner. All clods shall be suitably broken to small pieces. When the material is mostly rock boulders, these shall be broken into pieces not larger than 150 mm size. Sand used for filling shall be clean, medium grained and free from impurities. Fines less than 75 microns shall not be more than 20%. In any case, the materials to be used for filling purpose shall have the prior written approval of the Engineer.
- b) If excavated materials are to be used for filling, then the contractor shall select the materials from the stockpile, load and transport this material and execute the filling. These shall include excavation of earth which may become hard due to lying in stock yard for a long period of time.

**2.5.3 Filling (/backfilling) Procedure**

- a) After completion of foundation, footings, walls and other construction below the elevation of the final grades, and prior to filling, all temporary shoring, timber etc. shall be sequentially removed and excavation cleaned of all trash, debris, and perishable materials. Filling shall begin only with the written approval of the Engineer. Also, areas identified for filling shall be cleared of all soft pockets, vegetation, bushes, slush, etc. In case of plinth and similar filling, the ground shall be dressed and consolidated by ramming and light rolling.
- b) Filling materials shall not be dropped directly upon or against any structure or facility where there is danger of displacement or damage. Filling shall be started after the concrete/masonry has set and shall be carried out in such a manner so as not to cause any undue lateral thrust on any part of the structure.
- c) All space between foundation (concrete or masonry) and the sides of excavation shall be filled to the original surface after making allowance for settlement.
- d) Fill shall be placed in horizontal layers not exceeding 300 mm compacted thickness. Each layer shall be watered and compacted

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with proper moisture content and with such equipment as may be required to obtain a compaction/density as specified.

- e) Trucks or heavy equipment for deposition or compacting fill shall not be used within 1.5 meters of building walls, piers, or other facilities which may be damaged by their weight or operation. The methods of compaction shall be with plate compactors subject to the approval of the Engineer.
- f) Fill adjacent to pipes shall be free of stones, concretes etc. and shall be hand placed and compacted uniformly on both sides of the pipe and where practicable up to a minimum depth of 300 mm over the top of pipes. While tamping around the pipes, care should be taken to avoid unequal pressure.
- g) Filling shall be accurately finished to line, slope, cross section and grade as shown on the drawings. Finished surfaced shall be free of irregularities and depressions and shall be within 20 mm of the specified level.
- h) Where filling with stone from excavated materials is specified, it shall be from broken pieces of boulders. At first a 75 mm thick cushion of selected earth shall be laid over which 200 mm thick graded stones shall be laid to loose layers of 200 mm and then the interstices filled with properly graded fine materials consisting of selected earth brought from within ash pond or from borrow areas. Each layer shall be watered and compacted to the specified density before the next layer is laid. However, no cushion shall be required where filling is over non-rocky surface.
- i) Where filling with 65 mm down graded stone obtained from excavated materials/ borrow areas/ quarries is specified, it shall be selected stone laid over an initial 50 mm thick cushion layer of selected earth and then stone laid in 200 mm loose thick layers, interstices filled with properly graded fine material consisting of selected earth brought from borrow areas. Each layer shall be watered and compacted to the specified density before the next layer is laid. However, no cushion shall be required where filling is over non-rocky surface.
- j) Where clean stone fill is specified, it shall consist of clean selected stone metal of 40 mm nominal size. It shall be laid in layers not exceeding 150 mm (loose) and lightly tamped before the next layer is laid. No compaction shall be required for this type of stone filling.

#### **2.5.4 Compaction**

- a) Where compaction to 85% of Standard Proctor Density is called for such compaction shall be by mechanical means but the Contractor

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may be permitted to adopt manual means only if the Engineer finds that the desired compaction is achievable in the field.

- b) Where compaction to 95% of Standard Proctor Density is called for, it shall be by mechanical means only by with minimum 10 tonne vibratory rollers. Each layer shall be watered, rammed and compacted to the density as specified in the Schedule of Items.
- c) For compacting each sand layer, water shall be sprayed over it to flood it and it shall be kept flooded for 24 hours to ensure maximum compaction. Vibro-compactors shall also be used if necessary to obtain the required degree of compaction. Any temporary works required to contain sand under flooded condition shall also be undertaken. The surface of the consolidated sand shall be dressed to required levels or slope.
- d) After the compacted fill has reached the desired level, the surface shall be flooded with water for 24 hours, allowed to dry and then rammed and consolidated to avoid any settlement, at a later date. The compacted surface shall be properly shaped, trimmed and consolidated to an even gradient or level. All soft spots shall be excavated, filled and consolidated.
- e) The degree of compaction of compacted fill in place will be subjected to tests by the Engineer as the work progresses, and the contractor shall provide the necessary facilities to make such tests. If any test indicates that the compaction achieved is less than the specified degree of compaction, the engineer may require all fill placed subsequent to the last successful test to be removed and re-compacted by the contractor. Compaction procedure shall be amended as necessary to obtain satisfactory results.

### **3.0.0 STRIPPING**

#### **3.1.0 Scope**

This section of the specification covers stripping of foundation for embankment as shown in the drawings and as described herein.

#### **3.2.0 General Requirements**

The Contractor shall furnish all labour , equipment and materials required for complete performance of the work in accordance with the drawings and as described herein.

#### **3.3.0 Stripping of Foundations**

The entire area of embankment including some area beyond and contiguous with the area of embankment proper shall be stripped to

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minimum 300-500 mm depth (or more as per design) on soil/ash respectively as directed by the Engineer, to remove all unsuitable materials and to provide for benching. In the portion of the dyke where ground slope is steep, the stripping shall be done in a fashion as directed by the Engineer to provide for benching. The unsuitable material shall include all debris, vegetable matter including roots, weathered and disintegrated rocks, organic silts, swamps material, that are unsuitable for use in permanent construction or that might interfere with the proper binding of the embankment with the foundation, or the proper compaction of the materials in the embankment or that may be otherwise objectionable.

The stripping shall be kept far enough in advance of other items of works to ensure that no undesirable material will get mixed with approved embankment material and to allow for inspection and measurement.

Materials from stripping operations shall be deposited on either side of the embankment away from the heel and toe of the embankment and unsuitable material shall be disposed off upto a lead as per schedule of items or as directed by Engineer.

The stripping shall be carried to the required level and to provide benching wherever required as indicated in the drawing. Should the excavation be done deeper by error, the same shall be made good by filling the same with approved earth and properly compacted so that the required formation level is obtained at the Contractor's cost.

#### **4.0.0 IMPERVIOUS LINER**

##### **SCOPE**

This section of specification covers the item of providing & laying the Impervious Liner to the surface of ash storage lagoon/Ash Pond as indicated in the drawings with below mentioned methods:

- (1) With naturally existing impervious clayey soils or manufactured impervious soil by blending soil/earth with bentonite in order to achieve the required imperviousness of permeability not more than  $1 \times 10^{-6}$  cm/sec or by laying Low Density Polyethylene Sheet of 750 micron thickness.

OR

#### **4.1.0 REQUIREMENTS OF PROVIDING CLAY CORE IMPERVIOUS LAYER**

The compacted thickness of liner shall not be less than 300 mm. The suitability or otherwise of the material shall be determined by laboratory tests. In case clayey soil of the specified quality is not available, alternatively soil blended with required quantity of bentonite (not less than 4 percent by volume) to achieve the specified permeability also can be used

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with the same specified procedure for laying and compaction. Blending shall be done by suitable means. Layer of liner laid shall be compacted to have a dry density not less than 90% of the maximum dry density (standard proctor) for the soil with suitable rollers or by any other method approved by the Engineer.

Bentonite is fine textured colloidal clay. Sodium bentonite shall be used for the work. Laboratory tests shall be conducted to determine the percentage of bentonite needed to achieve the desired permeability of  $1 \times 10^{-6}$  cm/sec.

Soil to be used for liner shall be free from organic matter, debris etc. Clods of soil shall be broke down before mixing the soil with bentonite. The soil shall be pulverised and air dried by spreading it before mixing bentonite.

After cleaning, cutting of grass, leveling and proper compaction of Ash Pond base, LDPE lining s to be laid on the ground with proper lapping between lining sheets and covered with minimum 300mm compacted thick earth.

#### **4.1.1 LAYING OF CLAY CORE IMPERVIOUS LINER**

The work broadly involves laying of clayey soil (or) mix of soil & bentonite, mixing of soil & bentonite, Spreading the mix, compacting & Testing of Permeability. The area to be covered is shown in the drawing or as instructed by the engineer. The work also involves removal of muck/debris and disposal of the debris and any excavated material upto a lead as per schedule of items or as directed by the engineer.

The scope of work shall include but not be limited to the following,

1. Initial laboratory testing on the natural impervious clayey soil ( if available) to check the permeability.
2. Submission of report of the laboratory tests and percentage of bentonite requirement in soil–bentonite mixtures and any other information.
3. The contractor shall submit the details of construction methodology to be adopted and equipment proposed to be used at site for the construction of liner for engineer's approval before the actual start of the work.
4. Providing, laying & Compacting Impervious liner ( soil-bentonite mix or impervious clayey soil ) at the site as per the instruction of engineer.

#### **4.1.2 Storage of Bentonite**

Storage of the bentonite shall be the responsibility of the Contractor. A dedicated storage area shall be selected at the project that is away from

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the high traffic area and is level, dry and well drained

Bags of bentonite should be stored on their original pallets. All stored bentonite covered with plastic sheet or tarpaulin until use.

#### 4.1.3 Sub-grade Preparation

The surface upon which the Impervious Liner is to be provided shall be graded & prepared to provide adequate support for compaction and to be free from mass movements.

The subgrade surface should be prepared by minimum 300 mm stripping, grading, watering wherever required, and removing all vegetation, rocks, and other matter which could penetrate the Impervious Liner or decrease the uniformity of the mixture. The largest allowable rock shall have no dimension greater than one-third the finished thickness of the Impervious Liner. The prepared surface shall be compacted by at least 2 passes of 8 Ton – 10 Ton roller.

In case earth for formation of dyke is borrowed from inside the lagoon where impervious liner is to be provided, after borrowing fill material from the ash pond, the excavated surface shall be prepared with compaction by two passes of 8 Ton – 10 Ton roller and slope shall be maintained to 1V:4H.

#### Mixing, placing & compaction of manufactured impervious soil

For mixing of soil & bentonite, Contractor can select any of the following method.

**Mix in Other Place:** Soil & bentonite shall be mixed thoroughly in dry condition in a mixture and water shall be added, once the mix attains uniformity, The mix will be transported to site and spread over the prepared surface of lagoon to get the compacted thickness not more than 300 mm.

**Mix in Place:** Alternatively soil shall be spread in layers and the required bentonite shall be spread over the soil surface. Before applying the bentonite, soil moisture should be adjusted to 2-3% above optimum moisture Content. The bentonite shall be spread uniformly across the accepted subgrade surface at the specified application rate, using a customized agricultural seed or lime spreader or other equipment as approved by the engineer. The bentonite shall be thoroughly mixed and compacted layer thickness of 300 mm. Multiple cross-directional passes with the mixing equipment shall be performed until the soil/bentonite mixture is homogeneously mixed as determined by visual inspection for color uniformity.

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Transition from the end of one completed section of the liner to the beginning of the next will be accomplished by re-mixing and recompacting within a transition zone that is not less than 1 m in width.

#### **4.3.0 UPSTREAM SLOPE PROTECTION**

Upstream slope of the earthen bund shall be protected by Low Density Polyethylene Sheet LDPE of 750 micron. The Bed of the reservoir will be lined with smooth lining, where as the slope will be lined with one side textured lining. The membranes will be anchored on the berms with a suitably designed anchor trench and will be backfilled after the anchoring of the membrane is completed.

LDPE Geomembrane manufactured as per GRI GM 13 standards, with a minimum width of 5 m, UV resistant & minimum elongation of 700%. The liner should be manufactured in a plant backed with internal testing lab. Manufacturer should have In-house testing lab should be GAI LAP and same to be tested by NABL certified lab also. The liner should have proper marking of manufacturers name at every 1m along the length so that only approved liner is used at site."

Storage of material, transportation, and carrying and Laying of LDPE is to be done very carefully with all measures to protect from rubbing and tearing. Proper overlapping between two sheets is to be maintained as per drawing/IS code or the direction of Engineer-in-Charge.

#### **5.0.0 BORROW AREAS**

##### **5.1.0 Borrow earth**

5.1.1 All materials required for the embankment which are not available from cut-off trench excavation or from other excavations or within the lagoon shall be obtained from designated borrow areas. The impervious material required for filling cut-off trench and pipe trench and core of the dyke shall be approved clayey soil like CI-CH, CH etc. brought from elsewhere or manufactured soil prepared by blending the soil.

5.1.2 The depths of cut in all parts of the borrow areas will be determined by the Engineer and the cuts shall be made to such depths only. The type of equipment used and the operation in the excavation of materials in borrow areas shall be of such type that will produce the required uniformity of mixture of materials for embankment.

5.1.3 Borrow area shall be opened so as not to impair the usefulness or mar the appearance of any part of the work or any other property. The excavation surfaces and surface of dumped waste materials shall be left in a

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reasonably smooth and even condition. When the borrow area is located contiguous to the dyke alignment then it must be ensured that the borrow area shall not be opened within a distance of five times the height of embankment contiguous to the heel or the toe of the embankment or 25 metre whichever is more.

5.1.4 For acceptance criteria for fill material refer Part - A of this specification.

#### **5.2.0 Preparation of Borrow Areas (site clearance)**

All areas required for borrowing earth for embankment shall be cleared of all rank vegetation and stumps roots, bush, rubbish, and other objectionable material. Particular care shall be taken to exclude all organic matter from the material to be placed in the dyke embankment. All unsuitable materials including rank vegetation, stumps shall be disposed off as specified elsewhere in this specification. The cleared areas shall be maintained free of vegetation growth during the progress of the work. The unsuitable materials will be filled back, after borrowing earth for earth embankment construction, as directed by the Engineer.

#### **5.3.0 Stripping of Borrow Areas**

Borrow areas shall be stripped of top soil, sod and any other matter which is unsuitable for the embankment construction. Materials from stripping shall be disposed off upto a lead as per schedule of items or as directed by Engineer. The depth of stripping shall be decided by the Engineer depending upon the nature of top soil and the vegetation present.

#### **5.4.0 Borrow Area Watering/ Dewatering**

The natural moisture content of material in the borrow areas as well as the optimum moisture content corresponding to the Proctor's maximum dry density for the material in the particular borrow area shall be obtained from laboratory tests. Additional moisture if required shall be introduced into the borrow area by watering well in advance of excavation, to ensure uniformity of moisture content. If in any borrow area before or during excavation there is excess moisture, steps shall be taken to reduce the moisture by the selective excavation to secure the materials of required moisture by excavating drainage ditches, by allowing adequate time for drying or by other means. To avoid formation of pools in the borrow areas during excavation operation, drainage ditches from borrow areas to the nearest outlets shall be excavated.

### **6.0.0 PREPARATION OF FOUNDATION SURFACE**

#### **6.1.0 Scope**

This section covers the preparation / compaction of foundation of the dyke as indicated in the drawings and described herein.



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## 6.2.0 General Requirements

- 6.2.1 Foundation preparation shall be performed as per drawings and as described herein subsequent to stripping of foundation and excavation, if any, No material shall be placed in any section of the fill portion of the embankment until the foundation for the section of the fill portion of the embankment has been dewatered, suitably prepared and has been approved by the Engineer. All excavations made for test pits or other sub-surface investigations and all other existing cavities, found within the zone below the established lines of excavation for embankment foundation, shall be filled with earth/ash of the corresponding zone and properly compacted. The foundation should be free from all organic materials, vegetable sods, and weak layers of compressive materials such as clays or low density silts. The top soil of foundation should be stripped properly such that vegetable sods and top layers are removed to ensure proper bond between embankment and foundation.
- 6.2.2 Masonry / concrete surfaces of the back of retaining walls, wing walls, concrete pipes, box culverts, etc. against which the fill is to be placed, shall be cleaned and moistened prior to placing the earth/ash. The foundation immediately adjacent to the masonry / concrete structures shall be thoroughly cleaned of loose materials and moistened and compacted using hand held plate compactors Pools of water shall not be permitted in the foundation and shall be drained and cleaned prior to placing the first layer of embankment material. In case wet patches/marshy area of nallah/pond is encountered along the proposed foundation of dyke embankment, shall be thoroughly cleaned/removed by box cutting and shall be built up in layers.
- 6.2.3 The area of rock surface which is to be in contact with earth/ash fill of the dyke shall be exposed with rough excavation. Hard rock promontories and overhangs shall be removed by suitable means wherever required, care being taken to avoid objectionable shocks to foundation rock. As far as possible, the whole contact area of foundation rock after rough excavation shall be exposed at one time to enable examination of the rock surface characteristics and planning the method of treatment. Suitable benching shall be provided in the foundation rock where the rock surfaces are steeper than 2 H : 1 V.
- The rock surface shall be thoroughly cleaned. Pockets of sand and gravel and other soil shall be removed and soft erodable seams and localised decomposition cleaned out. Loose rock shall be removed by hand picking and wedging. Finally the hand cleaned surface shall be thoroughly washed with powerful water jets to remove the fines which would have worked into the seams of the rock and to obtain a clean surface.
- 6.2.4 Wherever specified in the Schedule of Items or Drawings, the earth/ash surface shall be compacted by rolling, to achieve the specified degree of compaction using appropriate rollers, in a manner specified for formation of

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embankment in layers, elsewhere in this specification.7.0.0 Impervious  
Soil Fills

### 7.1.0 Scope

This section of specification covers the item of filling the cut-off trench, filling around pipe/ RCC encased pipe laid in trench (for water escape pipes, ash water recirculation pipes, emergency escape water pipes, etc) and formation of impervious core as indicated in the drawings with naturally existing impervious clayey soils or manufactured impervious soil by blending available soil/earth with bentonite.

### 7.2.0 General Requirements

7.2.1 The Contractor shall furnish all materials labour, equipment and material required for complete performance of the work in accordance with the drawings, schedule of items and as described herein.

7.2.2 The cut-off trench shall be filled up in layers not exceeding 300 mm in compacted thickness and in the manner described under placing the earth fill in **Clause 8.5.0** using impervious soils CL or CI type having permeability less than  $1 \times 10^{-6}$  cm/sec, to be obtained by the Contractor from his borrowed area as approved by the Engineer or from the pond area. The suitability or otherwise of the material shall be determined by laboratory tests. In case clayey soil of the specified quality is not available, alternatively manufactured impervious soil by blending required quantity bentonite (not less than 4 percent) to available soil to achieve the specified permeability also can be used with the same specified procedure for laying and compaction. Blending of bentonite with earth shall be done in dry form in a concrete mixer or mixed by suitable means on a platform. Each layer of earth deposited shall be compacted to have a dry density not less than 98% of the maximum dry density (standard proctor) for the soil with suitable tractor drawn heavy sheep foot tamping rollers of minimum 10 tones capacity or by any other method approved by the Engineer. The compaction shall have to be uniform throughout the length and breadth of each layer. The roller should be made to travel over the entire section of each layer so that the earth is fully compacted and the roller leaves no visible marks on the surface.

7.2.3 Before placing the water escape pipes within the embankment, construction of dyke upto 600 mm above the RCC lining for pipes shall be carried out without actually placing the pipes. Later on, trenches shall be excavated for pipes and lining work, pits for cut-off collars and diaphragm filters. These trenches shall then be filled using naturally available CL-ML type soil (plasticity index 7-20). or with manufactured soil by blending with bentonite to achieve specified plasticity. Earth layer deposited in these trenches shall be compacted with suitable compactors to have a dry density not less than 100 percent of the maximum dry density (standard proctor).

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7.2.4 The spreading of the next layer shall be carried out only after the underlying layer has been approved by the Engineer or his authorised representative.

7.2.5 The impervious core of the dyke shall be made with approved clayey soil brought from elsewhere and / or with manufactured soil by blending the available soil with bentonite (not less than 4 per cent by volume) to achieve the permeability not more than  $1 \times 10^{-6}$  cm/ sec. The procedure for laying and compaction shall be the same as specified for the dyke or shells of dyke.

### 7.3.0 **Water for cut-off trench and embankment works**

The Contractor has to make his own arrangements for the supply of water for embankment works. It shall be the responsibility of the Contractor to identify and develop water source or sources, running a pipe line / pipe lines laid at a distance not less 10 metre away from the toe / heel of the dyke for conveying the water required for the work from the supply sources, tapping water from manifolds provided at suitable intervals along the pipe line with the aid of water hoses and sprinkling jets for sprinkling water uniformly over the entire area (and not poured in patches) for bringing up the layers to the required moisture content. Alternately he may employ sufficient number of water tankers also. No separate payment for the above shall be made and entire cost on account of the same shall be included in the rates for relevant items of schedule.

### 8.0.0 **EARTHEN / ASH /SLAG DYKE AND EARTHEN / ASH /SLAG DYKE SHELL/CORE**

#### 8.1.0 **Scope**

This section of specification covers the earth work involved in the dyke/ dyke shell/core formation.

#### 8.2.0 **General Requirement**

The Contractor shall furnish all labour, equipment and materials required for complete performance of the work in accordance with drawings schedule of items and as described herein.

#### 8.3.0 **Earthen Embankment**

The shell/core embankment shall be constructed to the lines and grades shown on the drawings. Placement of fill shall be performed in an orderly way and in an efficient and workman like manner, so as to produce fills having such quantities of density, strength and permeability as will ensure the highest practicable degree of stability and performance of the embankment.

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No bushes, roots, sods or other perishable or unsuitable materials shall be placed in the embankment. The suitability of each part of the foundation for placing embankment materials thereon and of all materials for use in embankment construction shall be determined by the Engineer. The dyke may be constructed in separate portions or reaches, provided that:

- i) The slopes of the bonding surfaces between the previously completed portions of the embankment and materials to be placed in each zone shall not be steeper than 2.5 horizontal to 1 vertical in case of earth and 3.0 H : 1 V in the case of ash.
- ii) The embankment is constructed right across the whole section in each portion or reach.

#### **8.4.0 Fill materials**

The materials for dyke shell/core embankment shall be obtained from the designated borrow areas and available excavated material to the extent possible considering fill material as specified elsewhere in the specification. Some earth material available from the excavation of cut-off trench, etc., if found suitable, shall also be used for the embankment construction.

#### **8.5.0 Placing the fill material**

8.5.1 Before placing the fill, the foundation shall be prepared and compacted as per **Clause 6.0.0**. The distribution and gradation of materials throughout the fill shall be as shown in the drawings or as directed by the Engineer. The combined excavation and placing operations shall be such that the materials when compacted in the fill will be blended sufficiently to produce the specified degree of compaction and stability. The fill material obtained from a particular borrow area, as far as possible, shall be used in forming the complete cross-section of the fill, as per drawing, for a particular stretch. Sequences of the placing of fill material shall be such that it shall be possible to identify at all stages of construction which borrow area material is/was used in which stretch of the fill/embankment.

8.5.2 No stones, cobbles or rock fragments, having maximum dimensions of more than 10 cm shall be placed in the fill. Such stones and cobbles shall be removed either at the borrow pit or after being transported to the fill but before the materials in the fill are rolled and compacted. Such stones or cobbles shall be placed in other portions of embankment if found suitable or rejected as directed. The materials shall be placed in the fill in continuous horizontal layers, stretching right across the whole section, not more than 30 cm in compacted thickness and rolled as here in specified. During construction a small transverse slope from centre towards the edges should be given to avoid pools of water forming due to rains. The surface of materials to be placed thereon, shall be moistened and/or worked with harrow, scarifier or other suitable equipment, in an approved manner to a sufficient depth to provide a satisfactory bonding surface

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before the next layer of fill material is placed. If the rolled surface of any fill is found to be too wet for proper compaction, it shall be raked up, allowed to dry, or shall be worked with a harrow or any other approved equipment to reduce the moisture content to the required amount and then it shall be re-compacted before the next layer is placed.

**8.5.3** When compacting the fill material against steep rock abutment or walls or masonry or concrete structure the construction surface of embankment shall be sloped away from rock or masonry or concrete structures for a distance of 3 m to 4 m at an inclination not steeper than 6 horizontal to 1 vertical. If the foundation surface is too irregular to allow the use of a large roller directly against a structure/rock out crop, the roller shall be used to compact the fill material as close to the structure or the out crop as possible and the portion of the embankment directly abutting against the rock or the structure shall be compacted with pneumatic hand compactors/tampers in thin layers. The moisture content of the fill material placed against the rock or the structure shall be high enough to allow it to be compacted into all irregularities of the rock or the structure. Care shall be taken in placing the first layer of the fill so that no damage is caused by the hauling machinery to the base grade as this may get concealed by the spread layer or fill. Sheep foot roller shall not be employed for compacting till the thickness of the layers already compacted by other means is greater by 30 cm than the depth of the feet on the roller drum. The material for the first layer shall be at moisture content sufficient to enable bonding of the fill with the rock surface.

**8.6.0 Weather Conditions**

Embankment materials shall be placed only when the weather conditions are satisfactory to permit accurate control of the moisture content in the embankment materials.

**8.7.0 Moisture Control**

Prior to and during compacting operations, the materials in each layer of fill shall have moisture content about 2% less than the optimum moisture content, in the case of cohesive soil. In the case of cohesionless material, including ash, the placement moisture content may have only little effect on the compaction behaviour of the fill, and hence, appropriate moisture content required from other site considerations such as dust suppression, etc, may be adopted. The Contractor shall make his own arrangements for supply of water in the manner described under “Water for cut-off trench and embankment” under the Clause 7.3.0. If the moisture content is greater than required, the material shall be spread and allowed to dry before starting rolling. The moisture content shall be uniform throughout the layer of materials and ploughing, discing, harrowing or other methods of mixing may be required to obtain uniform distribution. If the moisture content is more or less than the range of the required practicable moisture content, or

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if it is not uniformly distributed throughout the layer, rolling shall be stopped and shall be started again only when the above conditions are satisfied.

### 8.8.0 Degree of Compaction

8.8.1 While the specification provides that equipment of a particular type is to be deployed and used, compaction shall be done to achieve 95% standard Proctor density by mechanical means. Compacted layer thickness shall be maximum 300 mm. Tamping (sheep foot) rollers or pneumatic rollers shall be used for compacting cohesive materials and pneumatic rollers and vibratory rollers shall be used for compacting cohesionless materials including ash. Any other suitable type of compaction equipment also can be employed after necessary field trials about their effectiveness and with approval of the Engineer.

### 8.9.0 Rolling and Tamping

#### 8.9.1 Rolling

When each layer of material has been conditioned so as to have the proper moisture content uniformly distributed throughout the material, it shall be compacted by passing the roller. The exact number of passes shall be decided after necessary field tests. The layers shall be compacted in strips overlapping not less than 0.6 m. The rollers or loaded vehicles shall travel in a direction parallel to the axis of the dyke.

Density tests shall be made after rolling and the dry density attained shall be not less than 95% of maximum dry density (Standard Proctor) obtained in the Laboratory for the type of material used unless otherwise specified elsewhere.

#### 8.9.2 Tamping

Rollers will not be permitted to operate within 1.0(one) m of concrete and masonry structures. In locations where compaction of the fill material by means of the roller is impracticable or undesirable the material shall be specially compacted as specified here in at following locations:

- a) Portions of the dyke embankment adjacent to masonry structures.
- b) Earth / ash in dyke embankment adjacent to steep abutments,
- c) Earth / ash fill at locations specially designated by the Engineer.

Fill shall be spread in layers not more than 30 cm. in compacted thickness and shall be moistened to have the required moisture content. When each layer of material has been conditioned to have the required moisture content it shall be compacted to achieve the dry density of not less than 95% of maximum dry density (Standard Proctor) by special rollers, mechanical tampers, hand held vibratory

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tampers or by other approved methods, and all equipment and methods used shall be subject to approval based on evidence of actual performance.

### **8.10.0 Inspection Test**

Control tests shall be carried out as per approved quality plan of Part C of this specification. The Contractor shall provide all facilities such as labour, conveyance, equipment, etc. required for collection of samples and to conduct tests in-situ or at laboratory. Relevant tests to be conducted at the borrow area, on embankment and at laboratory as the work progresses.

### **8.11.0 Dressing and Trimming of the Slopes**

The outer slopes of the embankments shall be neatly dressed to line as the placing of the fill progresses. Compaction shall extend over the full width of the embankment and the material in the slopes shall be compacted as for the rest of structure. To ensure proper compaction at the outer edge, either slope compactor may be used or the fill shall be constructed for a minimum of 0.5 m extra width on either edges and the outer edge trimmed to specified width and slope, as per construction drawings, after completion of the dyke section upto top, in different stretches of the alignment. No slope shall be left without trimming to design slope. The trimmed slope surface shall be checked for adequate compaction as specified in the Quality Assurance check list as given in Part C and under compaction, if any, shall be corrected. Slopes shall be maintained until final completion and acceptance. Any material that is lost by weathering or due to any other cause shall be replaced. The trimmed materials are permitted for reuse in the embankment. No separate payment shall however, be made for forming extra width, offsets or trimming the slopes and the unit rates for the embankment work shall, therefore, provide for the same.

### **8.12.0 Provision for Settlement**

While forming the embankment, due allowance of 1 per cent of the vertical height or as appropriate shall be made to allow for settlement so as to maintain the top of dyke at designed elevation.

## **9.0.0 FORMATION OF SAND BLANKET AND CHIMNEY**

### **9.1.0 Scope**

The section of the specification covers supplying and forming of sand blanket on the foundation of embankment, sand chimney if any in the bund and sand filters between toe drain, rock-toe, rip rap and foundation and along the slope as indicated in the drawings.

**9.2.0 General Requirements**

The Contractor shall furnish all labour and material required for the complete performance of the work in accordance with the drawings, schedule of item and as described herein.

**9.3.0 Sand Blanket/Sand Chimney/sand filter**

Thickness of graded sand shall be provided as indicated in the drawings or as specified or as directed by the Engineer.

**9.4.0 Material**

The material for blanket, chimney and sand filters shall consist of clean sound and well graded coarse sand. The materials shall be free from debris, wood, vegetable matter and other deleterious matter. The gradation of sand material shall meet the requirements as specified below (Refer Table 2 Criteria for Filters IS 9429 – 1999):

- a)  $D_{15} (F) \geq 5D_{15} (B)$  or 0.1mm whichever is higher  
 where, suffix "F" denotes filter material and "B" base material  
 (common to all 4 types of base material)
- b) 

<u>Base Soil Type</u>	<u>Filter criteria</u>
1	$D_{15} (F) \leq 9D_{85} (B)$ or 0.2mm, which ever is higher
2	$D_{15} (F) \leq 0.7\text{mm}$
3	$D_{15} (F) \leq (40-A)$ $\text{-----} \times (4 \times D_{85}(B) - 0.7) + 0.7\text{mm},$ (40-15) where A = % passing 75 micron
4	$D_{15} (F) \leq 4D_{85} (B)$
- c) Max size of filter shall not exceed 75 mm.
- d) Material passing 75 micron shall not exceed 5%
- e) Filter material should be non-cohesive
- f) Limits of  $D_{10} (F)$  and  $D_{90} (F)$  for preventing segregation should be as under :



<b>D<sub>10</sub> (F)</b> <b>Min. (mm)</b>	<b>D<sub>90</sub> (F)</b> <b>Max. (mm)</b>
<0.5	20
0.5 to 1.0	25
1.0 to 2.0	30
2.0 to 5.0	40
5.0 to 10	50
10 to 50	60

#### **9.4.1 Degree of compaction**

The filter material shall be suitably compacted to a firm condition to achieve a relative density of 70%.

#### **9.5.0 Placing**

##### **9.5.1 Sand Blanket**

Sand blanket shall be laid subsequent to site clearance, stripping and excavation, if any. The foundation area shall be cleared before laying the bottom layer of blanket material. Filter material shall be laid in layers not exceeding 30 cm. Care shall be taken to ensure that materials of different layers do not get mixed, both at the time of placing and during compaction. After the layers of filter blanket material have been laid and compacted as directed by the Engineer earth/ash fill material shall be laid.

##### **9.5.2 Sand Chimney**

Sand chimney of specified thickness shall be laid at the specified location by excavating and removing the already compacted bund material, exposing sand chimney in the lower layers earlier laid, and refilling the trench with sand in layers. The layer of sand shall be well rammed. The depth of each layer of chimney to be laid shall not be more than 30 cm or as directed by the Engineer. The excavated material can be reused in the dyke construction While excavating the earth for filling sand for chimney drain, the top layer of sand which has been mixed with earth/ash, shall also be removed.

Alternatively, the sand chimney can also be laid in layers simultaneously with the laying of each layer of fill. In such case, the top level of sand layer

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shall always be kept at about 100 mm above earth/ash level on both sides. Each layer of sand shall be compacted. Care shall be taken to avoid mixing of earth/ash and sand.

### 9.5.3 **Sand filter**

The sand filter around the rock-toe and below rip-rap shall closely follow the levels of the embankment in the area. Sand filter shall be laid subsequent to stripping of foundation and / or trimming of slope of compacted bund. The excavated earth/ash shall be removed from the working area and stockpiled at a place directed by the Engineer. The surface to receive the sand filter shall be cleaned by suitable means before laying of filter material. The sand filter shall be laid in layers. The thickness of the layers shall not be more than 30 cm or as directed by the Engineer. The sand layer shall be well compacted. Care shall be taken that materials of different layers do not get mixed, both at the time of placing and during compaction.

## 10.0.0 **GRADED COARSE RAINED AGGREGATE FILTERS**

### 10.1.0 **Scope**

The section of the specification covers supply and placement of the graded aggregate filters at the bottom and on the slope of toe drain, rock-toe and below rip-rap protection layers on embankment slopes and at any other place as indicated in the drawings released for construction or as directed by the Engineer.

### 10.2.0 **General Requirements**

The Contractor shall furnish all labour, equipment and materials required for the complete performance of the work in accordance with the drawings and as described herein.

### 10.3.0 **Material**

The coarse aggregate material shall consist of durable well graded broken rock of hard stone variety from the specified quarries and shall be approved prior to being transported to the area of deposition. The materials shall range in the size from 10 mm to 75 mm and shall satisfy the filter criteria.

The rock material used in the aggregate filters shall satisfy the following condition:

- a) Specific gravity shall not be less than 2.50. (As per IS: 1122)
- b) Sulphate soundness less than 10% loss of weight after 5(Five) cycles

(As per IS: 1126)

- c) Aggregate Impact value shall not exceed 30% (As per IS: 2386)
- d) Water absorption shall not exceed 2.5%. (As per IS: 2386)
- e) In slake durability test (as per IS: 10050), the percentage retained after ten (10) minutes cycles shall be more than 85%.

#### 10.4.0 Placing

Graded aggregate filters shall be constructed over the trimmed surface of the embankment slope, as indicated in the drawings. The aggregate filters shall be placed in layers of uniform thickness as shown in the drawings and care shall be taken to avoid segregation of coarse and fine materials and formation of pockets.

#### 11.0.0 ROCK TOE

##### 11.1.0 Scope

This section of the specification covers the supply and forming toe drain & rock toe as shown in the drawings.

##### 11.2.0 General Requirements

The Contractor shall furnish all labour, equipment and materials required for the complete performance of the work in accordance with the drawings, schedule of item and as described herein.

##### 11.3.0 Material

The rock material used for the toe drain & rock toe shall satisfy the quality requirements specified under Clause 10.3.0. The materials shall range in size from 10 to 45 cm. All brush, roots or other perishable materials shall be removed from rock-fill during spreading and shall be transported to a disposal area as decided by Engineer.

The rock available from the excavation of water escape structure/ stripping / drain channel / within the land acquired for construction of earthen dyke etc. which satisfy the quality requirements specified under Clause 10.3.0 and found suitable for construction of toe drain & rock toe by Engineer shall be used. These shall be washed, cleared, and broken into required size and stacked separately, at a place as directed by the Engineer.

##### 11.4.0 Placing

The stone pieces shall be hand placed to obtain a stable, well graded and free draining fill. The toe drain & rock toe shall be constructed in layers so that the smaller rock fragments shall be placed adjacent to the filter of

embankment and the large rock fragments near the outer edge of the rock toe. The rock fill shall be hand placed, spread and roughly levelled in layers not greater than 30 cm. in thickness in order to maintain a reasonably uniform surface and ensure that the completed fill will be stable and do not contain any voids having least dimension larger than 50 mm.

Contamination of the rock with finer materials from any other zones shall be avoided. Accumulations of soil caused by contamination shall be removed.

Separate record shall be kept for the rock toe constructed using the rock obtained from quarries, from within the acquired land, from the excavation of cut-off trench, water escape structure etc. if separate rates are quoted in the Schedule of Items.

## **12.0.0 RIP-RAP ON THE SLOPE OF EMBANKMENT**

### **12.1.0 Scope**

The section of the specification covers the supply and forming rip-rap protection on the slope of the embankment as shown in the drawing.

### **12.2.0 General Requirements**

The Contractor shall furnish all labour, equipment and material required for the complete performance of the work in accordance with the drawings, schedule of item and as described herein.

### **12.3.0 Material and Placing**

Rip-rap shall be hand placed on the slopes of the dyke embankment as per **IS: 8237 - "Code of practice for Protection of slope for reservoir embankments"**. The thickness of rip-rap layer shall be as indicated in the drawings. The thickness shall be measured normal to slope of the embankment.

**The rock materials used for rip-rap shall satisfy the quality requirements specified under Clause 10.3.0.**

The quality of individual rock fragments shall be dense, sound and resistant to abrasion, and shall be free from cracks, seams, shale partings, conglomerate bands and other defects that would tend to increase unduly their susceptibility to destruction by water and weathering action. The shape of the individual rock fragment shall be angular. Fragments having thickness less than 50% of their maximum dimensions shall not be used as rip-rap. The stones shall be evenly distributed over the paved area. The average weight of stones shall be 15 kg. for 300 thick rip-rap and 50 kg. for 600 thick rip-rap. These stones shall be placed on the edge with longer dimension normal to the slope. Rock fragments and spells shall be tightly driven into the interstices to wedge the rip-rap in place and close direct

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opening to underlying slope. The wedging shall be done with the largest chip practicable, each chip being well driven home with a hammer so that no chip can be removed by hand. Stones shall be laid in a compact manner beginning at the bottom of the slope.

Rip-rap shall be placed along with the fill so that a minimum of break down will occur during placing and spreading.



The rock, if any, available from the excavation of water escape structure / stripping / drain channel, etc, which satisfies the quality requirements specified under **Clause 10.3.0** and found suitable for construction of rip-rap by Engineer shall be used. These shall be washed, cleared, and broken into required size and stacked separately, at a place as directed by the Engineer.

Similarly, rock materials which satisfy the quality requirements specified under **Clause 10.3.0** can also be obtained from rock if any available within the land acquired for construction of earthen dyke, if it is found suitable. The location from where the material will be obtained shall be approved by the Engineer. The rock shall be broken to required size and shape and shall be cleaned before use.

Separate record shall be kept for the rip-rap constructed using the rock obtained from quarries, from within the acquired land, from the excavation of cut-off trench, water escape structure, etc. if separate rates are quoted in the Schedule of Items.



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**TECHNICAL SPECIFICATIONS  
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## 1.0 GENERAL

- 1.1 Specifications of materials and workmanship shall be as described in the Central Public Works Department Specifications Vol. I & II (latest) include latest amendments, unless otherwise specified. These CPWD Specifications shall be deemed to form part of this contract. The **CONTRACTOR** shall procure and maintain copies of the latest CPWD Specifications at site for reference.
- 1.2 These technical Specifications shall be supplementary to the specifications contained in the CPWD specifications, wherever at variance, these Particular Specifications shall take precedence over the provisions in the CPWD Specifications.

## 2.0 REFERENCE CODES & STANDARDS



- 2.1 Wherever reference of IS Specifications/ or IS Codes of Practice are made in the Specifications/ Schedule of Rates or Preambles, reference shall be to the latest edition of IS (Bureau of Indian Standards).

IS - 383	Coarse & Fine aggregates from natural sources for concrete.
IS - 427	Distemper, dry, colour as required.
IS - 432	Mild Steel & Medium tensile steel bars.
IS - 456	Code of Practice for Plain and Reinforced Concrete.
IS - 515	Natural and Manufactured aggregates for use in mass concrete
IS - 730	Hook bolts for corrugated sheet roofing
IS - 800	Code of Practice for General Construction in Steel
IS - 1079	Hot rolled carbon steel sheets & strips
IS - 1081	Code of practice for fixing and glazing of metal (steel & aluminium) doors, windows and ventilators.
IS - 1161	Steel tubes for structural purposes.



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IS - 1285	Wrought aluminium & aluminium alloy extruded round tube and hollow sections
IS - 1361	Steel windows for Industrial Buildings.
IS - 1363	Hexagon head bolts, screws & nuts of product grade C : Part - I Hexagon head bolts ( size range M5 to M64)
IS - 1367	Technical supply conditions for threaded steel fasteners
IS - 1566	Hard - Drawn steel wire fabric for concrete reinforcement.
IS - 1786	High strength deformed steel bars & wires for concrete reinforcement.
IS - 2062	Steel for general structural purposes.
IS - 2116	Sand for masonry mortars.
IS - 2212	Code of practice for brickwork.
IS - 2386	Methods of test for aggregates.
IS - 2835	Flat transparent sheet glass
IS - 4021	Timber door, window and ventilator frames
IS - 4923	Hollow Steel sections for structural use.
IS - 4925	Concrete batching and mixing plant.
IS - 5410	Cement Paint
IS - 6477	Dimensions for wrought aluminium & aluminium alloys, extruded hollow sections.
IS - 7318	Fusion welding of steel.
IS - 10262	Recommended guidelines for concrete mix design.
IS - 14871	Products in Fibre Reinforced Cement – Long Corrugated or Asymmetrical Section Sheets and Fittings for Roofing and Cladding - Specification

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### 3.0 EARTHWORK

#### 3.1 Excavation

- 3.1.1 Excavation shall be carried out in soil of any nature and consistency, in the presence of water or in the dry, met on the site to the lines, levels and contours shown on the detailed drawings and **CONTRACTOR** shall remove all excavated materials to soil heaps on site or transport for use in filling on the site or stack them for reuse as directed by the Engineer-in-Charge.
- 3.1.2 Surface dressing shall be carried out on the entire area occupied by the buildings including plinth protection as directed without any extra cost. The depths of excavation shown on the drawings are the depths after surface dressing.
- 3.1.3 The site around all buildings and structures to a width of 3 metres beyond the edge of plinth protection, ramps, steps, etc. shall be dressed and sloped away from the buildings.
- 3.1.4 Black cotton soil, and other expansive or unsuitable soils excavated shall not be used for filling in foundations, and plinths of buildings or in other structures including manholes, septic tanks etc. and shall be disposed off within the contract area marked on the drawings, as directed, levelled and neatly dressed.
- 3.1.5 In case of trenches exceeding 2 metres depth or where soil is soft or slushy, the sides of trenches shall be protected by timbering and shoring. The **CONTRACTOR** shall be responsible to take all necessary steps to prevent the sides of trenches from caving in or collapsing. The extent and type of timbering and shoring shall be as directed by the **Engineer-in-Charge**.
- 3.1.6 Where the excavation is to be carried out below the foundation level of adjacent structure, the precautions to be taken such as under pinning, shoring and strutting etc. shall be determined by **Engineer-in-Charge**. No excavation shall be done unless such precautionary measures are carried out as per directions of **Engineer-in-Charge**.
- 3.1.7 Specification for Earth work shall also apply to excavation in rock in general. The excavation in rock shall be done such that extra excavation beyond the required width and depth as shown in drawings is not made. If the excavation done in depth greater

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than required /ordered. The **CONTRACTOR** shall fill the extra excavation with concrete of mix 1:5:10 as the foundation concrete at his own cost.

- 3.1.8 **CONTRACTOR** shall make all necessary arrangements for dewatering / defiling as required to carry out proper excavation work by bailing or pumping out water, which may accumulate in the excavation pit from any cause/ source whatsoever. In addition to this, if required, contractor shall also install continuous dewatering pump-sets to lower the ground water table below the working level to make the area fit and safe for working.
- 3.1.9 **CONTRACTOR** shall provide suitable draining arrangements at his own cost to prevent surface water entering the foundation pits from any source.
- 3.1.10 The **CONTRACTOR** is forbidden to commence the construction of structures or to carry out concreting before **Engineer-in-Charge** has inspected, accepted and permitted the excavation bottom.
- 3.1.11 Excavation in disintegrated rock means rock or Boulders including brickbats which may be quarried or split with crow bars. This will also include laterite and hard conglomerate.
- 3.1.12 Excavations in hard rock - meant excavation made in hard rock to be done manually, or by blasting using only explosives and / or pneumatic hammers. In case of blasting, control blasting should be adopted depending on site conditions. For using explosives **CONTRACTOR** shall follow all provisions of Indian Explosives Act / Rules 1983, corrected / revised up to date.
- 3.1.13 In case of hard rock excavation to be carried out using explosives the, **CONTRACTOR** shall obtain the written approval in advance.
- 3.1.14 The measurements for excavations shall be restricted and limited to minimum excavation line as per drawing for payment purposes.
- 3.1.15 Adequate protective measures shall be taken to see that the excavation does not affect or damage adjoining structures. The **CONTRACTOR** shall take all measures required for ensuring stability of the excavation and safety of property and people in the vicinity. The **CONTRACTOR** shall erect and maintain during progress of work, temporary fences around dangerous excavations at no extra cost.

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3.1.16 Excavation in ordinary soil means excavation in ordinary hard soil including stiff heavy clay, hard shale, or compact moorum, or any materials, which can be removed by the ordinary application of spades, shovels, picks and pick axes. This shall also include removal of isolated boulders each having a volume not more than 0.50m<sup>3</sup>.

3.1.17 Excavation in soft rock includes limestone, sandstone, laterite, hard conglomerates, etc. or other rock which can be quarried or split with crowbars or wedges. This shall also include excavation of tarred pavements, masonry work and rock boulders each having a volume of not more than 0.25m<sup>3</sup>.

3.1.18 Excavation in hard rock includes any rock bound in ledges or masses in its original form or cement concrete for which in the opinion of the Engineer-in-Charge, requires the use of compressed air, equipment, sledge hammer and blasting or non-explosive materials viz. Acconex manufactured by A.C.C. Ltd. Specifications and instructions for use shall be as per manufacturer.

3.1.19 In case of any difficulty concerning the interpretation of type of soil as mentioned above, the Engineer-in-Charge shall decide whether the excavation in a particular material is in ordinary soil, soft rock or hard rock and his decision in this matter shall be final and binding on the CONTRACTOR and without appeal.

### 3.2 **Filling**

3.2.1 Back filling of excavations in trenches, foundations and elsewhere shall consist of one of the following materials approved by **Engineer-in-Charge**.

Soil

Sand

Moorum



Hard-core

Stone/gravel

All back filling material shall be approved by the **Engineer-in-Charge**.

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- 3.2.2 Soil filling - Soil material shall be free from rubbish, roots, hard lumps and any other foreign organic material. Filling shall be done in regular horizontal layers each not exceeding 20 cm. depth.
- 3.2.3 Back filling around completed foundations, structures, trenches and in plinth shall be done to the lines and levels shown on the drawings.
- 3.2.4 Back filling around pipes in the trench shall be done after hydro testing is done.
- 3.2.5 Back filling around liquid retaining structures shall be done only after leakage testing is completed and approval of **Engineer-in-Charge** is obtained.
- 3.2.6 Sand used for filling under foundation concrete, around foundation and in plinth etc. shall be fine/ coarse, strong, clean, free from dust, organic and deleterious matter. The sand filling under foundation shall be rammed with Mech. compactor. Sand material shall be approved by **Engineer-in-Charge**.
- 3.2.7 Moorum for filling, where ordered, shall be obtained from approved pits and quarries which contain siliceous material and natural mixture of clay. Moorum shall not contain any admixture of ordinary earth. Size of moorum shall vary from dust to 10 mm.
- 3.2.8 Hard-core shall be of broken stone of 90 mm to 10 mm size suitable for providing a dense and compact sub grade. Stones shall be sound, free from flakes, dust and other impurities. Hard core filling shall be spread and levelled in layers, 15 cm thick, watered and well compacted with ramming or with mechanical / hand compacts including hand packing wherever required.
- 3.2.9 If any selected fill material is required to be borrowed, **CONTRACTOR** shall make arrangements and procure such material from outside borrow pits after obtaining all necessary permissions from statutory authorities. The material of source shall be subject to prior approval of **Engineer-in-Charge**. **CONTRACTOR** shall make necessary access roads to borrow areas and maintain the same, if such access roads do not exist, at no extra cost.
- 3.2.10 Plinth filling shall be carried out with approved material as described earlier, in layers not exceeding 200 mm, watered and compacted with mechanical compaction machines. **Engineer-in-Charge** may however permit manual compaction by hand

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tampers in case he is satisfied that mechanical compaction is not possible. When filling reaches the finished level, the surface shall be flooded with water, unless otherwise directed, for at least 24 hours, allowed to dry and then the surface again compacted as specified above to avoid settlements at later stage. The finished level of the filling shall be trimmed to the level specified. Compacted surface shall have at least 95% of laboratory maximum dry density. A minimum of one test per 250 sq. meters of compacted area shall be done.

3.2.11 Whenever the fill material (earth or soil) is purchased, **CONTRACTOR** shall get the approval of Engineer-in-Charge. The CONTRACTOR shall arrange to determine the following properties of the soil (at outside NABL accredited laboratory without any cost to owner) and shall get the approval of **Engineer-in-Charge**.



1. Clay content : 15% to 20%
2. Laboratory dry density (MDD) : Not less than 1600 kg/m<sup>3</sup>
3. Plasticity Index : Not more than 20
4. Optimum Moisture Content (OMC) : 8% to 12%

3.2.12 The fill shall be compacted using a vibrating compactor of not less than 1.5 tonne. The fill shall be thoroughly compacted in layers as directed but not more than 200 mm thick. Adequate water shall be used for compaction and the density after compaction shall be not less than maximum dry density obtained in test of IS: 2720 Part-8. Compacted surface shall have at least 95% of laboratory maximum dry density. A minimum of one test per 250 sq. meters of compacted area shall be done for each layer.

3.2.13 The Gravel fill shall be non plastic granular material, well graded, strong, with maximum particle size of 50 mm, with not more than 15% passing a 4.75 mm IS sieve, free of all debris, vegetable matter and chemical impurities.

3.2.14 All clods, lumps etc. shall be broken before compaction.

3.2.15 In case of grading/banking successive layers of filling shall not be placed, until the layer below has been thoroughly compacted to satisfy the requirements laid down in this specification.

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Prior to rolling, the moisture content of material shall be brought to within +/-2% of the optimum moisture content as described in IS 2720 Part-7. The moisture content shall preferably be on the wet side for potentially expansive soil.

After adjusting the moisture content as described, the layers shall be thoroughly compacted by means approved by Engineer-in-Charge, till the specified maximum laboratory dry density is obtained.

General, fill shall be placed in layers not exceeding 200 mm thickness and shall be thoroughly compacted to achieve a compaction of at least 95% of laboratory maximum dry density up to entire depth of filling. Final fill of 600 mm thickness shall consist of preferably natural material in, as dug condition except that stones larger than 100 mm shall be removed. It shall be placed in layers not exceeding 200 mm thickness and compacted to achieve of at least 95% of laboratory maximum dry density. Each layer shall be tested in field for density and accepted by Engineer-in-Charge, subject to achieving the required density before laying the next layer. A minimum of one test per 250 sq meters for each layer shall be conducted.

If the layer fails to meet the required density, it shall be reworked or the material shall be replaced and method of construction altered as directed by Engineer-in-Charge to obtain the required density.

The filling shall be finished in conformity with the alignment, levels, cross-section and dimensions as shown in the drawing.

Extra material shall be removed and disposed off as directed by the **Engineer-in-Charge**.

#### 4.0 PLAIN AND REINFORCED CONCRETE WORK

This specifications deals with cement concrete, plain or reinforced, for general use, and covers the requirements for concrete materials, their storage, grading, mix design, strength & quality requirements, pouring at all levels, reinforcements, protection, curing, form work, finishing, painting, admixtures, inserts and other miscellaneous works.

##### 4.1 Materials

4.1.1 Cement: Any of the following cements may be used as required.

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IS - 8112	43/53 Grade ordinary Portland cement
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4.1.2 Water: Water used for mixing and curing concrete and mortar shall conform to the requirements as laid down in IS: 456. Sea water shall not be used for concrete work.

4.1.3 Aggregates: Coarse and fine aggregates for cement concrete plain and reinforced shall conform to the requirements of IS 383 and / or IS 515. Before using, the aggregates shall be tested (at outside NABL accredited laboratory without any cost to owner) as per IS: 2386.

Coarse aggregate: Coarse aggregate for all cement concrete work shall be broken or crushed hard stone, black trap stone obtained from approved Quarries or gravel.

Sand: Fine aggregate for concrete work shall be coarse sand from approved sources. Grading of coarse sand shall be within grading zones I, II or III laid down in IS: 383, table 4. If required the aggregates (both fine and coarse) shall have to be thoroughly washed and graded as per direction of **Engineer-in-Charge**.

#### 4.2 **Mixing**

All cement concrete plain or reinforced shall be machine mixed. Mixing by hand may be employed where quantity of concrete involved is small, with the specific prior permission of the **Engineer-in-Charge**. 10% extra cement shall be added in case of hand mixing as stipulated in IS-456.

For large and medium project sites the concrete shall be sourced from ready- mixed concrete plants or from on site or off site batching and mixing plants (IS 4926)

#### 4.3 **Water Cement Ratio, Laying & Curing**



Water Cement Ratio, Laying & Curing shall be done as per IS:456.

#### 4.4 **Grades of Concrete**

4.4.1 Grades lower than M 25 shall not be used in reinforced concrete.

4.4.2 A sieve analysis test of aggregates shall be carried out (at outside NABL accredited laboratory without any cost to owner) as and when the source of supply is changed



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without extra charge notwithstanding the mandatory test required to be carried out as per CPWD specification.

4.4.5 All tests in support of mix design shall be maintained as a part of records of the contract. Test cubes for mix design shall be prepared by the CONTRACTOR under his own arrangements and at his costs, but under the supervision of the **Engineer-in-Charge**.



4.5 **Design Mix Concrete**

4.5.1 Design mix shall be allowed for major works where it is contemplated to be used by installing weigh batch mixing plant as per IS 4925. At the time of tendering, the CONTRACTOR, after taking into account the type of aggregates, plant and method of laying he intends to use, shall allow in his tender for the design mix i.e., aggregate/cement and water/cement ratios which he considers will achieve the strength requirements specified, and workability for concrete to be properly finished.

4.5.2 Before commencement of concreting, **CONTRACTOR** shall carry out preliminary tests (at outside NABL accredited laboratory without any cost to owner) for design mix on trial mixes proposed by him in design of mix to satisfy the **Engineer-in-Charge** that the characteristic strength is obtained. In this regard, CONTRACTOR may consult govt. approved/reputed institute to get design mix done as per IS 10262 at his own cost. The concrete mix to be actually used shall be approved by the **Engineer-in-Charge**.

4.5.3 Notwithstanding the above, the following shall be the maximum combined weight of coarse and fine aggregate per 50 kg of cement.

Grade of Concrete	Maximum weight of fine & coarse aggregates together per 50 kg of cement (for nominal mix only)
1. M - 10	480 kg
2. M - 15	350 kg
3. M - 20	250 kg

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4.5.4 The workability of concrete produced shall be adequate, so that the concrete can be properly placed and compacted. The slump shall be as per IS 456.

#### 4.6 **Testing of Concrete**

4.6.1 Testing of concrete, sampling and acceptance criteria shall be in accordance with IS 456.

#### 4.7 **Proportioning**



Mixes of cement concrete shall be as ordered. Where the concrete is specified by grade, it shall be prepared by mixing cement, sand and coarse aggregate by weight as per mix design. In case the concrete is specified as volumetric mix, then dry volume batching shall be done, making proper allowances for dampness in aggregates and bulking in sand. Equivalent volume batching for concrete specified by grade may however be allowed by the **Engineer-in-Charge** at his discretion.

#### 4.8 **Pre Cast Concrete**

The specifications for pre cast concrete will be similar as for the cast in situ concrete. All pre cast work shall be carried out in a yard made for the purpose. This yard shall be dry, properly levelled and having a hard and even surface. If the ground is to be used as a soft former of the units, shall be paved with concrete or masonry and provided with a layer of plaster (1:2 proportion) with smooth neat cement finish or a layer of MS sheeting. The casting shall be over suitable vibrating tables or by using form vibrators as per directions of **Engineer-in-Charge**.

The yard, lifting equipment, curing tank, finished material storage space etc. shall be designed such that the units are not lifted from the mould before 7 (seven) days of curing and can be removed for erection after 28 (Twenty Eight) days of curing. The moulds shall preferably be of steel or of timber lined with G.I .sheet metal. The yard shall preferably be fenced.

Lifting hooks, wherever necessary or as directed by **Engineer-in-Charge** shall be embedded in correct position of the units to facilitate erection, even though they may not be shown on the drgs. and shall be burnt off and finished after erection.

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Pre cast concrete units, when ready shall be transported to site by suitable means approved by **Engineer-in-Charge**. Care shall be taken to ensure that no damage occurs during transportation. All adjustments, levelling and plumbing shall be done as per the instructions of the **Engineer-in-Charge**. The CONTRACTOR shall render all help with instruments, materials and staff to the **Engineer-in-Charge** for checking the proper erection of the pre cast units.

After erection and alignment the joints shall be filled with grout or concrete as directed by **Engineer-in-Charge**. If shuttering has to be used for supporting the pre cast unit they shall not be removed until the joints has attained sufficient strength and in no case before 14 (fourteen) days. The joint between pre cast roof planks shall be pointed with 1:2 (1 cement : 2 sand) mortar.

## 5.0 STEEL REINFORCEMENT

5.1 Steel reinforcement shall comprise:

Cold twisted bars conforming to IS: 1786

CRS bars

TMT bars

Hard drawn steel wire fabric conforming to IS: 1566

5.2 All joints in reinforcement shall be lapped adequately to develop the full strength of the reinforcement as per provision of IS: 456 or as per instruction of **Engineer-in-Charge**.

## 6.0 FORM WORK

6.1 The shuttering or form work shall conform to the shape, lines and dimensions as shown on the drawings and be so constructed as to remain sufficiently rigid during placing and compacting of the concrete and shall be sufficiently tight to prevent loss of liquid from the concrete. The surface that becomes exposed on the removal of forms shall be examined by **Engineer-in-Charge** or his authorized representative before any defects are made good. Work that has sagged or bulged out, or contains honey combing, shall be rejected. All shuttering shall be steel shuttering.

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6.2 The **CONTRACTOR** shall be responsible for sufficiency and adequacy of all form work. Centering and form work shall be designed & detailed in accordance with IS 14687 and approved by the **Engineer-in-Charge**, before placing of reinforcement and concreting.

6.3 **Stripping Time**

Forms shall not be struck until the concrete has reached strength at least twice the stress to which the concrete may be subjected at the time of removal of form work. The strength referred to shall be that of concrete using the same cement and aggregates, with the same proportions and cured under conditions of temperature and moisture similar to those existing on the work. Where possible, the form work shall be left longer as it would assist the curing.

Note 1: In normal circumstances and where ordinary Portland Cement is used, forms may generally be removed after the expiry of the following periods:

1.	Walls, columns and vertical faces of all structural members	24 to 48 hours as may be decided by the <b>Engineer-in-Charge</b>
2.	Slabs (props left under)	3 days
3.	Beam soffits (Props left under)	7 days
4.	Removal of props under slabs 1. Spanning up to 4.5 m 2. Spanning over 4.5 m	7 days 14 days
5.	Removal of props under beams & arches: 1. Spanning up to 6 m 2. Spanning over 6m	14 days 21 days

For other types of cements, the stripping time recommended for ordinary Portland Cement may be suitably modified.

Note 2: The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

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## 7.0 CEMENT CONCRETE BLOCK

Cement concrete block shall be machined made in the proportion of such that mix shall not be leaner than one cement to twelve combined aggregates (by volume) but having minimum strength of 7.5 MPa. Combined aggregate shall be graded as near as possible to IS: 383. The fineness modules of combined aggregate shall be between 3.6 and 4. The concrete block shall be properly cured as per IS-456. The surface of conc. block shall have even face without any honeycomb and free from cracks.

### 7.1 Mortar

Cement and water shall conform to the requirements laid down for cement concrete work.

7.1.1 Sand for concrete block masonry mortars shall be coarse sand generally conforming to IS: 2116. Maximum quantities of clay, fine dust, shall not be more than 5% by weight. Organic impurities shall not exceed the limits laid down in IS: 2116.

7.1.2 Mix of mortar for building concrete block shall be as specified in the item of work.

7.1.3 Mixing of the mortar shall be done in a mechanical mixer. When quantity involved is small hand mixing may be permitted by **Engineer-in-Charge**. Any mortar remaining unused for more than 30 minutes after mixing shall be rejected.

### 7.2 Concrete Block Masonry



The thickness of joints shall be 10 mm +- 3mm. Thickness of joints shall be kept uniform. In case of foundation and manholes etc. joints up to 15 mm may be accepted.

### 7.3 Half Concrete Block

All courses shall be laid with stretchers. Reinforcement comprising 2 nos. 6 mm dia MS bars shall be provided over the top of the first course and thereafter at every fourth course.

### 7.4 Fixtures

All iron fixtures, pipes spouts, hold fasts of doors and windows which are required to be built into the wall shall be embedded in cement concrete blocks 1:2:4 mix (1 cement :2

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coarse sand :4 graded stone aggregate. 20 mm nominal size) of size indicated in the item.

### 7.5 **Curing**

Concrete block masonry shall be protected from rain by suitable covering when mortar is green. Masonry work shall be kept constantly moist on all faces for a minimum period of seven days.

## 8.0 **STRUCTURAL STEEL WORK**

This specification covers the technical requirements for the preparation of shop drawings, supply, fabrication, protective coating, painting and erection of all structural steel rolled sections, built up sections, plates and miscellaneous steel required for the completion of the work.

### **Steel**

All structural steel used in construction within the purview of this contract shall, comply with one of the following Bureau of Indian Standard Specifications, whichever, is appropriate or as specified.

IS – 2062 Hot rolled sections and plates



IS – 1079 Cold formed light gauge sections

IS – 1161 Tubular sections

IS – 4923 Hollow sections (rectangular or square)

### **Fabrication**

Fabrication of steel structure shall be carried out in conformity with the best modern practices and with due regard to speed with economy in fabrication and erection and shall conform to IS-800. All members shall be so fabricated as to assemble the members accurately on site and erect them in correct positions. Before dispatch to site the components shall be assembled at shop and any defect found rectified. All members shall be free from kink, twist, buckle, bend, open joints etc. and shall be rectified before erecting in position. Failure in this respect will subject the defective members to rejection.

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### **Fabrication Drawings:**

Development of Fabrication drawings shall be in contractor's scope. Connections, splices and other details shall be suitably designed based on good Engineering practice.

### **Electrodes:**

Electrodes used for welding shall comply with IS-814 or IS - 815.


### **8.1 MS Black/High Strength Bolts and Nuts**

M.S.Black or high strength bolts, nuts and washers etc. shall be as per IS-800, IS-1363 and IS-1367. Manufacturer's test certificate shall be made available to the **Engineer-in-Charge**. For bolted joints, shanks and threaded bolts are to be used to ensure that threaded length do not encroach within the thickness of connected members of dimension beyond the following limit:-

1. 1.5 mm for connected members of thickness below 12 mm and
2. 2.5 mm for connected member of thickness 12 mm and above and that adequate shearing and bearing values required as per design are achieved.

Every portion work shall have its erection mark or numbers stencilled on the member for guidance in erection and bear all necessary marks of erections as directed by the Owner / Consultant.

- 8.2 No part of the work is to be oiled, painted (except contact surfaces ) packed, bundled, crated or dispatched until it has been finally inspected and approved by the Owner / Consultant or his authorized representative. The whole steel work before being dispatched from the Contractor's shop shall be dry and after being thoroughly cleaned from dust, mills scale, rust etc., and shall be given two coats of primer and one coat of final paint as per painting specification attached in this enquiry. Unless otherwise specified, all surfaces inaccessible after welding shall be given two coats of primer and two coats of paints as per painting specification attached in this enquiry.

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8.3 The Owner / Consultant or his authorized representative shall have free access at all reasonable time to all places where the work is being carried out, and shall be provided by the Contractor at his own expenses all necessary facilities for inspection during fabrication and erection. The Owner / Consultant or his authorized representative shall be at liberty to reject the work in whole or in part if the workmanship or materials do not conform to the terms of the specifications mentioned herein. The Contractor shall remove, replace or alter any part of the work as ordered by the Owner / Consultant or his authorized representative.

## 9.0 PAINTING ON STRUCTURAL STEEL

The following specification shall be used for painting of structural steel work.

### 9.1 Scope

This specification covers the technical requirements for shop and site application of paint and protective coatings and includes; the surface preparation, priming, application, testing and quality assurance for protective coatings of structural steelwork, plate work, handrails and associated metal surfaces, which will be exposed to atmospheric for industrial plants.


### 9.2 Definitions

C.S	-	Carbon steel and low chrome (1-1/4 Cr through 9 Cr) alloys
S.S	-	Stainless steel, such as 304,316, 321, 347,
Non-ferrous	-	copper, aluminium and their alloys.
High Alloy	-	Monel, Inconel, Incoloy, Alloy 20, Hastelloy, etc.
DF	-	Dry Film thickness, the thickness of the dried or cured paint or coating film.

### 9.3 Safety Regulations

Protective coatings and their application shall comply with all national, state, and local codes and regulations on surface preparation, coating application, storage, handling, safety, and environmental recommendations.



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Sand or other materials producing silica dust shall NOT be used for any open-air blasting operations.

#### 9.4 Material Safety Data Sheets

The latest issue of the coating manufacturer's product datasheet, application instructions, and material safety data Sheets shall be available prior to starting the work and shall be complied with during all preparation and painting / coating operations.

#### 9.5 Materials

All paints and paint materials shall be obtained from the company's approved manufacturer's list. All materials shall be supplied in the manufacturer's containers, durably and legibly marked as follows.

Specification number

Colour reference number

Method of application

Batch number

Date of Manufacture

Shelf life expiry date

Manufacturer's name or recognised trade mark.

#### 9.6 CODE AND STANDARDS:

Without prejudice to the provision of Clause 1.1 above and the detailed specifications of the contract, the following codes & standards shall be followed. Wherever reference to any code is made, it shall correspond to the latest edition of the code.

#### 9.7 Indian Standards:

IS-5: 1994 Colors for ready mixed paints and enamels.

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IS-2379: 1990 Color codes for identification of pipe lines.

IS-2629: 1985 Recommended practice for hot-dip galvanizing on iron and steel.

IS-2633: 1986 Methods for testing uniformity of coating of zinc-coated articles.

IS-8629: 1977 Code of practice for protection of iron and steel structures from atmospheric corrosion.

IS: 110 Specification for Ready Mixed Paint, Brushing, Grey Filler, for Enamels, for Over Primers

IS: 101 Methods of test for ready mixed paints & enamels.

### 9.8 Other Standards:

9.8.1 Swedish Standard: SIS-05 5900-1967 / ISO-8501-1-1988

(Surface preparations standards for Painting Steel Surface).

This standard contains photographs of the various standards on four different degrees of rusted steel and as such is preferable for inspection purpose by the Engineer-in-charge.


9.8.2 DIN: 53151 Standards for Adhesion test.

9.9 The paint manufacturer's, instructions shall be followed as far as practicable at all times. Particular attention shall be paid to the following:

- a. Instructions for storage to avoid exposure as well as extremes of temperature.
- b. Surface preparation prior to painting.
- c. Mixing and thinning.
- d. Application of paints and the recommended limit on time intervals between coats.

### 9.10 Surface Preparation

9.10.1 Safety

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All work in adjacent areas, which may negatively affect the quality of blast cleaning, and/or impose safety hazards, must be completed or stopped before the blasting operation starts.

#### 9.10.2 Pre-Cleaning

Prior to surface preparation all weld spatter shall be removed from the surface, all sharp edges ground down and all surfaces cleaned free of contaminants including chalked paint, dust, grease, oil, chemicals and salt. All shop primed surfaces shall be water washed by means of suitable solvent, by steam cleaning, with an alkaline cleaning agent if necessary or by high-pressure water, to remove contaminants prior to top-coating.

#### 9.10.3 Surface decontamination

Surface decontamination shall be performed prior to paint application when uncoated surface is exposed to a corrosive environment or existing paint work is to be repaired. Existing coatings shall be removed by abrasive blast cleaning, and then high pressure potable water shall be used to clean steel surfaces. Prior to application of coatings, the surface shall be chemically checked for the presence of contaminants. A surface contamination analysis test kit shall be used to measure the levels of chlorides, iron salts and pH in accordance with the kit manufacturer's recommendations.

Swabs taken from the steel surface, using cotton wool test swabs soaked in distilled water shall not be less than one swab for every 25m<sup>2</sup> of surface area to be painted.

Maximum allowable contaminant levels and pH range is as follows:



Sodium chloride, less than 50 microgram / cm<sup>2</sup>;

Soluble iron salts, less than 7 microgram / cm<sup>2</sup>; and

pH between 6 – 8

If the results of the contamination test fall outside the acceptable limits, then the wash water process shall be repeated over the entire surface to be painted, until the contaminant test is within the specified levels.

#### 9.10.4 Abrasive blasting

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All C.S materials shall be abrasive blast cleaned in accordance with relevant IS Codes. To reduce the possibility of contaminating S.S., blasting is not usually specified. However, for coatings which require a blast-cleaned surface for proper adhesion, S.S. may be blast cleaned using clean aluminium oxide or garnet abrasives (Free from any chloride or Iron / Steel contamination). When hand or power tool cleaning is required on S.S., only S.S. wire-brushes (including 410 S.S.) which have not been previously used on C.S. surfaces may be used.

The surface profile of steel surfaces after blasting shall be of preparation grade Sa 2-1/2 of Swedish Standards SIS-05-5900 (Latest Revision) or better according to ISO 8501-1 and shall be measured using the replica tape method or the comparator method.



The roughness (profile) of blast-cleaned surfaces shall be Medium (G) according to ISO 8503-2: 1988 (appendix 1) unless otherwise specified. Medium defines a surface profile with a maximum peak-to-valley height of 60-100 microns, and G indicates that the surface profile is obtained by grit blasting. For the evaluation of surface roughness Comparator G shall be used.

Abrasive blast cleaning shall NOT be performed when the ambient or the substrate temperatures are less than 3 Degree Celsius above the dew point temperature. The relative humidity should preferably be below 50% during cold weather and shall never be higher than 60% in any case.

Abrasive blast cleaning shall be performed with a clean, sharp grade of abrasive. Grain size shall be suitable for producing the specified roughness. Abrasives shall be free from oil, grease, moisture and salts, and shall contain no more than 50ppm chloride. The use of silica sand, copper slag and other potentially silica containing materials shall not be allowed.

The blasting compressor shall be capable of maintaining a minimum air pressure of 7 kPa at the nozzle to obtain the acceptable surface cleanliness and profile.

The blast cleaning air compressor shall be equipped with adequately sized and properly maintained oil and water separators. The air supply shall be checked to ensure no oil and water contamination at the beginning of each work shift.

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Blast cleaning abrasive shall be stored in a clean, dry environment at all times. Recycling of used abrasive is prohibited.

After blast cleaning, the surfaces shall be cleaned by washing with clean water (Pressure 7kg/cm<sup>2</sup> using suitable nozzles. During washing broom corn brushes shall be used to remove foreign matter.

Assessment of the blast cleaned surfaces shall be carried out in accordance with reference code.

Blast cleaned surfaces which show evidence of rust bloom or that have been left uncoated overnight shall be re-cleaned to the specified degree of cleanliness prior to coating.

All grit and dust shall be removed after blasting and before coating application. Removal shall be by a combination of blowing clean with compressed air, followed by a thorough vacuum cleaning with an industrial grade, heavy duty vacuum cleaner.

All cleaned surfaces shall have protection from atmospheric corrosion as per IS8629:1977

**9.11 Painting system to be used is indicated below:**

Epoxy Painting:

- 9.11.1 All the surfaces must be abrasive blasted and 1 coat of primer, 2 coats of intermediate and 1 coat of finish paint applied in the fabrication shop before the same are shifted to site for erection. All the members must be suitably match marked for facilitating proper assembly.

After erection is over all surfaces shall be washed up as follows:

Washing with clean water (pressure 7 kg/cm<sup>2</sup>) using suitable nozzles. During washing broom corn brushes shall be used to remove foreign matters.

Solvent washing if required to remove traces of oil grease etc.

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After washing the surface as indicated above, the surfaces shall be suitably touched up to the extent required so that all the damages to the primed surfaces caused during erection are done up.

- a) The surfaces affected by welding and / or gas cutting during erection shall also be suitably touched up. Before touch up is taken up surfaces shall be prepared by mechanical means such as grinding, power brushing etc. to achieve surface finish to ST-3.
- b) After touch up work is over as indicated above, all the surfaces shall be given one coat of finish paint to the required specification.

9.11.2 The following points must be observed for painting work:

1. Primer and paint shall be compatible to each other and should be from the same manufacturer.
  2. The recommendation of the paint manufacturer regarding mixing, matching and application must be followed meticulously.
  3. Technical representative of paint manufacturer should be available at site as and when required by **Engineer-in-Charge** for their expert advice as well as to ensure that the painting work is executed as per the instruction of paint manufactures.
- c) Paints and primers shall be supplied at site in original container with factory seal otherwise such paints and primers shall not be allowed to be used. Mode of application i.e. by spray, brush or roller shall be strictly as per recommendation of paint manufacturer.
  - d) Painting materials must be used before the expiry date indicated on the containers.
  - e) Number of coats and DFT per coat must be strictly followed as indicated above. If the desired DFT is not achieved for primer, intermediate and finish paints in two coats (each), **CONTRACTOR** shall be required to apply extra coat (s) to achieve the desired DFT without any extra cost to **Engineer-in-Charge**.
  - f) Color shade for each coat of primer and finish paint must be different to identify the coats without any ambiguity.
  - g) Shade for the final finish coat shall be decided by **Engineer-in-Charge** at site.

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- h) All painting materials must be accompanied by manufacturers test certificates. However, Engineer-in-Charge has any doubt regarding quality of materials, he shall have the right to direct CONTRACTOR to get the doubtful material tested or and provided (by CONTRACTOR) testing agencies for which no extra payment shall be made to the CONTRACTOR and the charges shall deemed to be covered in the unit rates quoted for fabrication and erection of structural work.
- i) DFT for paint shall be measured at least 20 points and mean DFT shall not vary by more than 10% than specified in DFT.
- j) Reliable and calibrated Instrument for measurement of DFT shall be arranged and provided by **CONTRACTOR** at his cost.
- k) Thickness of each coat shall also be checked regularly to ensure uniformity in DFT.

9.11.3 Abrasive blasting and painting works, being a specialized job must be carried out through the approved agencies only.

#### 9.11.4 PAINTING ON STEEL STRUCTURES

SL.NO	DESCRIPTION	GENERIC COATING SYSTEM
1.	SURFACE PREPARATION	Blast clean to SA 2.5
2.	PRIMER	One coat of ethyl silicate zinc rich with solvent. Thickness 75 micron per coat
3.	INTERMEDIATE	Two coat of two pack high build aliphatic amine cured epoxy coating Thickness 100 micron per coat.
4.	FINISH COAT	One coat of two pack amine cured epoxy / Acrylic aliphatic polyurethane. Thickness 50 micron per coat
5.	Total DFT	325 Micron

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**On Minor Structural Steel Sections/Structures such as fencing, concertina coil etc.**

Painting on Structural Steel on minor structures shall be with synthetic enamel paint of approved brand and manufacture to give an even shade: Two or more coats on new work after necessary primer coat.

**10.0 STEEL / ALUMINIUM DOORS, WINDOWS AND VENTILATORS**

10.1 The Steel doors, windows and ventilators shall be of the size and type as per IS-1361 and IS-1038. Fixing and glazing shall be done as per IS-1081 and as per manufacturer's instructions. The putty of approved make such as special gold size or equivalent conforming to IS-419 shall be used.

10.2 Aluminium doors, windows and ventilators shall be manufactured from wrought aluminium and aluminium alloy extruded round tube and / or hollow rectangular / square sections conforming to IS: 1285 & IS : 6477 or equivalent as approved by **Engineer-in-Charge**.

**11.0 ROOFING & CLADDING**

For roofing & cladding Non-asbestos high impact Polypropylene reinforced cement 6mm thick corrugated sheets (as per IS:14871) roofing up to any pitch and fixing with polymer coated J or L hooks, bolts and nuts 8mm dia. G.I. plain and bitumen washers or with self drilling fastener and EPDM washer.

**12.0 FLOORING AND PAVING**

**12.1 Sub Base of floor**

12.1.1 The area to be paved shall be divided into suitable panels. Form work shall be provided. The boarding / battens shall be fixed in position with their toe at proper level, giving slope where required. Alternatively base concrete may be deposited in the whole area at a stretch.

12.1.2 Before placing the base concrete the sub-base shall be properly wetted and rammed. The concrete of the specified mix shall then be deposited between the forms where provided, thoroughly tamped and the surface finished level with the top edge of the



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forms. The surface of base concrete shall be spreader uniformly. The surface shall be finished rough to provide adequate bond for the topping. Two or three hours after concrete has been laid the surface shall be brushed with wire brush to remove any scum or Latinate and swept clean so that coarse aggregate is exposed.

## 12.2 Cement Concrete Floor Finishes

12.2.1 The surface of base concrete shall be thoroughly cleaned by scrubbing with coir or steel wire brush. Before laying the topping, the surface shall be soaked with water at least for 12 hours and surplus water mopped up immediately before the topping is laid.

12.2.2 The forms shall be fixed over the base concrete dividing into suitable panels. Where glass dividing strips are provided, thickness of glass dividing strips shall be 4 or as indicated. Before placing the concrete topping, neat cement slurry at the rate of 2 kg/sq.m shall be then thoroughly brushed into the base concrete just ahead of the finish. The topping shall then be laid, thoroughly compacted by using screed board/plate vibrator. The surface floated with a wooden float to a fair and even surface shall be left for some time till moisture disappears from it. Junctions with skirting / dado or wall surfaces shall be rounded off using cement mortar 1:2 curing shall be carried out for a minimum of 7 days.

## 13.0 PLASTERING


13.1 Sand for plastering shall be 50% fine sand and 50% coarse sand from approved sources.

13.2 Preparation of surface shall be done as per CPWD specifications.

13.3 Cement mortar shall be of the mix as indicated in the items and shall be mixed as specified in the CPWD specifications.

13.4 Joints in walls etc. shall be raked to a depth of 12 mm, brushed clean with wire brushes dusted and thoroughly washed before starting the plaster work.

13.5 The surface shall be thoroughly washed with water cleaned and kept wet to saturation point before plastering is commenced.

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13.6 Cement mortar as indicated, shall be firmly applied to the masonry walls in a uniform layer to the thickness specified and will be pressed into the joints. On concrete surfaces rendering shall be dashed to the roughened surface to ensure adequate bond. The surface shall be finished even and smooth. Hectoring wherever required shall be done as per directions of **Engineer-in-Charge**. Nothing extra shall be paid on this account.

13.7 All plaster work shall be cured for at least 7 days.

13.8 Integral water proofing compound shall be mixed with cement in the proportion recommended by the manufacturer. Care shall be taken to ensure that the water proofing material gets well and integrally mixed with cement. All other operations are the same as for general plaster work.

13.9 For sand face plaster undercoat of cement plaster 1:4 (1 cement : 4 sand) of thickness not less than 12 mm shall be applied similar to one coat plaster work. Before the under coat hardens the surface shall be scared to provide for the top coat. The top coat also of cement mortar 1:4 shall be applied to a thickness not less than 8 mm and brought to an even surface with a wooden float. The surface shall then be tapped gently with a wooden float lined with cork to retain a coarse surface texture, care being taken that the tapping is even and uniform.



#### 14.0 EXTERIOR PAINTING

14.1 Exterior painting shall be Acrylic smooth exterior.

14.2 Where shown on drawings for external surfaces of sand faced plaster, or any other surface, two coats of cement paint shall be applied of tint and shade as approved by the **Engineer-in-Charge**.

14.3 The surfaces shall be prepared as specified for white washing. Before applying cement paint the surface shall be thoroughly wetted to control surface suction. The surface shall be moist but not dripping wet, when the paint is applied. Not less than 24 hours shall be allowed between the two coats. In hot weather the first coat shall be slightly moistened before applying the second coat.

14.4 On external plastered surfaces (one coat primer + minimum 3 coat of paints), sand faced or plain plastered and concrete surfaces, apex weather proof paint shall be

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vigorously scrubbed on to work the paint into the voids and provide a continuous paint film free from pin holes and other openings

## 15.0 GLAZING

15.1 Sheet glass glazing of doors, windows etc. shall be of selected quality glass conforming to IS: 2835. Toughened splinter proof industrial safety glass shall confirm to IS: 2553. No cracked chipped or disfigured glass shall be accepted Glass shall be in one piece for each pan.

15.2 Glazing shall be fixed with timber or steel / aluminium beading as called for. Glass shall be back puttied and fixed with beading for a water tight and rattle free installation. Sizes of timber/ steel / aluminium beading shall be as directed.

## 16. PROTECTIVE COATING AND LINING SYSTEM

### 16.1 EPOXY COATING

Characteristics of coated surfaces (after application)



- Compressive strength : min. 90 N/mm<sup>2</sup>
- Tensile strength : min. 10 N/mm<sup>2</sup>
- Abrasion resistance : as per Amsler 1.5 mm after 3000 revol.
- Bonding (joining) factor : 1
- Adhesion with concrete : min. 2.5 N/mm<sup>2</sup>
- Elongation : 15%

### APPLICATION:

#### A) ON FLOOR

##### 1. For Chemical resistant flooring

SL. NO	DESCRIPTION
1.	Surface preparation- in this case concrete columns, beams, soffitt slabs, floors & plastered brick masonry walls (for receiving IMPREGNATION, BOND COATS, COATINGS etc) with



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SL. NO	DESCRIPTION
	hand wire brushes or rotary wire brushes etc and removing all the dust , dirt etc complete.
2.	Impregnation with monomer (5 cps viscosity) to be applied by brush with a consumption of minimum 0.25 kg/m <sup>2</sup>
3.	Providing and applying structural grade Epoxy Bonding agent, (with bond strength of 3 N/mm <sup>2</sup> ) over concrete prior to screed concrete. Bonding agent to be used as per application procedure of manufacturer.
4.	Self levelling cementitious screed avg. 25mm thick, using proportion 1:1:0.5 cement: sand : 8 mm down aggregates ( by weight) with addition of suitable free flow and performance improving additives namely micro silica, shrinkage compensating admixtures, polymers, high range super plasticizers. W/C ratio not to exceed 0.4. Compressive strength of the screed to be 37.5 N/mm <sup>2</sup> after 28 days over bonding agent.
5.	Providing and applying structural grade Epoxy Bonding agent, (with bond strength of 3 N/mm <sup>2</sup> ) over screed concrete. Bonding agent to be used as per application procedure of manufacturer.
6.	Self levelling epoxy phenolic IPN (inter penetrating polymer network) screed (min 3mm thick, solvent free resin in proportion of 1 resin hardener mix : 2 sharp silica sand 600 micron down) on dry and clean surface of the self levelling cementitious screed done earlier, using special fork type leveller tool and allowing the screed to cure for 48 hours.

## 2. For Anti-static epoxy flooring system in Substation –

The switch gear room in the substation shall be provided with electrostatic discharge flooring (ESD flooring- 2MM thick Anti-static epoxy flooring system)

Sr. No.	Specification
	Base Surface Requirement: Base floor substrate should be minimum M20 grade reinforced concrete surface, clean dry (moisture below 5%), sound and finished smooth and levelled.

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1	Surface Preparation: Clean the surface thoroughly by mechanical means preferably using vacuum assisted mechanical grinders to remove loose particles, dust, dirt, laitance, etc. All the stickers on the floor shall be removed and the area cleaned thoroughly. Any cracks above 1mm should be grove cut, cold/construction joints to be given suitable treatment. (Expansion /Isolation joints to be provided with flexible PU sealant and will be in the scope of contractor)
2	Primer Application : Providing & Applying two component epoxy based penetrating primer, having a volumetric mixing ratio of resin and hardener as per manufacturer guidelines, to a thickness of 100 microns which has excellent bond with concrete substrate by Brush / Roller and broadcasting of chemically treated silica and allow for 5-6 hours curing.
3	Sealer Application Providing & applying two components epoxy mortar of homogeneous mix and levelled by trowel to form a monolithic layer to a thickness of 800 microns and allow curing for 4-5 hours.
4	Conductive Coat: The self adhesive copper grid shall be provided across the area with 10 mtr spacing. The copper stripe shall be taken out at few points to connect the same to earth pit. (Connecting to earthing strip and making earthing pit will be in the scope of contractor)
5	Conductive Base Coat: Providing & applying of epoxy ESD, at a specified ratio as per manufacturer guidelines to a thickness of 100 microns by Brush / Roller and broadcasting of chemically treated silica and allow for 12 hours curing. This layer forms the electrical plane through which static charges are dissipated.
6	Topcoat Application: Providing & applying of STAT GUARD ESD at a specified ratio and levelled by trowel to a thickness of 1000 microns and spike roller is applied for de-aeration. This can be given in any colour. The entire top coat has to be dried for 24 hours before loading. Final finished floor shall be levelled smooth surface, clean and dust free. The surface resistivity of the total system shall be in the range of $1 \times 10^6$ Ohms to $1 \times 10^9$ Ohms as per the ASTM F 150, EOS/ESD Standard 7.1 or NFPA 99 A guidelines.

## B) ON WALLS, SLAB, SOFFITS, BEAMS, COLUMN

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SL. NO	DESCRIPTION
1.	Surface preparation- in this case concrete columns, beams, soffitt slabs, floors & plastered brick masonry walls (for receiving IMPREGNATION, BOND COATS, COATINGS etc) with hand wire brushes or rotary wire brushes etc and removing all the dust , dirt etc complete.
2.	Impregnation with monomer (5 cps viscosity) to be applied by brush with a consumption of minimum 0.25 kg/m <sup>2</sup>
3.	Impregnation of prepared concrete surface (internal walls, slab, soffits, beams, column and cut outs) with polymethyl methacrylate monomer (viscosity 5cps), brush applied @ 0.25kg/m <sup>2</sup> . Three coat epoxy phenolic IPN solvent containing protective coating with one non pigmented primer coat and two subsequent colour coats with approved shades giving total dry film thickness of 225 +/- 10 microns over impregnated and cleaned surface.

## 16.2 ACID PROOF TILES:

### MATERIAL

#### 1) TILES

These tiles shall be made of clays, feldspar, quartz, talc and vitrified at high temperature in ceramic kilns and kept unglazed so as to prevent from slipperiness. Tiles shall not absorb more than 2% of their own dry weight when soaked in water. Compression strength: 700 Kg/cm<sup>2</sup> Min. & Flexural strength: 200 Kg/cm<sup>2</sup> Min. It shall not lose more than 1.5% of it weight when soaked in acid.

#### Chemical compositions of tiles:

- Al<sub>2</sub>O<sub>3</sub> : 22-24%
- SiO<sub>2</sub> : 60-65%
- Fe<sub>2</sub> O<sub>3</sub> : 1.0-2.0%
- Alkalise : 10-12%

#### 2) K-BASED SILICATE MORTAR

Acid Proof cement KSC is a potassium silicate based corrosion cement. Acid tile linings carried out with KSC cement are not subject to crystal formation in the pores of

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cement. Besides Bitumastic surface is joint-less, hence there is no danger of Acids percolating through the surface.

Characteristics of K-based Silicate mortar:

- Colour : White
- Density (lbs/Cub. ft.) : 130
- Water Absorption : 2-5 %
- Tensile Strength (Psi) : 400
- Compressive strength (Psi) : 2800
- Bond Strength (Psi) : 180
- Coefficient of thermal expansion :  $6.0 \times 10^{-6}$

### 3) BITUMASTIC MORTAR

It shall consist of an acid proof inorganic filler and blended bitumen. It shall be trowelled to concrete having total thickness of 10 mm.

**Characteristics of Bituminous compounds:**

- Density ( $\text{Kg/m}^3$ ) : 2200
- Water content by mass percent (max) : 0.5
- Flash point  $^{\circ}\text{C}$  ,min. : 35

**Consistency**

- a) Before setting (test after 1 hr) min. : 100
- b) After setting (test after 24 hr) min. : 80

Mastic shall be heated to  $150-300^{\circ}\text{C}$  and shall be applied in 5 mm layers after surface is cleaned and dried.

### 4) BITUMINOUS PAINT

This is generally of heavy grade bituminous corrosion resisting paint. 2 coats of the paint shall be given, and drying time between the 2 coats shall not be less than 5 hours. Also, its drying time after second coat shall not be more than 8 hours. Its finish shall be smooth, glossy and elastic.

The primer shall conform to the following requirements:

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- Viscosity by standard tar viscometer, 4mm orifice at 25°C: 4 to 24
- Penetration at 25°C, 100g, 5sec in 1/100 cm : 20 to 50
- Water content percent (max) : 0.2

#### APPLICATION

SL. NO.	DESCRIPTION	ITEM OR AREA
1.	Bituminous Paint (Primer)	Concrete surface
2.	10mm Bitumastic Laying in two layers each shall not be more than 5mm thick	Over Bituminous Paint
3.	One layer, 5mm Acid, K-based Silicate Type mortar	#
4.	10 mm thick Acid proof tiling	Over K-based Silicate

# - Tiles should be fixed on bitumastic surface with the help of 5mm K-based silicate mortar.

### 16.3 ACID RESISTANT BRICK LINING

#### A. MATERIAL

These bricks are made of raw materials such as clay or shale of suitable composition with low lime and iron content, feldspar, flint or sand and vitrified at high temperature in ceramic kilns. Bricks shall not absorb more than 2% of their own wt. when soaked in water.



Compression strength: > 700 Kg/cm<sup>2</sup>. Bricks shall not lose more than 1.5% at their own weight when tested for acid resistance.

Chemical compositions of bricks are

- a) Al<sub>2</sub>O<sub>3</sub>                      22-24%
- b) SiO<sub>2</sub>                         60-65%
- c) Fe<sub>2</sub> O<sub>3</sub>                     1.0-2.0%
- d) Alkalies                     10-12%

#### 1) K-BASED SILICATE MORTAR



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Acid Proof cement KSC is a potassium silicate based corrosion cement. Acid brick linings carried out with KSC cement are not subject to crystal formation in the pores of cement. Besides Bitumastic surface is joint-less, hence there is no danger of Acids percolating through the surface.

Characteristics of K-based Silicate mortar:

Colour	: White
Density (lbs/Cub. ft.)	: 130
Water Absorption	: 2-5 %
Tensile Strength (Psi)	: 400
Compressive strength (Psi)	: 2800
Bond Strength (Psi)	: 180
Coefficient of thermal expansion	: $6.0 \times 10^{-6}$

## 2) BITUMASTIC MORTAR

It shall consist of an acid proof inorganic filler and blended bitumen. It shall be trowelled to concrete having total thickness of 10 mm.

Characteristics of Bituminous compounds:

Density (Kg/m <sup>3</sup> )	: 2200
Water content by mass percent (max)	: 0.5
Flash point °C ,min.	: 35

Consistency

c) Before setting (test after 1 hr) min.	: 100
d) After setting (test after 24 hr) min.	: 80

Mastic shall be heated to 150-300°C and shall be applied in 5 mm layers after surface is cleaned & dried.

## 3) BITUMINOUS PAINT(PRIMER)

This is generally of heavy grade bituminous corrosion resisting paint. 2 coats of the paint shall be given, and drying time between the 2 coats shall not be less than 5

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hours. Also, its drying time after second coat shall not be more than 8 hours. Its finish shall be smooth, glossy and elastic.

The primer shall confirm to the following requirements:

Viscosity by standard tar viscometer, 4mm orifice at 25°C : 4 to 24

Penetration at 25°C, 100g, 5sec in 1/100 cm : 20 to 50

Water content percent (max) : 0.2

### APPLICATION

SL. NO.	DESCRIPTION	ITEM OR AREA
.	Bituminous Paint (Primer)	Concrete surface
.	10mm Bitumastic Laying in two layers each shall not be more than 5 mm thick	Over Bituminous Paint
3.	One layer, 5mm Acid, K-based Silicate Type mortar	#
4.	One layer, 40mm Acid resistant Brick lining	Over K-based Silicate



#:- K-based Silicate mortar should be buttered on all sides of acid-resistant brick except the side facing the surface to be exposed to corrosives

## 17. POLYURETHANE WATERPROOFING

### 17.1 MATERIALS

The two component Solvent free Polyurethane coat shall have the following properties –

1. Solid content ASTM D 2369-  $\geq 90\%$
2. Mixing ratio - 8:1
3. Elongation ASTM D 638 - 700-900%
4. Tensile strength ASTM D 638- 1-2 MPa

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The coating shall be applied to a minimum thickness of 600 microns (300 $\mu$ X2) thickness with separate wearing course ( as per ASTM C 898 & 836) over application of 2 component, solvent free Epoxy Primer of 200 microns with tensile of 20-30 MPa and elongation of 4-5% for smooth surface and act as primer coat at all elevations in vertical and horizontal surface

It shall be perfectly smooth, dust free and shall retain glossy finish at least up to 3 years It shall be resistant to acid, alkalis and have a very low water absorption rate of 0.5% maximum at ambient temperature after 7 days.

The packs shall not be older than 9 months after the date of manufacture and packing.

## 17.2 Workmanship

### 17.2.1 Preparation of surface

The roof surface shall be thoroughly cleaned with a wire brush and all foreign matter etc shall be removed. Well defined cracks on the surface shall be cut to "V" section, cleaned and filled up flush with a paste of 2 component polyurethane based crack filling compound and white cement in a ratio of 1:2.

### 17.2.2 Primer Coat



Primer coat shall be mixed in the ratio as per manufacturer's specification A single coat of this primer shall be applied by brush over the prepared bed as an adhesion coat.

The primer shall be allowed to dry for minimum of 8 hours before the successive finishing coats of Polyurethane are applied.

### 17.2.3 Finishing coats

The finishing coats shall consist of three successive pigmented seating coats each of 2 pack polyurethane, mixed in the ratio as per manufacturer's specifications. Application shall be with brush, to a smooth and even finish. The overall dry film thickness shall be Ambient temperature at the time of application shall not be less than 5°C and not more than 40°C.

Each coat shall be allowed to dry for minimum 8 hours or as per manufacturer's specification before applying next coat. Care shall be taken for quick application after mixing the 2 pack primer in view of short pot life of the mix and shall be fully consumed within the stipulated period as per manufacturer's specification. (Maximum 60 minutes

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at 30°C.

Polyurethane coating shall be continued up the parapets/ walls for a minimum of 150 mm over the finished roof surface. It shall be continued into rain water pipes by at least 100mm.



Treated surface should be allowed to cure for minimum 72 hours.

#### 17.2.4 Cement Screed

The final coat of polyurethane, when tacky shall be sprinkled with 300 micron layer of clean sand. Plain cement concrete (1:2:4) of 25mm minimum thickness with 24 SWG chicken wire mesh shall be then laid to slope in panels not exceeding 6 M<sup>2</sup> area per panel The joints between panels shall be raked out neatly to a minimum 6mm x 6mm V-groove and filled up with an approved quality elastomeric compound sealant. Drain outlet shall be provided for all spouts/rain water pipes by suitable rounding, filling and skoping of PCC as per drawing. At the junction of the roof and parapet or any other vertical surface, a fillet of 75mm radius shall be formed in cement mortar 1 cement 4 coarse sand.

#### 17.3 Guarantee



The agency for waterproofing shall furnish a guarantee, which shall be agreed upon in the Contract to ensure the successful performance of the Contract. The guarantee shall be for a period of 10 years. Any work required to be carried out as a result of any defects in workmanship during the period of the guarantee shall be carried out by CONTRACTOR at his cost.

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**SECTION – 7.2**



**DESIGN PHILOSOPHY**

**(CIVIL & STRUCTURAL)**



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## 1.0 GENERAL

### 1.1 Scope

This engineering design basis defines the minimum design criteria that shall form the basis for carrying out detailed structural design and engineering of all plant and non-plant structures and buildings. All data required in this regard shall be taken into consideration for acceptable, satisfactory and trouble-free engineering of the structures.

Compliance with this design basis and / or review of any of CONTRACTOR documents shall in no case relieve the CONTRACTOR at the contractual obligations. All structures shall be designed for the satisfactory performance of the functions for which they are being constructed.

### 1.2 Units of Measurement

Units of measurement in design shall be in metric system.

### 1.3 Definitions

1. CCE Chief Controller of Explosives
2. TAC Tariff Advisory Committee
3. NFPA National Fire Protection Association
4. IS Indian Standards



### 1.4 Codes and Standards

The design shall be in accordance with established codes, sound engineering practices and shall conform to the statutory regulations applicable to the country.

The main codes and standards and statutory regulations considered as minimum requirements are as follows Latest revision of these shall be followed:



- IS:456 Code of practice for plain & reinforced concrete
- SP:34 Handbook on concrete reinforcement and detailing
- IS:800 Code of practice for general construction in steel
- IS 801 Code of practice for use of cold formed light gauge steel structural members in general building construction.
- IS:802 Code of practice for use of structural steel in overhead transmission line towers
- IS:806 Code of practice for use of steel tubes in general building construction
- IS:816 Code of practice for use of metal arc welding for general construction
- IS:875 Code of practice for design loads
- IS:1080 Code of practice for design & construction of shallow foundations on soil



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- IS:1161 Specification for steel tubes for structural purpose
- IS:1597 Code of practice for construction of stone masonry
- IS:1838 Filters for expansion joints
- IS:1893 Criteria for earth quake resistant design of structures
- IS:1904 Code of practice for design and construction of foundations in soils, General requirements
- IS:1905 Code of practice for structural use of un-reinforced masonry
- IS:2185 Concrete masonry units
- IS:2629 Recommended practice for hot dip galvanizing of iron and steel
- IS:2633 Methods for testing uniformity of coating of zinc coated articles
- IS:2911 Code of practice for design and construction of pile foundations
- IS:2950 Code of practice for design & construction of raft foundations
- IS:2974 Code of practice for design & construction of machine foundations
- IS:3370 Code of practice for concrete structures for storage of liquids
- IS:4091 Code of practice for design and construction of foundation for transmission line tower and poles
- IS:4326 Code of practice for earthquake resistant design and construction of buildings
- IS:4925 Specification for Concrete Batching and Mixing Plant
- IS:4991 Criteria for blast resistant design of structures for explosions above ground
- IS:5249 Determination of dynamic properties of soil
- IS:6403 Code of practice for determination of bearing capacity of shallow foundations
- IS:6745 Method for determination of mass of zinc coating
- IS:8009 Code practice for calculation of settlements of foundations
- IS:9595 Recommendations for metal arc welding of carbon and carbon manganese steel
- IS:11089 Code of practice for design and construction of ring foundation
- IS:12118 Two parts polysulphide based sealant
- IS:13920 Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.

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### Factory Rules

In case of any difference between Codal provision and this design basis, the stringent one should govern the design.

In case of any conflict / deviations amongst various documents, the order of precedence shall be as follows:

1. Statutory Regulations
2. Job Specifications
3. Engineering Design Basis
4. Standard Specifications

## 2.0 Design Loads

The following design loadings shall be considered:

1. Dead loads including self weight
2. Live load
3. Wind load
4. Seismic load
5. Equipment load
6. Dynamic load
7. Load from lifting appliances
8. Erection loads / maintenance loads
9. Thermal load
10. Earth pressure / Hydrostatic Loads
11. Any other load not mentioned above, but applicable

These loadings shall be applicable to all structures irrespective of the material employed for construction.

### 2.1 Dead Loads

Dead load shall comprise of the weight of all permanent construction including walls, fire proofing, floors, roofs, partitions, stairways and fixed services.



### 2.2 Equipment Loads

The empty / operating / test weight of process equipment including all fixtures, platforms, ladders and attached piping but excluding contents, shall be considered. If piping weight is not indicated separately or not included in the weight of the equipment, the same shall be taken as 10% of the weight of the equipment.

#### 1. Bundle Pull

Bundle pull forces for different types of exchangers shall be taken as under:

- a. Fixed type - Nil

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- b. Kettle type - 0.30 × Bundle weight  
c. All other types - 0.86 × Bundle weight or 30 N/mm of diameter  
Whichever is greater

Total Bundles Pull shall be considered on fixed pedestal alone

## 2. Thermal Expansion

Horizontal force due to thermal expansion of horizontal vessels / exchangers shall be relieved by using slotted holes and slide plates and remaining force derived from the product of the sliding saddle 'gravity load' and the coefficient of friction shall be applied to each support. the coefficient of friction shall be taken as under:

- |                              |   |      |
|------------------------------|---|------|
| a. teflon to teflon          | : | 0.08 |
| b. stainless steel to teflon | : | 0.10 |
| c. steel to steel            | : | 0.30 |
| d. steel to concrete         | : | 0.45 |

## 3. Non-Static Loading

Foundations and structures supporting vessels subject to surge loading, such as Deaerators shall be designed with sufficient stiffness and rigidity to resist a notional horizontal forces of 10% of those derived from the Vessel's operating weight or the given surge load whichever is greater. The forces shall be applied at the vessel's centre of gravity and act longitudinally or transversely. Consideration shall be given to bracing these structures.

The design of foundations and structures supporting agitated vessels, centrifuges, reactors and other variable load equipment shall take full account of all the loading data provided by the equipment vendors. Where no loads are available, consideration shall be given to applying force at 10% of operating weight. In addition, for dynamic effect loads will be increased by 50% of steam agitated equipment and 25% for mechanical agitated vessels.

Where two or more similar items of such equipment are supported on a common foundation or structure, the design must be based on the assumption that these items will resonate in phase.



## 4. Rotating Equipment

Comprehensive loading data of mechanical equipment, such as, fans, blowers, pumps, compressors, D.G. Sets, turbines, motors engines etc., as furnished by the equipment vendor shall be considered.

### 2.3 Live Loads



Live loads shall, in general, be as per IS:875. However, the following minimum live loads shall be considered in the design of structures to account for maintenance and erection phases; if equipment layout / vendor drawings indicate loads of greater magnitude, the same shall be adopted.

1. Process Building / Technological Structure (Open / Enclosed type)

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Operating area	-	5.0 kN/m <sup>2</sup>
Maintenance area	-	7.5 kN/m <sup>2</sup>
Ground floor	-	10.0 kN/m <sup>2</sup>
<b>2. Compressor House/TG House</b>		
Operating area	-	7.5 kN/m <sup>2</sup>
Maintenance area	-	7.5 kN/m <sup>2</sup>
Ground floor	-	10.0 kN/m <sup>2</sup>
<b>3. Service Platform</b>		
Vessel / Tower	-	3.0 kN/m <sup>2</sup>
Isolated platform (for valve operation)	-	2.5 kN/m <sup>2</sup>
Access way	-	2.5 kN/m <sup>2</sup>
Cross over	-	2.0 kN/m <sup>2</sup>
Piperack walkways	-	2.5 kN/m <sup>2</sup>
Gantry girder walkway	-	3.0 kN/m <sup>2</sup>
<b>4. Substation / Control Room</b>		
Panel floor	-	10.0 kN/m <sup>2</sup>
Miscellaneous partition	-	1.0 kN/m <sup>2</sup>
Other areas	-	5.0 kN/m <sup>2</sup>
<b>5. Office building</b>		
Office area	-	3.0 kN/m <sup>2</sup>
Entrance lobby	-	5.0 kN/m <sup>2</sup>
Exit way	-	5.0 kN/m <sup>2</sup>
Miscellaneous partition	-	1.0 kN/m <sup>2</sup>
Document Storage area	-	10.0 kN/m <sup>2</sup>
<b>6. Laboratory</b>		
Upper floors	-	4.0 kN/m <sup>2</sup>
Ground floor	-	5.0 kN/m <sup>2</sup>
<b>7. Cooling Tower</b>		
Operating platform /cover	-	3.0 kN/m <sup>2</sup>
Slab of hot water basin & Sump	-	
<b>8. GT Building / DM Plant /ETP</b>		
Operating platforms	-	3.0 kN/m <sup>2</sup>
Ground floor	-	5.0 kN/m <sup>2</sup>
<b>9. Staircase</b>		
Process Building	-	5.0 kN/m <sup>2</sup>
Technological structure	-	5.0 kN/m <sup>2</sup>
Office	-	5.0 kN/m <sup>2</sup>
Substation/Control Room	-	3.0 kN/m <sup>2</sup>
Laboratory	-	4.0 kN/m <sup>2</sup>
Service platform	-	2.5 kN/m <sup>2</sup>

Loads on account of equipment and incidental loads shall be taken over and above the loads indicated in the table.

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For all other buildings not covered in above Table, the imposed loads shall be taken as specified in IS:875 (Part II)

1 kN/m<sup>2</sup> allowance shall be made for services supported from below the floor.

Live load on various types of roofs shall be as per the requirements given in IS:875.

## 2.4 Wind Loads

Wind loads for structural design shall be as per IS-875 (Part-3) except for switchyard structures and transmission towers for which IS:802 shall be applicable. Basic wind speed shall be 50 M/s . Definition of basic wind speed shall be peak gust velocity averaged over 3 second time interval at 10 m height above mean ground level with 50 years mean return period. The design life span of all structures, except temporary structures, and boundary wall shall be taken as 50 years. Life span of temporary structures and boundary wall can be lesser and shall be as per IS:875.

To account for surface area of piping, platforms and other attachments fixed to the equipment, the surface area of the equipment (vessel/column) exposed to wind shall be increased by 20% or as specified in the mechanical data sheets of the equipment.

## 2.5 Seismic Loads

The site falls in Seismic zone-III. Seismic loads shall be as per IS:1893 (Latest Revision) .

## 2.6 Impact and Vibratory Loads

Structures subjected to impact or vibratory loads shall be designed as per the provision of IS:875 & IS:2974. Requirements for monorails and overhead cranes shall be as per IS:800, IS:875 or manufacturer's data, whichever is more stringent.

## 2.7 Contingency Loads

### 2.7.1 RCC Structures

All floor slabs and beams shall be designed for a concentrated load of 10 KN acting simultaneously with the uniform live load, but not with actual concentrated loads from equipment, piping etc. This load shall be placed to result in maximum moment and / or maximum shear.

This load shall not be considered for the design of columns, foundations and in overall frame analysis. For floor slabs, the load shall be considered to be distributed over an area of 0.75 m x 0.75 m.

### 2.7.2 Structural Steel

For process plants, the following contingency additional loading shall be applied to individual beam elements, these shall be applied as point loads to produce worst shear and bending stresses:

- |                             |      |
|-----------------------------|------|
| 1. Platform Walkways        | 3 kN |
| 2. Secondary Floor Trimmers | 5 kN |

3. Primary / Grid beams 10 kN

## 2.8 Miscellaneous Loads

Apart from the specified live loads, possible overloading during construction / hydro-test maintenance / erection shall also be considered in the design Job specifications and shall also be referred to, for any specific loading.

Hydrostatic pressure shall be adequately accounted for, in the design of structures, below ground water table.

All the handrails, parapets, parapet walls, balustrades shall be designed for horizontal load mentioned in Table 3 of IS-875 (Part-2).

## 2.9 Load Combinations

Structure & its member shall be designed for worst combination of the above loads.

## 3.0 DESIGN CRITERIA FOR FOUNDATIONS

### 3.1 General

Foundation sizing shall be based on working loads without any factor.

### 3.2 Shallow Foundations

3.2.1 For gravity loading, allowable net bearing capacity of soil shall be based on the following settlement criteria:

Foundation Type	Allowable Settlement(mm)
– Foundations in unit areas, utility areas and Foundations for plant buildings including substation, Compressor house, control room, technological structures	25
– Machine foundations and critical equipment with interconnected piping	25
– Foundations supporting non-plant buildings	40

3.2.2 For transient loadings, such as wind / seismic, allowable net bearing capacity based on shear criteria may be considered.

3.2.3 For load combinations including wind/Earthquake, the Safe Soil Bearing Pressure may be increased by 25%.

3.2.4 Allowable Loss of contact area between underside of foundation and soil (due to resultant Overturning Moment) under different loading conditions shall be as given below.

Load Combination description	Allowable % Loss of Contact Area
A. Operating Load case ( Plant operating, with or without Live Loads, for worst cases)	0 % to 10%

Operating Load Case with Wind or Earthquake (with or without Live Loads, for worst cases)	up to 25%
B. Operating Load case (Plant operating, with or without Live Loads, for worst cases)	0 % to 20%
Operating Load Case with Wind or Earthquake (with or without Live Loads, for worst cases)	up to 30%

Where A = Foundations on Soil , B = Foundations on Rock

### 3.2.5 Soil and hydrostatic pressure on walls below grade

In the design of walls below grade, provision shall be made for the lateral pressure of adjacent soil. Due allowance shall be made for possible surcharge from fixed or moving loads. When a portion or whole of the adjacent soil is below a free water surface, computations shall be based on the weight of the soil, diminished by buoyancy, plus full hydrostatic lateral pressure.



The lateral pressure from surcharge loads shall be taken in addition the lateral earth pressure loads.

### 3.2.6 Stability of foundations

Foundations shall be checked for stability against overturning, sliding & uplift. While checking against uplift, the following shall be considered.

#### Foundation Design – Factors of Safety

Type of Structures	Minimum factor of safety against overturning		Minimum factor of safety against Sliding		% Weight of Overburden over projected plan area of footing
	With wind or seismic	Without wind or seismic	With wind or seismic	Without wind or seismic	
All Buildings/ Structures / Eqpt. In Units	1.5	2.0	1.5	1.5	100
Pipe Rack	1.5	2.0	1.5	1.5	50
Flood Light Mast	1.5	-	1.5	1.5	50**
Retaining Wall	1.5	2.0	1.5	1.75	100
Flare supporting Structures	1.5	-	1.5	-	50**

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\*\* In case area is paved, overburden shall be based on NGL (for area under filling) or 600 mm below HPP, whichever is lower. In case of unpaved area, it shall be w.r.t. FGL.

Minimum factor of safety against uplift shall be 1.2 for all structure. (Note: In case of sumps, lining weight shall not be included). Beneficial load of backfill can be included on in circumstances where it will never be removed.

Buoyancy from high ground water levels shall be taken into account in investigating stability against uplift.

### 3.3 **Piled Foundations**

Piles shall be designed as per IS: 2911 . However, pile capacity shall be proven by a sufficient number of initial load tests before preparing piling plans.

The increase in Safe Working Load permitted as per codal provisions, under load combinations including wind / earthquake shall apply equally to uplift and shear conditions, subject to confirmations by the piling CONTRACTOR with respect to the particular piling system. Pile capacity may be similarly increased in blast condition to 1.5 times the permissible capacity under compression, tension and shear modes.

When any major machinery is to be supported on piles, behaviour of the piles under dynamic, loading conditions, as established by necessary field test, shall be considered.

The capacity of pile groups shall be obtained by applying appropriate group efficiency factors. Where piles pass through filed ground, the available pile safe working load shall be suitably reduced to account for negative skin friction caused by settlement of fill. Where suitable, consideration shall be given to reducing drawdown effects by slip coating the piles.



While computing horizontal capacity, piles shall be treated as fixed head or free head depending on the degree of fixity at the top.

### 3.4 **Machine Foundations**

Machine / Mechanical equipment foundations shall satisfy the requirements of IS:2974 and any other parameters as per machine vendors.

Generally, foundations and structures supporting rotating machinery shall be so proportioned that their natural frequency shall not fall within the range of 0.8 to 1.2 of normal operating speed of the equipment. Further for major rotating machinery such as main compressor, the amplitude of foundation of structure during normal operation shall not exceed the allowable amplitude specified by the equipment manufacturer. The above consideration may be omitted for centrifugal pumps and fans and other minor rotating equipment weighing less than 1 ton or if the mass of the rotating parts are less than 1/100th of the mass of foundation installed directly on concrete provided that the weight of foundation is not less than 3 times of the equipment weight. In such cases, dynamic analysis is not necessary.



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When dynamic analysis is called for, the combined centre of gravity of the machine and foundation system shall, as far as possible, pass through the centre of area of the foundation raft or centroid of the pile group. Wherever unavoidable, eccentricity shall be less than 5% for block foundations and 3% for frame foundations. However, in highly compressible soils, no eccentricity shall be permitted.

Foundations shall be so designed that natural frequency of the foundation system shall not resonate with the following:

- a) Operating speed of the motor / turbine
- b) Operating speed of the machine
- c) 2 x Operating speed of the machine
- d) Critical speed of the machine (for centrifugal machines)

It shall be ensured that there is no transfer of vibrations from machine foundations to any part of the adjoining structures. In case such machine are sitting on building floors, approved damping pads shall be used with prior approval of OWNER / CONSULTANT.

Where deviations (resulting from inaccuracies in soil parameter measurements, approximations in design method, etc.) from calculated natural frequencies, leading to amplitudes in excess of specified limits are foreseen, provision for increasing the foundation mass without removal of the machine and without affecting surrounding space availability or connected piping shall be made, if possible.

### 3.5 **Concrete Grade**

Grade of concrete to be used in foundation shall in general be as per the philosophy adopted for the entire structure. However, minimum cement content, type of cement and any remedial actions, if required for foundations due to aggressiveness of subsoil water, shall be as stated elsewhere in this document. Minimum grade of reinforced concrete shall be M25. For underground & water retaining structures, such as, manholes, cooling tower etc. M 30 grade reinforced concrete shall be used.

### 3.6 **Foundation Bolts**

#### 3.6.1 **Minimum cover to Foundation Bolts**

Minimum distance from the center line of foundation anchor bolt to edge of pedestal shall be as per standard drawings.

#### 3.6.2 All equipment foundation bolts / templates shall be designed and supplied by equipment vendor.



Foundation bolts for steel structures shall be designed and supplied by CONTRACTOR as per standard drawings or approved equivalent.

### 3.7 **Pedestal Heights**

Building plinth : 450 mm above finished ground level

Pedestals for structural columns:

Open paved area : 300 mm (min.) OR as indicated in

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	Equipment layout drawing
Open unpaved area	: 300 mm
Covered area(building etc.)	: 300 mm (min.) OR as indicated in drawing
Storage tank foundation	: As per equipment layout
All equipment supporting foundations / pedestals	
Open area	: As required but not less than 300 mm
Covered area	: As required but not less than 150 mm
Stair Pedestals	: 300 mm (min.) OR as indicated in equipment Layout drawing.
Ladder pedestals	: 300 mm



### 3.8 Design Criteria for Reinforced Concrete Structures

#### 3.9 General

- 1) All buildings, structures retaining storage structures, trenches, pits etc. shall be of RCC and designed based on the following IS codes (latest revision with all amendments, issued there to) in general, and other relevant IS codes applicable : IS:456, 875, 1893, 1904, 2911, 2950, 2974, 3370, 4326, 4991, 4998, 5249, 6403, 8009, 13920.
- 2) Only limit state method as per IS:456 shall be followed for the design unless otherwise specified elsewhere in this document for special structures.
- 3) All skeletal structures shall be of frame type construction, and detailing shall be as per provision of IS:13920.
- 4) Where the specified design depth of groundwater table so warrants, all underground pits, tunnels, basements, etc. shall be leak-proof R.C.C. construction using water proofing compounds.

#### 3.10 Liquid Retaining R.C.C. Structures and Basements

- 3.10.1 All liquid retaining / storage R.C.C. structures shall be leakproof and designed as uncracked section in working stress method as per IS:3370. However, the parts of such structures not coming in contact with the liquid, shall be designed according to IS:456 except ribs of beams of suspended floor slabs and counterforts of walls (located on the side remote from liquid) and roof of liquid retaining structures which shall be designed as uncracked section. Hot/cold water basin, and other primary framing members of Cooling Towers and similar liquid retaining structures, which remain constantly in contact with water (stored / sprayed) shall be designed as uncracked sections. No increase in permissible stresses in concrete and reinforcement shall be made under wind or seismic conditions for such structures.
- 3.10.2 All liquid retaining / storage structures shall be designed assuming liquid up to the full height of wall, irrespective of provision of any overflow arrangement. Pressure relief valves or similar pressure relieving devices shall not be considered in underground water retaining RCC structures. Hot water basin in cooling tower shall be designed for the weight of water up to top of parapet wall.
- 3.10.3 The walls and base slabs of liquid retaining storage structures shall be provided with reinforcement on both faces for thicknesses greater than 150 mm.

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3.10.4 In all liquid retaining structures, PVC water bars (230 mm wide, 6 mm thick) shall be provided at each construction joint. PVC water bars shall be of minimum 150/230 mm width and 6 mm thickness, and generally shall be rified/serrated type with a central bulb Kicker type PVC water bars shall be used for the base slab and in other areas where it is required to facilitate concreting.

#### 4.0 Concrete Grade

The **minimum M25** grade of reinforced cement concrete shall be used for all structures and foundations except for grade slabs / paving for which M20 may be used. From durability consideration the minimum cement content and maximum water-cement ratio shall be as follows :

Type of Cement	Plain concrete		Reinforced concrete		Remarks Exposure Condition
	Minimum cement content (kg/m <sup>3</sup> )	Maximum water-cement ratio	Minimum cement content (kg/m <sup>3</sup> )	Maximum water-cement ratio	
43 Grade-OPC	240	0.55	330 (for shallow fdns) -400 (for piles)	0.45	Moderate

Maximum cement content shall not exceed 450 kg/m<sup>3</sup>. If soil investigation report recommends high cement content and / or specified type of cement, the same shall have precedence.

75 mm thick lean concrete of grade M10 (nominal mix) shall be provided under all RCC foundations except under base slab of liquid retaining structures where 100 thick concrete of mix M10 (nominal mix) shall be used. The lean concrete shall extend 75 mm beyond the foundation for normal foundations and 100 mm under liquid retaining structures.



Concrete for encasing shall be M20 with 10 mm down aggregate.

Plain cement concrete (PCC) of grade M15 (nominal mix) of minimum 150 mm thickness shall be provided under all masonry wall foundations.

Plain cement concrete of grade M20 of minimum 40 mm thickness shall be provided as damp proof course, at plinth level of all masonry walls and to be coated with 3 mm thick bitumen emulsion.

#### 4.1 Reinforcement Bars

High yield strength deformed TMT steel bars of grade Fe500D conforming to IS:1786 shall be used.

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#### 4.2 **Minimum Cover to Reinforcement**

Minimum clear cover shall be provided to all steel reinforcement as per IS:456 & IS:3370.

#### 4.3 **Expansion Joints**

##### **Concrete structures**

Expansion points in concrete structures shall be provided at 30-35 m centers. The expansion joint shall be provided preferably by way of twin columns on a common foundation. Sliding joints shall be avoided as far as possible.

#### 4.4 **Deflections**

4.4.1 Deflections in concrete structures shall in general be limited by adherence to the limits on span by depth ratio for beams and slabs and length to lateral dimension ratios for columns as prescribed in IS:456. Where special functional / serviceability requirements or large spans demand actual deflections and / or crack widths shall be calculated and the following limits adhered to:

- Total deflection due to all loads including the Effects of temperature creep and shrinkage : Span/250
- Crack width (for non-liquid retaining structure) : 0.3 mm
- Total horizontal deflection between two floors : Storey height/200

#### 4.5 **Miscellaneous Applications**

##### 4.5.1 **Admixtures**

Admixtures shall conform to IS:9103 and to be mixed with concrete (if required) strictly as per manufacturer's recommendations.

##### 4.5.2 **Plinth protection**

Each building shall be provided with 1.0 m wide concrete M15, 100 thick laid on 75 mm thick M7.5 concrete with 8 Tor @ 250 c/c both ways Reinforcement bars all round as plinth protection. A surface drain to be provided along-with plinth protection which shall be connected to the drainage system.

##### 4.5.3 **Ramps**

Ramps for building entrance shall be cast in situ R.C.C. designed as a grade slab and the slope of ramps shall not be less than 1 in 10. Minimum thickness of the slab shall be 150 mm.



##### 4.5.4 **Hot Bitumen Paint**

All underground structures including top surface of foundations shall be painted with two coats of hot bitumen paint of grade 20/30 with quantity of bitumen at least 1.2 kg/m<sup>2</sup> per coat.

##### 4.5.5 **Masonry Wall**

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- a) All masonry walls from ground floor shall be placed on R.C.C. grade beams. However, light internal partitions may be placed on ground floor slab.
- b) All brick masonry (M 7.5 grade) walls shall be considered as 230mm thick, except for partition walls which will be 115 mm thick. However, for fire barrier walls minimum thickness shall be considered as 350 mm.
- c) All in-filled brick (M7.5 grade) panels shall be designed to transfer horizontal loads from wind and seismic to the structural frameworks without damage and the extent of brick panel dimensions shall be as per the recommendations in IS. All half masonry wall shall be provided with reinforcement consisting of 2 Nos. of 8mm diameter bars at every fourth layer.

#### 4.5.6 **CRITERIA FOR MASONRY WORKS**

##### 4.5.6.1 **General**

All masonry works shall be designed in accordance with IS:1905, IS:1597, IS:2185, IS:4326 and other relevant IS Codes as applicable. All external brick, stone and hollow concrete block masonry walls shall be of minimum 230, 350 and 250 mm thickness respectively. ES 2516, enclosed with the tender may be referred for details. Masonry shall be plastered with CM 1:6, 12 mm thick on inside surfaces and 20 mm thick on outside surfaces.

##### 4.5.6.2 **Cement Mortar**



All masonry work shall be constructed in 1:6 cement sand mortar except half brick partition walls which shall be constructed in 1:4 cement sand mortar with 2 nos.8mm dia. M.S bars provided at every fourth course properly anchored with cross walls or pillars.

### 5.0 **DESIGN CRITERIA FOR STEEL STRUCTURES**

#### 5.1 **General / Design Methods**

- 5.1.1 Design, fabrication and erection of the above work shall be carried out in accordance with the following IS Codes as applicable to the specific structures, viz, IS:800, 801, 802, 806, 814, 816, 875, 1893, 6533, 9595, etc. Basic consideration of structural frame work shall primarily be stability, ease of fabrication/erection and overall economy, satisfying relevant Indian Standard Codes of Practice. Steel structures adequately braced in vertical and horizontal planes, consistent with functional requirements, shall be preferred over structure having moment connections. Moment connections, if adopted, shall be fully rigid as per IS:800. Where fully rigid joints are adopted they shall generally be confined to the major axis of the column member. Flare stack supporting structure shall be adequately braced on all four faces.

Structural elements, continuously exposed to temperatures above 200° C, shall be designed for reduced stress as per Table-4 of IS:6533 (Part-2). The expected temperature of steel components shall not be allowed to exceed 400 ° C. The structures connected to column, heater vessels working at high temperatures shall not

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be rigidly connected with staircase and adjoining structures, which are on ambient temperatures.

- 5.1.2 Crane gantry girders shall generally be of welded construction and of single span length. Chequered plate shall be used for gantry girder walkway flooring.
- 5.1.3 Steel staircases shall have channels provided as stringers with minimum clear width of 1000 mm. The vertical height between successive landings shall not exceed 4.0 meters. Treads shall be minimum 250 mm wide made of grating (with curved chequered plate nosing) spaced equally so as to restrict the rise to maximum 150 mm. If relevant local by-laws or applicable Factory Act Rules stipulates more stringent requirements in this regard, the same shall be adhered to.
- 5.1.4 Electro-forged galvanized MS gratings grating shall be minimum 30 mm deep. The maximum size of voids in the grating shall be limited to 34 mm x 65 mm. The minimum thickness of galvanizing shall be 86 microns. Gratings shall be suitable for the operation and maintenance loads for the floors.
- 5.1.5 Bolted connections shall be adopted as far as practicable, except for cases where welded connections are required viz. (Galvanized) electrical switchyard structures and transmission towers. Structural connections shall have minimum two bolts of 16 mm dia. unless otherwise limited by the size of members
- 5.1.6 Lock nuts shall be provided for anchor bolts of tall structures, tall process columns, vibrating equipment, etc.
- 5.1.7 Minimum two nuts shall used for all anchor bolts except for ladder, stair and hand rail.

## 5.2 **Expansion Joints**

Expansion joints shall be provided at 80 – 100 m centres, where possible, column bracing shall be provided at the center of a longitudinal frame, rather than at the ends so as to avoid constraints on free expansion.



## 5.3 **Steel Grade**

Structural steel shall be of yield stress of 250 Mpa conforming to grade B of IS:2062. Tubular steel shall conform to Yst 310 of IS:1161 & 4 IS: 4923.

## 5.4 **Limiting Permissible Stresses**

Permissible stresses in structural members shall be as specified in various codes.

- |        |   |  |
|--------|---|--|
| IS:800 | - | Hot rolled sections (excluding transmission towers and Switchyard structures). |
| IS:801 | - | Cold formed light gauge sections   |
| IS:802 | - | Transmission towers & switchyard structures                                    |
| IS:806 | - | Tubular Structures   |
- Permissible stresses in bolts shall be as specified in:
- |        |   |   |
|--------|---|---|
| IS:800 | - | Hot rolled sections                         |
| IS:801 | - | Cold formed light gauge sections            |
| IS:802 | - | Transmission towers & switchyard structures |

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- IS:806 - Tubular Structures  
Permissible stresses in welds shall be as specified in:  
IS:801 - Cold formed light gauge sections  
IS:806 - Metal Arc Welding

## 5.5 Limiting Deflection

- a) The limiting permissible vertical deflection for structural steel members shall be as specified below :-



- Gantry girder for electric overhead crane (Capacity up to 50T)	:	L/750
- Gantry girder for electric overhead crane (Capacity over 50T)	:	L/1000
- Gantry girder for manually operated crane	:	L/500
- Girder beam for supporting dynamic equipment/hoist	:	L/450
- Grating / Chequered plate	:	L/200 or 6mm Whichever is less
- Purlins supporting any type of roofing material	:	L/200
- Under (dead load + live load) or (dead load + wind Load ) conditions	:	
- Other structural components	:	As specified in relevant IS, Where "L" represents the span
- The limiting permissible horizontal deflection for multistoried steel structure/ building including flare stack	:	Height/325

## 5.6 Minimum Thickness

### 5.6.1 Structural Components

The minimum thickness of various structural components (Hot rolled sections) shall be as given:

- a. General Construction
- Trusses, Purlins, Side Girts, Bracings : 6 mm
  - Columns, beams : 7 mm
  - Gussets in trusses & girders
    - i. Upto and including 12 m span : 8 mm

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- ii. Above 12 m span : 10 mm
- Flare Trestles, Stiffeners : 8 mm
- Base plates : 10 mm
- Chequered plate : 6 mm (on plain)
- Grating : 3 mm.

## 6.0 DESIGN REQUIREMENTS FOR SPECIFIC APPLICATIONS

### 6.1 Pipe rack/Cable rack

For designing the piperack superstructure and foundation the following loads shall be considered:

#### 6.1.1 Vertical Loading

Actual weights of pipes coming at each tier shall be calculated. In calculating the actual weight of pipe, the class of pipe, material content and insulation, if any, shall be taken into consideration. Insulation density shall be taken as 2600 N/m<sup>3</sup> minimum. In case of gas / steam carrying pipes, the material content shall be taken as one-third volume of pipe filled with water. The total actual weight thus calculated, shall then be divided by the actual extent of the span covered by the pipes to get the uniformly distributed load per unit length of the span. To obtain the design uniformly distributed load, over the entire span, the u.d.l. obtained as above, shall be assumed to be spread over the entire span. However, minimum loading for any piperack shall not be less than 1.25 kN/m<sup>2</sup>. In case, the calculated loading is higher than 1.25 kN/m<sup>2</sup>, this shall be rounded off to the nearest multiple of 0.25 (i.e., 1.50, 1.75 kN/m<sup>2</sup>)

Vertical loads of flare pipe shall be taken as one third full of water for piping within units & one sixth full for outside unit battery line. All flare line independent support shall be of four legged braced open lower type construction.



In addition to piping load, gravity loads due to encasement, if any, shall be considered.

#### 6.1.2 Friction Force (Longitudinal & Transverse)

Where the pipes are of similar diameter and service conditions, the friction force at each tier on every portal both in longitudinal and transverse directions, shall be 10% of the design vertical loading of the pipes for four or more pipes supported on a tier and 30% of the design vertical loading of the pipes, for single to three pipes supported on a tier. Longitudinal friction force shall be considered as uniformly distributed over the entire span of the beam at each tier and transverse friction force shall be considered as a concentrated load at each tier level. Friction forces on T-supports and trestles shall be taken as 30% of the vertical loading. Both longitudinal and transverse friction forces shall be considered to be acting simultaneously.

For two-phase fluid flow/transfer lines frictional force shall be minimum 50% of the weight of pipe including contents & insulation, acting simultaneously in transverse & longitudinal direction.



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### 6.1.3 **Anchor and Guide Force (Thermal Load)**

Anchor and guide force (thermal load) in transverse and longitudinal direction shall be as per piping data.

### 6.1.4 **Loading on intermediate Beam at Tier Level**

Intermediate beam at tier level shall be designed for 25% of load on main portal beams in transverse direction. A reduction of 10% in vertical loading shall be considered for main portal beams, if intermediate beams are provided.

### 6.1.5 **Loading on Longitudinal beams**

Longitudinal beams connecting portal columns shall be sufficiently strong to sustain 25% of the load on the transverse beams. The total load shall be assumed as two equal concentrated loads acting at 1/3<sup>rd</sup> span. Other longitudinal axial forces coming on it from the design of the supporting system shall also be simultaneously taken into account in the design of the longitudinal beam. Friction & anchor forces, if specifically given by the Piping Specialist, shall also be catered for in the design. Loads from monorails, when supported from these beams, shall also be considered to be acting simultaneously along with all other loads mentioned above.

### 6.1.6 **Cable Tray and Walkway Loads**



The estimated actual load from electrical, instrumentation trays shall be considered at the specified locations, together with walkways, platforms for valve operation, wherever provided.

### 6.1.7 **Wind Force**

Transverse wind loading shall be calculated depending on the width of the piperack as per the following table. This force shall be considered irrespective of the height between two tiers.

<b>Width of Piperack</b>	<b>Wind Force at each Tier level(N)</b>
– Upto 4 m	1.25 x p x s
– Above 4 m but upto 6 m	1.50 x p x s
– Above 6 m but upto 10 m	2.00 x p x s
– Above 10 m	projected height x p x s
Where p = Horizontal wind pressure as per IS:875 (N/m <sup>2</sup> )	
s = Spacing of portals (m)	

For pipe racks of width greater than 10 m, the projected height shall be lesser of the following two:

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1.  $0.8 X$  (diameter of largest pipe including insulation (m) +  $\tan 10^\circ \times$  (width of rack (m)).
2. Height between consecutive tiers

6.1.8 For flare header or any other line supported on extended leg of piperack, the wind force shall be considered separately.

6.1.9 **Seismic Loads**

Seismic loads shall be as per IS:1893(Latest Revision) .

6.1.10 Pipe racks should be adequately braced in all possible directions, consistent with function requirements.

6.1.11 Limiting permissible horizontal deflection for piperack shall be height / 325.

6.2 **Culverts**

Culverts shall be designed as per the following IRC codes of practices and manual. Where crane access is specified, the culverts shall be designed for the crane loads.

1. Standard specifications and code of practice for Road Bridges (Section – I - General features of design)	IRC 5
2. Standard specifications and code of practice for Road Bridges (Section-II – Load and Stresses)	IRC 6
3. Guidelines for Evaluation of Load Carrying Capacity of Bridges	SP 37

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## SECTION-8.0



### TECHNICAL SPECIFICATION & DESIGN PHILOSOPHY – PIPING

FOR

### SUPPLY & CONSTRUCTION OF ASH POND AND ALLIED SERVICES

**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX,  
AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

0	27.05.2022	27.05.2022	ISSUED FOR TENDER	JKS	JKS/DD	AMAR
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



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5.0	Slurry Transportation Pipes and Accessories
6.0	Water Piping, Pipe Fittings and Accessories
7.0	Water Valves and Specialities
8.0	Slurry Sump Isolation Plug Valves, Sump Liners and Sump Agitating
9.0	Slurry Disposal Line Valves (Dyke End)

### List of attachments

Sl. No.	Doc. No.	Description
1.0	PNMP-TS-6100-Rev.0	Technical Specification for Pipes
2.0	PNMP-TS-6300-Rev.0	Technical Specification for Fittings
3.0	PNMP-TS-6400-Rev.0	Technical Specification for Flanges
4.0	PNMP-TS-6610-Rev.0	Technical Specification for Studs & Nuts
5.0	PNMP-TS-6620-Rev.0	Technical Specification for Gaskets
6.0	PNMP-TS-6700-Rev.0	Technical Specification for Valves
7.0	PNMP-ITP-02	Inspection & Test Plan for CS, LTCS, AS & SS Seamless Pipes
8.0	PNMP-ITP-03	Inspection & Test Plan for Fittings
9.0	PNMP-ITP-04	Inspection & Test Plan for Forged Flanges
10.0	PNMP-ITP-05	Inspection & Test Plan for CS, LTCS & SS Welded Pipes
11.0	PNMP-ITP-06	Inspection & Test Plan for Studs & Nuts
12.0	PNMP-ITP-07	Inspection & Test Plan for Valves
13.0	PNMP-ITP-08	Inspection & Test Plan for Gaskets

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## 1.0 Intent

This specification together with all enclosures cover the requirements for detailed design, engineering, manufacturing, inspection, testing, painting, supply, packing & forwarding, transportation to site, unloading & storage at site, erection/installation, assembly, trial run on no load, commissioning, smooth & trouble free operation and guarantee test run and acceptance of complete system including guarantee of complete piping for proposed Ash Pond and Allied Services and associated facilities along with supply of spares for commissioning and 2 years' operation for M/S TFL at Talcher (Odisha).

## 2.0 Scope of Work

The scope of work of Ash/Slag handling system shall consist of, but not limited to the following:-

The scope of piping work comprises turnkey/Item Rate supply, erection and commissioning of complete piping of Dyke/Ash & Slag handling system & associated facilities such as recovery Water System, Dyke Ash Evacuation system as specified and defined in this specification & BOQ. The scope of piping work also includes Pipe Pedestals etc.,

- a) Two (2) lengths of slurry disposal MS pipe lines from the ash slurry pumps up to ash dyke including garlanding of the dyke and extensions into the dyke at number of discharge points complete with basalt lined pipe bends, fixtures, elbows, gaskets, nuts, bolts, structural steel supports and other accessories as specified and as required. For garlanding of ash dyke, MS bends shall be provided.
- b) Four (4) nos. Motor operated knife edge gate valve at the suction (2 nos.) and discharge (2 nos.) of ash slurry pumps.
- c) Complete ash slurry piping along with bends, supports, bolts, nuts, clamps etc. inside the ash slurry pump house.
- d) Two (2) nos. slurry sump compartment isolation valves
- e) Five (5) nos. manually operated plate valves at the slurry disposal pipeline interconnection at pump house exit as specified and as required.



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- f) Two (2) nos. manually operated plate valves at Ash Dyke as specified and as required.
- g) Alloy Cast Iron liners for lining the Ash slurry sumps.
- h) Two (2) nos. vertical sump drainage pumps with drive motors complete with piping, valves, fittings, supports, inserts, sleeves etc.
- i) Following pipe lines complete with bends, fixtures, couplings, fittings, gaskets, nuts, bolts, clamps, structural steel supports and other accessories as specified and as required.

1. Inlet pipelines from Decantation well to Recovery Water Sump. Recover Water Pump to Stilling Chamber, Flash Mixer to Clarifier and Recycle water Sump to Feed Water Sump
2. There shall be one pipe line from Recycle water Pump to feed Water Sump, Pipeline shall be of 250mmNB, MS pipe of 6.35mm thickness.
3. All the interconnecting pipes from sumps to pumps and pump discharge to common header.
4. CPVC pipes from Dosing Tanks to Flash Mixer.
5. Potable water piping from terminal point to tank and drinking water facilities.
6. Service water piping from terminal point to the service water facilities within the as per the scope specified in the specification.
7. All the necessary clamping arrangements along with guides, bolts, nuts etc.

In addition to major pipelines brought out above, all the pipelines required to complete the Ash Water Recirculation System are included in the scope of the Bidder.

- a) All necessary valves, fittings, specialties etc. for various equipments, pumps piping etc. Necessary piping, valves, specialties etc. for inter-connection of associated equipment. Size of valves shall be same as respective pipe lines size.
- b) All necessary instrumentation for safe and reliable operation of the whole system as required and as specified.
- c) All air intake valve, drain valves, auto vent valves in pipelines along with isolation valves as per system requirement.

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- j) Mandatory Spare parts as specified in this specification.
- k) The Fire Fighting System shall be designed to provide adequate facilities for extinguishing any fire in the entire area of proposed Ash Pond and Allied Services and associated facilities of the proposed Scope of work. The system shall be designed and installed as per TAC / NFPA/ API/ IS standards and also as per latest applicable standards/ codes. The system shall be complete in all respects essential for proper installation operation and maintenance, irrespective of whether such systems are specifically mentioned in this specification or not.
- l) The CONTRACTOR shall design, supply and erect complete fire fighting network / system inside and around Ash and slag handling at proposed Ash Pond and Allied Services and associated facilities.
- m) Various drawings, data, test reports, test certificates, manuals for erection, operation and maintenance, etc. as required.
- n) All design data, drawings and information regarding the structures, services, terminal point details for piping etc. which are to be arranged by others shall be furnished by the bidder in a timely manner matching with the overall project schedule.
- o) Supply and application of all paints, including the final painting of the plant at site.
- p) In addition to what has been described above, bidder's scope of services shall include Submission, Review, Finalization and getting approval from Owner/PMC.



### 3.0 Layout Requirements (Piping)

No pipe trenches are to be routed inside or outside the building.

Valves shall be located such that they are accessible from the regular floor of the building, as far as possible. Valve operating platforms along with approach ladder/ cage ladder shall be provided for the valves which are not accessible from the floor of the building.

Each equipment room shall be provided with alternative exits in case of fire/ accidents as per requirement of factories act and statutory bodies/ TAC and insurance companies.

All the valves, gates, shutters etc. used in this plant shall be rising spindle type and general materials & constructions as per relevant AWWA/IS/BS etc.

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Instrument isolation Ball valves shall be of SS-316. Valves at flushing line in Alum soln. tank shall be of Diaphragm type having ebonite lining with adequate hardness.

All valves used in “Sludge” service shall have draining/flushing arrangement at valve seat.

All nuts, bolts, washers etc. in underwater and corrosive/erosive application shall be of SS 316.

All “Sludge” service pipes shall have flushing facilities.

The sludge draining system shall be continuously operating type

For all pipes handling lime and sludge, only flanged piping shall be used and pipe sizes shall not be less than 80mm NB where as all flushing line size shall be not less than 50 NB. All such pipes shall receive suitable slope during erection if it is gravity flow. ‘Tees’ shall be provided instead of ‘bends’ and ‘crosses’ shall be provided instead of ‘tees’ – all remaining’ faces kept blanked off for flushing purpose.

All valves in suction of pumps shall be provided with limit switches which shall be interlocked with the starting of these pumps.

## 4.0 Slurry Line Valves



### 1.00.00 General

1.01.00 This specification covers design, manufacture, constructional features, erection, testing and commissioning of slurry line valves.

### 2.00.00 Codes and standards

2.01.00 The design, manufacture, inspection and testing of slurry line valves shall comply with all the current applicable statutes, regulation and safety codes in the locality where the equipment is to be installed. The equipment shall also conform to the latest applicable Indian /British/ American Standards. Other internationally acceptable standards, which ensure equal or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the Contractor of the required statutory responsibility.



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### 3.00.00 Design and Constructional Features

3.01.00 In addition to the details specified in the enclosed Data Sheets, the Bidder/Contractor shall comply with the following requirements.

3.02.00 Adequately sized motor operated rubber seated knife edge gate valves shall be provided at the suction and discharge of slurry disposal pumps and sludge pumps.

3.03.00 The selection of the type of valve shall be done based on the line pressures.



3.03.01 The rubber seated knife edge gates valves shall have 100% tight shut-off in both the directions of flow.

3.04.00 Valves shall be provided with a mechanical indicator and limit switches to indicate open or closed position of the valve locally and remotely.

3.05.00 Valves shall be provided with hand wheel for manual operation. Gear operator of proven quality and reputed make shall also be provided if the effort required to operate the valve exceeds 25 Kgf.



3.06.00 Valves shall be specially designed for tough, abrasive and corrosive services.

3.07.00 As the accumulation of solid material in seat area could affect the tight closure of the valve (which may lead to premature wear due to improper shut off or the gate remaining partially in the flow path) and the wear of seat, deflection cone/wear liner (of minimum 400-450 BHN hardness) to limit such occurrences shall be provided.

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### Data Sheet for Slurry Line Valves

1.0	Type of Valves:	(i)	100% percent) tight shut off rubber lined knife edge gate valve
2.0	Numbers required	(i)	Two (2) nos. for each slurry disposal pumps, one (1) no. at suction and one (1) no. at discharge
		(ii)	2 Nos. for each sludge pump, 1no. at suction & 1 no. at discharge
3.0	Size of valves	:	Same as parent pipe size.
4.0	Method of operation	:	Motor operated with provision of hand wheel for manual operation.
5.0	<b>Material of Construction</b>		
5.1	Body/Cover:	:	Cast iron FG-260 to IS:210(min. 10 mm thickness) with alloy C.I./ S.S Deflection cone (minimum 400 BHN hardness)
5.2	Gate	:	Stainless steel with min. 400 BHN Hardness on wear surface for knife edge gate valves
5.3	Stem	:	Stainless steel (SS-316) for knife edge gate valves
5.4	Sleeve /Yoke	:	Bronze
5.5	Gland Packing	:	To suit service requirements

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## 5.0 Slurry Transportation Pipes and Accessories

### 1.00.00 General

1.01.00 This specification covers design, manufacture, constructional features, erection, testing and commissioning of Ash slurry, transportation pipes and accessories

### 2.00.00 Codes and standards

2.01.00 The design, manufacture, inspection and testing of various slurry transportation pipes and fittings shall comply with all the currently applicable statutes, regulation and safety codes in the locality where the pipelines are to be installed. The pipeline shall also conform to the latest applicable Indian/ British/ American Standards. Other internationally acceptable standards, which ensure equal, or higher performance than those specified, shall also be accepted. Nothing in this specification shall be construed to relieve the Contractor of the required statutory responsibility. In particular the pipeline shall conform to the latest edition of the following standards:

API-5LGr.B - LINE PIPE

IS:3589 - LINE PIPE

### 3.00.00 Design and Constructional Requirements



3.01.00 In addition to the details specified in the enclosed data sheet, the Bidder / Contractor shall comply with the following requirements.

3.02.00 Ash Slurry Transportation

3.02.01 The ash slurry transportation piping from Slurry sump of Slurry pump house to ash dyke including garlanding of ash dyke complete with all steel supports, hangers, clamps, support inserts, nuts, bolts, gaskets, etc. along the pipe routing etc.

3.02.02 The Ash concentration in slurry (W/W) shall not exceed 75:25 (W/W basis)

3.02.03 The diameter of slurry transportation piping from jet pump discharge or from bottom ash slurry transportation pump discharge should be selected considering slurry velocity of 2.8M per Sec. (Max.) in the pipe. The diameter of pipes, where gravity flow is expected, shall be selected based on the permissible slopes.

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3.03.00 Fittings

3.03.01 All slurry transportation pipe fittings i.e. bend, elbows, laterals, etc. shall be integral wear back type alloy cast iron or basalt lined fittings. The alloy C.I. fittings shall be specially thickened at wearing points. Minimum thickness of wear back shall be twice the pipe wall thickness.

3.03.02 All the fittings (bends, elbows/laterals spool pieces etc.) in the slurry pipe line shall be as per good engineering practice and of large radius of construction (Min.3D).

3.03.03 Spool pieces (alloy C.I. or basalt lined as the case may be) of min. 1.5m length shall be provided at the discharge of every fitting having an angle of 45° or above.

3.04.00 Couplings

3.04.01 For ease of rotation and replacement of slurry transportation pipes at regular intervals of time for maintenance purpose, sleeve type couplings shall be provided.

3.04.02 Straight length of pipes without any intermediate couplings shall not exceed 48 meters. It shall be possible to replace or rotate (as applicable) any fitting and any particular spool or pipe during maintenance without unduly disturbing neighbouring healthy joints and pipe spools.

3.04.03 The coupling shall be capable of taking a minimum of 2° angular deflection and sufficient gap between the ends of pipes at couplings shall be provided to take care of expansion and contraction in piping.

The thickness of coupling sleeve shall be as indicated in the enclosed datasheet.

<b>DATA SHEET FOR ASH SLURRY TRANSPORTATION PIPES AND ACCESSORIES</b>			
<b>I.</b>	<b>ASH SLURRY TRANSPORTATION PIPES</b>		
1.0	Type of pipes	:	ERW /SAW of grade Fe410 as per IS:3589/API-5LGrB. For slurry transportation from discharge of Slurry disposal pump up to ash dyke including garlanding of ash dyke.
2.0	Pipe Size	:	As per the requirement



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3.0	Thickness of pipes:	:	9.5 mm
4.0	Type of Joints	:	Welding Joints and Sleeve type coupling joints at every 48m distance
5.0	No. of pipes		As indicated in the tender drawing.
6.0	Quantity	:	As per tender layout.
<b>II. PIPE FITTINGS (BENDS, ELBOWS, LATERALS, SPOOL PIECES ETC.)</b>			
1.0	Material and hardness	i)	<b>Up to ash dyke</b> Ni-chrome-alloy cast iron or equivalent. Min. hardness 400 BHN. Integral wear back of minimum 20 mm thickness.
			<b><u>OR</u></b>
			20 mm thick cast basalt lined MS fittings (MS shell of 6 mm thickness)
			Hardness of basalt lining: 8 mhos (Min)
			Bending strength: 300 Kg per cm <sup>2</sup> (Min.)
			Compressive Strength: 4500 Kg per cm <sup>2</sup> (Min.)
			Density : 2.8 – 2.9 gm per cm <sup>3</sup>
		ii)	<b><u>Over ash dyke</u></b> MS fabricated with minimum 20 mm thick integral wear back. The pipe thickness of fittings shall be 10 mm.
<b>III. COUPLING</b>			
1.0	Type	:	Sleeve type couplings with minimum 9.0mm thick sleeves.
2.0	Material of Construction		

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2.1	Sleeve	:	Carbon Steel to IS:2062			
2.2	Flanges / End rings	:	Carbon Steel to IS:2062			
2.3	Gasket	:				
	(i) Material	:	EDPM to BS: 2494:1990 Type D/ Isoprene/ BunaN/ Neoprene			
	(ii) Properties	:	(a)	Durometer	50to70	ASTM
				hardness: Shore 'A' points		D- 2240
		:	(b)	Tensile strength ultimate psi (min.)	1300	ASTM D-412
2.4	Nuts & Bolts	:	Hot dip galvanized/ spray galvanized as per IS: 4759. Bolts, nuts and washers should be of similar material to those used for coupling housings /sleeves to minimize the possibility of galvanic corrosion			



## 6.0 Water Piping, Pipe Fittings and Accessories

### 1.00.00 GENERAL

1.01.00 This specification covers design, manufacture, constructional features, erection, testing and commissioning of water piping, fittings and accessories.

### 2.00.00 CODES AND STANDARDS

2.01.00 The design, manufacture, inspection and testing of water piping, fittings and accessories shall comply with all the currently applicable statutory regulations and safety codes in the locality where the equipment are to be installed. The

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equipment shall also conform to the latest applicable Indian/British/American standards. In particular the water piping shall conform to the latest edition of the following standards:

IS: 1239 (Part I & II)	:	Mild steel tubes, tubular and other wrought steel fittings
IS:1367	:	Technical supply condition for threaded steel fastener Introduction and general information.
IS:3589	:	Electrically welded steel pipes for water gas and Sewage (200 to 2000 nominal dia).
IS:4736	:	Hot dip zinc coating on steel tubes.
IS:6392	:	Steel pipe flanges.
IS:1363(Part I & II)	:	Black Hexagonal bolts, nuts and locknuts
IS:1364	:	Precision and semi-precision hexagonal screws, nuts and locknuts (dia 6 to 39 mm).
IS:2016	:	Plain washers.
IS:2062	:	Structural steel fusion-welding quality.
IS:3138	:	Hexagonal bolts and nuts (M-42 to M-150).
IS:2712	:	Compressor asbestos fire jointing gaskets.
IS:5822	:	Code of Practice for laying steel pipes.
IS:9404	:	Color code for identification of pipe lines used in thermal power plants.
BS:534	:	Black bolts, screws and nuts.
BS:916	:	Black bolts, screws and nuts.
BS:4504	:	Flanges & bolting for pipes, valves & fittings metric series.
ANSIB2.1	:	Dimensions of American Taper pipe threads.
ANSI B16.5	:	Steel pipe flanges, flanged valves and fittings
ANSI B16.9	:	Factory made wrought steel butt welded fittings
.ANSIB16.11	:	Forged steel fittings (Socket-welding and threads)
.ANSIB16.21	:	Non-metallic gaskets for pipe flanges.
ANSIB16.25	:	Butt welding Ends.
ANSIB.16.28	:	Steel short Radius fittings.
ANSI36.10	:	Welded and Seamless wrought steel pipe



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ASTM-A-53 : Pipe, steel black and hot dipped, zinc coated, welded and seamless.

**3.00.00 DESIGN AND CONSTRUCTION REQUIREMENTS**

3.01.00 In addition to the details specified in the enclosed datasheets, the bidder/contractor shall comply with the following requirements.

3.02.00 All required water pipe work including all instrument impulse piping and fitting from the tap off points up to and including root valves for complete system shall be furnished as specified.

3.03.00 All piping system shall be capable of withstanding the maximum pressure (pump shut off) in the corresponding line at the relevant temperatures.

3.04.00 All piping system shall be properly designed to take care of water hammer / pressure surges which may arise during operation of the system. Bidder shall provide necessary protective arrangement for the safe guard of the piping system under above mentioned conditions.

3.05.00 All piping shall be provided with vents at the highest points and drains at the lowest points along with vent valves and drain cocks. Vents shall not be less than 15mm in size. Drains shall not be less than 25 mm size.

3.06.00 At all intersection joints, it is Contractor's responsibility to design and provide suitable reinforcements as per the applicable codes and standards.

3.07.00 Bends, loops, off sets, expansion or flexible joints shall be used as required in order to prevent overstressing of the piping system due to thermal movements and to provide adequate flexibility.

3.08.00 The design, supply and installation of all pipe supports and hangers including pipe clamps, turn buckles, hanger rods, auxiliary steel etc. shall be furnished by the Bidder along with the associated pipe work. The Bidder shall furnish all bolting materials companion flanges, nuts gaskets etc. as required in the piping system and at all terminal points.





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- 3.09.00 All piping shall be routed so as to avoid interference with other pipes and their hangers and supports, electrical cable trays, ventilation ducting structural members, equipment etc. Adequate clearance shall be ensured with respect to the above to accommodate pipe movement.
- 3.10.00 The piping shall be arranged to provide clearance for the removal of equipment requiring maintenance and for easy access to valves and other piping accessories required for operation and maintenance.
- 3.11.00 Piping shall generally be routed above ground but where specifically indicated/ approved by the Engineer the pipes may be arranged in trenches or buried. Bidder shall provide either coal tar or Bitumen tapes on conventional coat and wrap system for corrosion protection of buried piping as per relevant codes and standards.
- 3.12.00 Overhead piping shall have a normal minimum vertical clearance of 3 meters above walk ways and working areas and 8 meters above roadways unless otherwise approved by the Engineer.
- 3.13.00 Rated flow of pumps shall be used for determining the pipe sizes and friction drop. Further the following line velocities shall be considered for estimating the line sizes of water pipes Pipes:

	Service	Velocity, M/Sc		
		Pipe size below 50mm	Pipe size of 50 to 150mm	Pipe size of 200mm and above
a)	Water pump Suction	0.6-0.9	1.2-1.5	1.2-1.5
b)	Water Pump Discharge	0.9-1.8	1.5-2.4	1.8-2.8

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Note:

(a.) Pipe Size in pump suction side shall be at least one pipe size larger than the corresponding pump discharge connection.

(b.) The proposed sizes of the water and air pipes shall be submitted for Owner's approval.

3.13.00 The pipe supports shall be spaced as follows.

Pipe size (NB)	25	50	100	150	200	300	400	500
Spacing in meter	2.1	3.0	4.3	5.2	5.8	7.8	8.2	9.8

### DATA SHEET FOR WATER AND AIR PIPING, FITTINGS AND ACCESSORIES

1.0	Type of Pipes	a)	Up to & including 150NB	MS, ERW pipes to IS:1239 Heavy grade
		b)	200NB to 450NB	MS ERW to IS:3589.
		c)	500NB and above	Rolled and welded from MS plate to IS:226- Dimensional tolerance as per IS:3589.
2.0	Pipe Sizes		As required.	
3.0	Thickness of Pipes	a)	Pipe specs. As per IS:1239	Pipe thickness shall be of Heavy grade.



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		b)	Pipe spec. as per IS:3589	Min 6.35 mm thick for 200NB to 400NB
		c)	Pipe spec. as per IS:3589 for pipe sizes above 400NB	Min.8.8mmthick
4.0	Type of Line joints.	a)	50NB and below	Socket welded to ANSI:B16.11
		b)	65NB and above.	Butt welded to ANSI: B16.25.
5.0	Quantity		As required	
6.0	Fittings (Bends)	a)	For sizes up to & including 65NB	3D radius bends and material same as parent pipe.
		b)	For sizes 80NB to 300NB	SR & LR elbow and material same as parent pipe.
		c)	350NB & above.	Miter bends with Miter angle not exceeding 22.5°. Material shall be same as that of parent pipe and dimensional tolerance shall be as per BS:534.
7.0	Flanges			Slip on flat face type with drilled and pressure rating as per valve and other specialties. Material of construction shall be IS:226 up to 20mm thickness and IS:2062 for higher thickness.

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8.0	Bolts			As per IS:1367 Clause 4.6 or ASTM-A-307-Gr.B.
9.0	Nuts			As per IS:1367 Clause 4.0 or ASTM-A-307Gr.B.
10.	Gaskets			Wire inserted Red rubber. Thickness shall be 1.6mm for sizes up to and including 250NB and 3.2 mm for higher sizes.

## 7.0 Water Valves and Specialities

### 1.00.00 GENERAL

1.01.00 The specification covers design, manufacture, construction features, erection, testing and commissioning of water line valve and specialities.

### 2.00.00 CODES AND STANDARDS

2.01.00 The design, manufacture, inspection and testing of water line valves and specialities shall comply with all the currently applicable statutes, regulations and safety codes in the locality where the valves are to be installed. In particular the valves shall conform to the latest edition of the following standards:

- IS: 778 Gun Metal Gate, Globe and check valves for general purpose.
- IS: 780 Sluice valves for water works purpose 150 to 300 mm size.
- IS: 1703 Ball valves (Horizontal plunger type) including floats for water supply.
- IS: 2685 Code of practice for selection, installation and maintenance of sluice valves.
- IS: 2906 Sluice valves for water works purposes (350 to 1200mm size).



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- IS: 5312 Swing check type reflex (Non-return) valves.
- BS: 1868 Specification for steel check valve (Flange & Butt-welding ends).
- BS: 1873 Steel globe and globe stop and check valves (flanged and butt-welding ends).
- BS: 5152 Specification for C.I. Globe, stop and check valves for general purpose.
- BS: 5353 Carbon and Alloy steel plug valves.
- BS: 5153 C.I. Check valves for general purpose.
- BS: 5154 Copper alloy globe stop and check and gate valves for general purpose.
- BS: 5158 C.I. and carbon steel plug valves for general purpose.
- ANSIB16.10 Face to face and End to End dimensions of ferrous valve.
- ANSIB16.34 Steel valves flanged and butt-welding ends.
- ANSIB-21 Dimensions of American taper pipe threads.
- API-598 Valve inspection and test.
- API-600 Steel gate valves.
- API-602 Compact design carbon steel gate valves for refinery

### **3.00.00 DESIGN AND CONSTRUCTION REQUIREMENTS**

- 3.01.00 In addition to the details specified in the enclosed data sheet the Bidder/ Contractor shall comply with the following requirements.
- 3.02.00 All valve shall be suitable for the service conditions i.e. Flow, temperature and pressure under which they are required to operate and those performing similar duties shall be interchangeable, with one another unless otherwise approved. All valves and connections shall be suitably protected to prevent damage and entry of dirt, till erected.
- 3.03.00 End to End dimensions shall be in accordance to ANSI B16.10 or as per codes to which they conform to.

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- 3.04.00 All manually operated valves of all sizes 200 NB and above shall be provided with gear operator of proven quality, reputed make and conforming to internationally accepted standard.
- 3.05.00 All valves above 65 NB shall be fitted with open/close position indicators.
- 3.06.00 All valves shall be provided with hand wheels, extension spindles and floor standorany other arrangement wherever required so that they can be operated manually with ease by a single operator from the nearest operating floor either at a lower or higher elevation as the case may be. Wherever necessary for safety purpose, locking devices shall be furnished with valves.
- 3.07.00 All Gate and Globe valves shall be of outside screw and yoke (OS&Y) type and provided with back seat to permit repacking with valves in operation.
- 3.08.00 The actuator operated valves shall be designed on the basis of the following prescriptions: The internal parts shall be suitable to support the stresses caused by the actuator.
- (a.) The valve actuator unit shall be suitably stiff so as not to cause vibrations, misalignment etc.
- (b.) Motorized Valves shall be provided with hand operating gear, hand wheel and clutching and declutching arrangement.
- 3.09.00 The size of all valves shall be the same as that of parent pipe.
- 3.10.00 The end connections, unless otherwise requested, shall comply with the following:
- Socket welding (SW)- ANSIB16.11
  - Butt welding (BW) - ANSIB16.25.
  - Threaded (SC) - ANSIB2.1

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- Flanged (FL) - ANSIB16.5.

3.11.00 Gate valves shall be used for isolation purposes, Globe valves shall be used for regulation purpose, check valves shall be used for non-return service, and plug valves shall be used for isolation purpose in those lines where quick opening and closing is required in the system.

3.12.00 Double flanged or wafer type butterfly valves of low leakage rate conforming to AWWA-C-504, BS:5155 or any other approval equivalent latest standard edition can also be used for isolation, quick isolation and regulation purposes.

#### **DATASHEET FOR WATER AND AIR LINE VALVES**

1.0	Type of valves	a)	For isolation purpose	Gate/Plug/Eccentric plug / Butterfly (double flanged or wafer type).
		b)	For Regulation purpose	Globe/butterfly (double flanged or wafer type)
		c)	For non-return service	Check type
2.0	Size of valves	:	Same as parent pipe size.	
3.0	Pressure class		To suit service conditions of flow, valves temperature and shut off pressure.	
4.0	Numbers required		As per system needs.	

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5.0	Method of operation	:	Manual/ Solenoid operated and pneumatically actuated or motor operated as per system requirements.
6.0	Fluid to be Handled	:	Water
7.0	Material of construction	:	
7.1	Forsizesbelow50NB		
	Body/Wedge/ Disc	:	Gun Metal
	Trim & Stem		Gun Metal
7.2	Forsizesabove50NB		
	Body/Wedge/ Disc	:	C.I. to IS210 Gr.FG220
	Trim & Stem		Brass / Gun Metal
8.0	Quantity	:	As required.

## 8.0 Slurry Sump Isolation Plug Valves, Sump Liners and Sump Agitating Nozzles

### 1.00.00 GENERAL

1.01.00 This specification covers design, manufacture, constructional features, erection, testing, and commissioning of Slurry sump isolation plug valves, sump liners and Sump agitating nozzles.



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## **2.00.00 CODES AND STANDARDS**

2.01.00 The design, manufacture, inspection and testing of slurry sump isolation valves, liners and agitating nozzles shall comply with all the currently applicable statutes, regulation and safety codes in the locality where the equipment are to be installed. The equipment shall also conform to the latest applicable Indian/ British/ American standards. Nothing in this specification shall be construed to relieve the Contractor of the required statutory responsibility.

## **3.00.00 DESIGN AND CONSTRUCTIONAL FEATURE**

3.01.00 In addition to the details specified in the enclosed Data Sheets, the Bidder shall comply with the following requirements.

3.02.00 The slurry sump shall have two (2) nos. isolated compartments in Slurry pump house. Each compartment shall serve two (2) numbers of streams of Slurry disposal pumps.

3.03.00 It shall be possible to operate Slurry sump isolation valves from top of sump level. The valve shall be provided with gear operator if effort required to operate the valve exceeds 25 kgf.

3.04.00 Material of construction for Slurry sump isolation valves shall be corrosion and abrasion resistant and shall be of quality most suited to proposed application. Suitable measures to protect the bearings from ash ingress shall be provided.

3.05.00 Valves shall be suitable for outdoor duty.

3.06.00 The Slurry distribution trough and sump compartments shall be provided with abrasion liners up to normal slurry working level.



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3.07.00 The Owner is concerned about the choking of the sump and suction pipe of slurry pump stream; Bidder shall provide adequate number of high velocity water jetting/agitating nozzles in the slurry sumps to avoid setting of ash particles at the bottom of the sumps.

**Data sheet for ash slurry sump**

**Isolation plug valves, sump liners, and Sump Agitating Nozzles**

<b>1.</b>	<b>SUMP ISOLATION VALVE.</b>		
1.	Type	:	Plug type, manually operated, suitable for outdoor, duty.
2.	Numbers	:	As per scope
3.	Size of valves	:	As required.
4.	Material of construction	:	Corrosion and abrasion resistant construction materials to suit the service requirements.
<b>II.</b>	<b>SUMP LINERS</b>		
1.	Quantity	:	As required
2.	Thickness	:	Minimum 20 mm thick.
3.	Material of construction	:	Alloy C.I. with minimum 350BHN hardness
<b>III.</b>	<b>SUMP AGITATING NOZZLES</b>		
1.	Quantity	:	As required.
2.	Material of construction	:	
2.1	Body	:	MS / Cast iron.
2.2	Nozzles Tip Type	:	Anti-corrosion tool steel or stainless steel of hardness 500-550 BHN.

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## 9.0 Slurry Disposal Line Valves (Dyke End)

### 1.00.00 GENERAL

1.01.00 The specification covers design, manufacture, constructional features, erection, testing and commissioning of Slurry disposal line valves at dyke end.

### 2.00.00 CODES AND STANDARDS

2.01.00 The design, manufacture, inspection and testing of slurry disposal line valves shall comply with all currently applicable statutes, regulation and safety codes in the locality where the equipment are to be installed. The equipment shall also conform to the latest applicable Indian/British/American Standards. In particular the valves shall conform to the latest edition of the following:

BS:5353 : Carbon and Alloy steel plug valves.



ANSI B16.10 : Face to face and end to end dimensions of Ferrous valves.

API-598 : Valve inspection and test.

### 3.00.00 DESIGN AND CONSTRUCTIONAL REQUIREMENTS

3.01.00 In addition to the details specified in the enclosed data sheet the Bidder/Contractor shall comply with the following requirements.

3.01.00 All valves shall be suitable for the service conditions i.e. flow, temperature and pressure under which they are required to operate and those performing similar duties shall be interchangeable, with one another unless, otherwise

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approved. All valves end connections shall be suitably protected to prevent damage and entry of dirt, till erected and commissioned.

3.02.00 Valves shall be provided with gear operator of proven quality, reputed make and conforming to some internationally accepted standard, if the effort required to operate the valve exceeds 25kgf.

3.03.00 All valves shall be fitted with indicators so that the valves opening can be readily determined.

3.04.00 The size of all valves shall be the same as that of parent pipe.

#### DATA SHEET FOR SLURRY DISPOSAL LINE VALVES

1.0	Type of valves	:	Plate type
2.0	Size of valves	:	Same as parent pipe size.
3.0	Pressure class valves	:	To suit service condition of flow, temperature and shut off pressure of pumps
4.0	Numbers required	:	As specified and as required.
5.0	Method of operation	:	Manually operated
6.0	Fluid to be handled	:	Slurry having 25% (percent) conc. (W/W) respectively.
7.0	Material of Construction		
7.1	Body	:	Cast steel/ spheroidal Ductile iron (ASTM-A-536).
7.2	Plate	:	Alloy C.I./ Hardened S.S. (400 BHN Hardness)

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**TECHNICAL SPECIFICATION**  
**FOR**  
**SUPPLY OF PIPES**

**1.0 GENERAL**

- 1.1 Scope: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, fabrication, inspection, testing, painting, packing and dispatch etc. This specification shall be read in conjunction with relevant codes and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.
- 1.2 The pipes shall be supplied in random length of 4 to 7 mtrs.
- 1.3 Total length allowance shall be -0/+1 random length.
- 1.4 All the standards referred shall be of latest edition.
- 1.5 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.
- 1.6 The quantities mentioned are tentative, may vary  $\pm$  25% and will be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

**2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY**


- 2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete.
- 2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.
- 2.3 Any deviations from the clause stipulated, in the codes and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref.no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

**3.0 MATERIAL**


- 3.1 All materials, whatsoever, required to complete the supply shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.
- 3.2 For pipes having NPS  $\geq$ 2" and nominal wall thickness,  $t > 3.0$  mm, the ends shall be beveled as per ASME B16.25 with weld contour as described below:

Material	Wall thickness, " t "	Weld contour
Carbon steel (except Low temp Carbon steel)	$3 < t < 22\text{mm}$	Figure 2(a)
	$t > 22\text{mm}$	Figure 3(a)
Alloy Steel, Stainless steel & Low Temp Carbon steel	$3 < t < 10\text{mm}$	Figure 4
	$10 < t < 25\text{mm}$	Figure 5(a)
	$t > 25\text{mm}$	Figure 6(a)

- 3.3 Seamless and ERW Pipes shall not have any circumferential seam joint in a random length. However, in case of EFW pipes, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted which shall be at least 2 meters from either end. The longitudinal seams of two portions shall be staggered by at least 90 degree apart.

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- 3.4 EFW pipes of size less than 36"NB shall not have more than one longitudinal seam joint and of size  $\geq 36$ "NB shall not have more than two longitudinal seam joints.
- 3.5 All stabilised grades (type 321, 321H, 347 and 347H) of stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temperature for stabilizing heat treatment shall be 900 deg C & 4 hrs respectively.
- 3.6 Carbon content for carbon steel pipes shall be maximum 0.25%.
- 3.7 "SAW" (Submerged Arc Welded) pipe shall also be acceptable against ERW (Electric Resistance Welding) Pipe for sizes 16"NB and above for carbon steel pipes.
- 3.8 Pipes shall not be supplied with any type of coating & wrapping (C & W) materials, wherever applicable. Activity of coating & wrapping (C & W) shall be done at site. Only bare pipes shall be supplied by bidder.
- 3.9 Pipes supplied as per IS-1239 Part-1 for sizes upto 6", shall be ERW, Black & Grade Heavy with plain ends for size upto 1 1/2" and bevel ends for size 2" to 6".
- 3.10 Pipes supplied as per IS-3589 for sizes 8" & above, shall be ERW, Grade Fe410, with beveled ends.
- 3.11 In case of SAW pipe to IS-3589, for sizes 26"NB & above, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted which shall be at least 1.5 meters from either end. The longitudinal seams of two portions shall be staggered by at least 90 degree apart.
- 3.12 Galvanized pipes shall be coated with zinc by hot dip galvanizing method in accordance with ASTM A153.
- 3.13 Galvanizing shall be done before pipe ends are threaded (screwed).
- 3.14 Seamless pipes are acceptable in place of welded pipes.
- 3.15 Furnace butt-welded, furnace lap-welded and spiral welded pipes are not permitted.
- 4.0 TESTING**
- 4.1 In case of seamless & welded pipes, parent material including weld and heat effected zone for low temperature service shall be impact tested (on charpy v notch) at the lowest design temperature in accordance with requirements of code/ specification.
- 4.2 Hydrostatic test shall be carried out on each random length of pipe as per ASTM A530 for pipes to ASTM specification and as per API 5L for pipes to API 5L specification.
- 4.3 Hydrostatic test for IS pipes shall be carried out on each random length of pipe as per test pressure conditions provided in IS-1239 & IS-3589 specification. Maximum hydrotest pressure for IS-1239 & IS-3589 pipes shall be limited to 5 MPa, wherever applicable.
- 4.4 Transverse tension test shall be carried out on pipes of nominal size 8" and above and thickness of Sch.120 and above as per supplementary requirements of respective standards.
- 4.5 Check analysis shall be carried out as per ASTM A530. For pipes as per ASTM A312 and pipe size  $\geq 8$ " and thickness  $\geq$  Sch120, Check analysis shall also be carried out as per supplementary requirement S1 of ASTM A312.
- 4.6 For seamless pipes, each length of pipe with following specifications shall be ultrasonically tested as per ASTM E213 or ASTM A388.
- (a) Size upto 4 inches and Sch  $\geq 120$
- (b) Size  $\geq 5$  inches and thk.  $\geq 12$  mm

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Any defects producing signal greater than the appropriate reference groove shall be unacceptable. The allowable defect shall be longitudinal flat bottom groove on the outside or inside surface of the pipes and length not greater than 25 mm, width not greater than 1.6 mm and depth not greater than the smaller of 1 mm or 5% of the wall thickness.

4.7 Intergranular Corrosion (IGC) Test shall be done for austenitic stainless steel pipes as per the followings:

As per ASTM A262 Practice B, Corrosion rate upto 60 mils/year shall be acceptable.

OR

As per ASTM A262 Practice E, with acceptance criteria of “no cracks as observe from 250X micrograph”.

4.8 All stainless steel pipes shall be supplied in solution annealed condition.

4.9 Positive Material Identification (PMI) shall be done for Alloy steel & Stainless steel pipes.

## 5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the Owner to carryout inspection. Approved inspection agencies are Lloyds/BV/ TUV for overseas vendors for both IBR & Non-IBR items. However, PDIL will be inspection agency for Non-IBR items and chief inspector of Boilers for IBR items for Indian vendors.

5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier’s work engaged in production and testing of materials ordered.

5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

5.4 All the items shall be inspected and tested in the presence of one or more representatives of the purchaser during various stages of manufacturing. Material shall be considered acceptable for despatch only after final certificate of acceptance is issued by the Inspector.

5.5 Testing performed in the presence of the purchaser’s representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

5.6 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

5.7 Scope of Inspection by TPIA :

Review of MTC (all batches).

Visual check for surfaces, external appearance (10% random witness).

Dimensional check – Outside diameter, weight, wall thickness, out of ovality, straightness, bevel angle (10% random witness).

Various physical test i.e. tensile strength, yield strength, percentage elongation, flattening test, bend test (inspection frequency as per respective specification).

Hydrostatic test (min. 10% random witness).


Packing: 10% random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

## 6.0 DOCUMENTATION

6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.



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Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of items quoted, if applicable.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

**NOTES:**

(A) for Approval

(I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.

Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The pipe shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

- a) Purchase order no.
- b) Material specification and grade
- c) Size and sch.no./thickness
- d) Quantity
- e) Heat and Lot No.
- f) Results of Chemical analysis
- g) Mechanical test results (as per applicable clause)
- h) Hydrostatic test results
- i) Non-destructive test results (as per applicable clause)

6.3 Pipes under IBR shall be supplied with 8 copies of IBR certificate in form IIIA duly signed by inspecting authority along with supply.


**7.0 MARKING**

7.1 Marking on pipe shall be as per the relevant standard. The minimum requirements of marking information shall be ASTM or API designation, size and Sch.No./thickness on each meter of standard pipe length in addition to the requirement of relevant code.

7.2 For all pipes of size 2" and above, marking shall be done by paint stenciling using a weather resistant paint against rust and moderate handling.

7.3 For pipe equal to size 1 ½ inch or less, marking shall be done on pipe or by die stamping on a metal tag fixed to the pipe by compression method.

7.4 In addition each length of pipe shall be given a 20 mm wide color code strip for the entire length, according to color coding of pipe material as per this specification.

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7.5 Part no. appearing against each item of bill of material shall be marked on both ends of each random length of pipe by paint stenciling and should be able to withstand sea transport, handling and storage.

**8.0 PRESERVATION AND PACKING**

8.1 Pipes up to size 4" shall be packed separately by sizes and material grades and clearly tagged for identification. However pipes above 4" can be shipped in crates or shipped loose.

8.2 All ends shall be capped or plugged. One coat of approved anti rust paint shall be applied on the surface of the pipe except S.S.pipes.

8.3 Pipes shall be adequately protected from both inside and outside to avoid mechanical damage during transit and storage. For transportation overseas, protection and packing shall be adequate to prevent damage from sea atmosphere.

**9.0 GUARANTEE**

9.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions of "ITB".

SL.NO.	MATERIAL	PIPING STANDARD	COLOUR
1.	C.S.	API 5L GR.B	Yellow
2.	C.S.	A-106 GR.B, ASTM-A672	Blue
3.	L.T.C.S.	A-333 GR.1, A-671 GR.CC-60	Red
4.	½ Mo	A-335 GR.P-1	Green
5.	1 ¼ Cr. ½ Mo	A-335 GR.P-11	Lilac
6.	2 ¼ Cr. 1 Mo	A-335 GR.P-22	Brown
7.	S.S.304	A-312 GR.TP-304, A-358 GR.TP304	White
8.	S.S.304L	A-312 GR.TP-304L	Slate
9.	S.S.321	A-312 GR.TP-321	Aluminum
10.	S.S.347	A-312 TP-347H	Grey
11.	S.S.316	A-312 GR.TP-316	Black
12.	S.S.316L	A-312 GR.TP-316L, A-358 GR.TP316L	Red



**INSPECTION & TEST PLAN  
FOR CS, LTCS & SS WELDED PIPES**

PNMP-ITP-01

DOCUMENT NO

SHEET 1 of 1

**1.0 SCOPE:**

This Inspection & Test Plan covers the minimum requirements of CS, LTCS & SS Welded Pipes, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

**2.0 INSPECTION AND TEST REQUIREMENTS:**

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification/Chemical composition	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	R	R
2.0	Welding(WPS/PQR/WPQ)				
2.1	Qualification of Welding Procedure	ASME SEC.IX Approved WPS/PQR	ASME SEC.IX	R	R
2.2	Qualification of Welding Personnel	ASME SEC.IX	ASME SEC.IX	R	R
3.0	Manufacturing (Rolling, machining etc.)	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
4.0	Heat Treatment (as applicable)	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
5.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.0	Destructive Testing: Tensile, bend, hardness, transverse tension, Impact test (as applicable) etc.	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	10% RW
7.0	Non Destructive Testing (as applicable)				
7.1	Ultrasonic Testing	ASME SEC V / ASTM E213	ASME SEC VIII DIV.1/ P.O.	H	10% RW
7.2	Radiography Testing	ASME SEC V / ASTM E94	ASME SEC VIII DIV.1/ P.O.	H	RT Film Review
8.0	Hydro Testing	ASTM A530/A999/API 5L	ASTM A530/A999/API 5L	H	10% RW
9.0	Visual examination (Workmanship, Finish, and Appearance)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
10.0	Overall Dimensional check (Outside diameter, Bevel Ends, thickness, mass & tolerances, Surface Condition)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
11.0	Random Length	P.O.	P.O.	H	10% RW
12.0	Positive Material Identification (For AS & SS pipes)	ASTM E1476/ PMI procedure	Applicable Material STD	H	10% RW
13.0	Product Marking & Packing/End protection	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
14.0	Documentation & Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

**Abbreviation:** DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

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**TECHNICAL SPECIFICATION**  
**FOR**  
**SUPPLY OF PIPES**

**1.0 GENERAL**

- 1.1 Scope: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, fabrication, inspection, testing, painting, packing and dispatch etc. This specification shall be read in conjunction with relevant codes and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.
- 1.2 The pipes shall be supplied in random length of 4 to 7 mtrs.
- 1.3 Total length allowance shall be -0/+1 random length.
- 1.4 All the standards referred shall be of latest edition.
- 1.5 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.
- 1.6 The quantities mentioned are tentative, may vary  $\pm$  25% and will be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

**2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY**


- 2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete.
- 2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.
- 2.3 Any deviations from the clause stipulated, in the codes and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref.no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

**3.0 MATERIAL**


- 3.1 All materials, whatsoever, required to complete the supply shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.
- 3.2 For pipes having NPS  $\geq$ 2" and nominal wall thickness,  $t > 3.0$  mm, the ends shall be beveled as per ASME B16.25 with weld contour as described below:

<b>Material</b>	<b>Wall thickness, " t "</b>	<b>Weld contour</b>
Carbon steel (except Low temp Carbon steel)	$3 < t < 22\text{mm}$	Figure 2(a)
	$t > 22\text{mm}$	Figure 3(a)
Alloy Steel, Stainless steel & Low Temp Carbon steel	$3 < t < 10\text{mm}$	Figure 4
	$10 < t < 25\text{mm}$	Figure 5(a)
	$t > 25\text{mm}$	Figure 6(a)

- 3.3 Seamless and ERW Pipes shall not have any circumferential seam joint in a random length. However, in case of EFW pipes, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted which shall be at least 2 meters from either end. The longitudinal seams of two portions shall be staggered by at least 90 degree apart.

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- 3.4 EFW pipes of size less than 36"NB shall not have more than one longitudinal seam joint and of size  $\geq 36$ "NB shall not have more than two longitudinal seam joints.
- 3.5 All stabilised grades (type 321, 321H, 347 and 347H) of stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temperature for stabilizing heat treatment shall be 900 deg C & 4 hrs respectively.
- 3.6 Carbon content for carbon steel pipes shall be maximum 0.25%.
- 3.7 "SAW" (Submerged Arc Welded) pipe shall also be acceptable against ERW (Electric Resistance Welding) Pipe for sizes 16"NB and above for carbon steel pipes.
- 3.8 Pipes shall not be supplied with any type of coating & wrapping (C & W) materials, wherever applicable. Activity of coating & wrapping (C & W) shall be done at site. Only bare pipes shall be supplied by bidder.
- 3.9 Pipes supplied as per IS-1239 Part-1 for sizes upto 6", shall be ERW, Black & Grade Heavy with plain ends for size upto 1 1/2" and bevel ends for size 2" to 6".
- 3.10 Pipes supplied as per IS-3589 for sizes 8" & above, shall be ERW, Grade Fe410, with beveled ends.
- 3.11 In case of SAW pipe to IS-3589, for sizes 26"NB & above, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted which shall be at least 1.5 meters from either end. The longitudinal seams of two portions shall be staggered by at least 90 degree apart.
- 3.12 Galvanized pipes shall be coated with zinc by hot dip galvanizing method in accordance with ASTM A153.
- 3.13 Galvanizing shall be done before pipe ends are threaded (screwed).
- 3.14 Seamless pipes are acceptable in place of welded pipes.
- 3.15 Furnace butt-welded, furnace lap-welded and spiral welded pipes are not permitted.
- 4.0 TESTING**
- 4.1 In case of seamless & welded pipes, parent material including weld and heat effected zone for low temperature service shall be impact tested (on charpy v notch) at the lowest design temperature in accordance with requirements of code/ specification.
- 4.2 Hydrostatic test shall be carried out on each random length of pipe as per ASTM A530 for pipes to ASTM specification and as per API 5L for pipes to API 5L specification.
- 4.3 Hydrostatic test for IS pipes shall be carried out on each random length of pipe as per test pressure conditions provided in IS-1239 & IS-3589 specification. Maximum hydrotest pressure for IS-1239 & IS-3589 pipes shall be limited to 5 MPa, wherever applicable.
- 4.4 Transverse tension test shall be carried out on pipes of nominal size 8" and above and thickness of Sch.120 and above as per supplementary requirements of respective standards.
- 4.5 Check analysis shall be carried out as per ASTM A530. For pipes as per ASTM A312 and pipe size  $\geq 8$ " and thickness  $\geq$  Sch120, Check analysis shall also be carried out as per supplementary requirement S1 of ASTM A312.
- 4.6 For seamless pipes, each length of pipe with following specifications shall be ultrasonically tested as per ASTM E213 or ASTM A388.
- (a) Size upto 4 inches and Sch  $\geq 120$
- (b) Size  $\geq 5$  inches and thk.  $\geq 12$  mm

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Any defects producing signal greater than the appropriate reference groove shall be unacceptable. The allowable defect shall be longitudinal flat bottom groove on the outside or inside surface of the pipes and length not greater than 25 mm, width not greater than 1.6 mm and depth not greater than the smaller of 1 mm or 5% of the wall thickness.

4.7 Intergranular Corrosion (IGC) Test shall be done for austenitic stainless steel pipes as per the followings:

As per ASTM A262 Practice B, Corrosion rate upto 60 mils/year shall be acceptable.

OR

As per ASTM A262 Practice E, with acceptance criteria of “no cracks as observe from 250X micrograph”.

4.8 All stainless steel pipes shall be supplied in solution annealed condition.

4.9 Positive Material Identification (PMI) shall be done for Alloy steel & Stainless steel pipes.

## 5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the Owner to carryout inspection. Approved inspection agencies are Lloyds/BV/ TUV for overseas vendors for both IBR & Non-IBR items. However, PDIL will be inspection agency for Non-IBR items and chief inspector of Boilers for IBR items for Indian vendors.

5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier’s work engaged in production and testing of materials ordered.

5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

5.4 All the items shall be inspected and tested in the presence of one or more representatives of the purchaser during various stages of manufacturing. Material shall be considered acceptable for despatch only after final certificate of acceptance is issued by the Inspector.

5.5 Testing performed in the presence of the purchaser’s representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

5.6 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

5.7 Scope of Inspection by TPIA :

Review of MTC (all batches).

Visual check for surfaces, external appearance (10% random witness).

Dimensional check – Outside diameter, weight, wall thickness, out of ovality, straightness, bevel angle (10% random witness).

Various physical test i.e. tensile strength, yield strength, percentage elongation, flattening test, bend test (inspection frequency as per respective specification).


Hydrostatic test (min. 10% random witness).

Packing: 10% random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

## 6.0 DOCUMENTATION

6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

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Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of items quoted, if applicable.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

**NOTES:**

(A) for Approval

(I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.

Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The pipe shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority alongwith supply of materials.

- a) Purchase order no.
- b) Material specification and grade
- c) Size and sch.no./thickness
- d) Quantity
- e) Heat and Lot No.
- f) Results of Chemical analysis
- g) Mechanical test results (as per applicable clause)
- h) Hydrostatic test results
- i) Non-destructive test results (as per applicable clause)

6.3 Pipes under IBR shall be supplied with 8 copies of IBR certificate in form IIIA duly signed by inspecting authority along with supply.

**7.0 MARKING**


7.1 Marking on pipe shall be as per the relevant standard. The minimum requirements of marking information shall be ASTM or API designation, size and Sch.No./thickness on each meter of standard pipe length in addition to the requirement of relevant code.

7.2 For all pipes of size 2" and above, marking shall be done by paint stenciling using a weather resistant paint against rust and moderate handling.

7.3 For pipe equal to size 1 ½ inch or less, marking shall be done on pipe or by die stamping on a metal tag fixed to the pipe by compression method.

7.4 In addition each length of pipe shall be given a 20 mm wide color code strip for the entire length, according to color coding of pipe material as per this specification.



	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF PIPES</b>	PNMP-TS-6100	0
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7.5 Part no. appearing against each item of bill of material shall be marked on both ends of each random length of pipe by paint stenciling and should be able to withstand sea transport, handling and storage.

**8.0 PRESERVATION AND PACKING**

8.1 Pipes up to size 4" shall be packed separately by sizes and material grades and clearly tagged for identification. However pipes above 4" can be shipped in crates or shipped loose.

8.2 All ends shall be capped or plugged. One coat of approved anti rust paint shall be applied on the surface of the pipe except S.S.pipes.

8.3 Pipes shall be adequately protected from both inside and outside to avoid mechanical damage during transit and storage. For transportation overseas, protection and packing shall be adequate to prevent damage from sea atmosphere.

**9.0 GUARANTEE**

9.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions of "ITB".

SL.NO.	MATERIAL	PIPING STANDARD	COLOUR
1.	C.S.	API 5L GR.B	Yellow
2.	C.S.	A-106 GR.B, ASTM-A672	Blue
3.	L.T.C.S.	A-333 GR.1, A-671 GR.CC-60	Red
4.	½ Mo	A-335 GR.P-1	Green
5.	1 ¼ Cr. ½ Mo	A-335 GR.P-11	Lilac
6.	2 ¼ Cr. 1 Mo	A-335 GR.P-22	Brown
7.	S.S.304	A-312 GR.TP-304, A-358 GR.TP304	White
8.	S.S.304L	A-312 GR.TP-304L	Slate
9.	S.S.321	A-312 GR.TP-321	Aluminum
10.	S.S.347	A-312 TP-347H	Grey
11.	S.S.316	A-312 GR.TP-316	Black
12.	S.S.316L	A-312 GR.TP-316L, A-358 GR.TP316L	Red



**INSPECTION & TEST PLAN  
FOR CS, LTCS, AS & SS SEAMLESS PIPES**

PNMP-ITP-02

DOCUMENT NO

SHEET 1 of 1

**1.0 SCOPE:**

This Inspection & Test Plan covers the minimum requirements of CS, LTCS , AS & SS Seamless Pipes, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

**2.0 INSPECTION AND TEST REQUIREMENTS:**

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification/Chemical composition	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	R	R
2.0	Forming	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
3.0	Heat Treatment (as applicable)	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
4.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
5.0	Destructive Testing: Tensile, bend, hardness, transverse tension, Impact test (as applicable) etc.	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	10% RW
6.0	Non Destructive Testing (as applicable)				
6.1	Ultrasonic Testing	ASME SEC V / ASTM E213	ASME SEC VIII DIV.1/ P.O.	H	10% RW
6.2	Radiography Testing	ASME SEC V / ASTM E94	ASME SEC VIII DIV.1/ P.O.	H	RT Film Review
7.0	Hydro Testing	ASTM A530/A999/API 5L	ASTM A530/A999/API 5L	H	10% RW
8.0	Visual examination (Workmanship, Finish, and Appearance)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
9.0	Overall Dimensional check (Outside diameter, Bevel Ends, thickness, mass & tolerances, Surface Condition)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
10.0	Random Length	P.O.	P.O.	H	10% RW
11.0	Positive Material Identification (For AS & SS pipes)	ASTM E1476/ PMI procedure	Applicable Material STD	H	10% RW
12.0	Product Marking & Packing/End protection	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
13.0	Documentation & Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

**Abbreviation:** DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

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**TECHNICAL SPECIFICATION**  
**FOR**  
**SUPPLY OF FITTINGS**

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FITTINGS</b>	PNMP-TS-6300	0
		DOCUMENT NO	REV
		SHEET 2 of 5	

## 1.0 GENERAL

1.1 **Scope:** This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and dispatch etc. This specification shall be read in conjunction with relevant codes and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.

1.2 Unless otherwise specified, the ends of fittings shall be to the following standards: Socket Weld (SW) / Threaded (Thd) ends as per ASME B 16.11.  
Butt Weld (BW) ends as per ASME B16.25 for sizes 2" & above.  
Threading as per ASME B1.20.1 (NPT, Taper threads).

1.3 All the standards referred shall be of latest edition.

1.4 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.

1.5 The quantities mentioned are tentative, may vary  $\pm$  25% and will be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

## 2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed along with offer without which the offer shall be considered incomplete and rejected without any reference.

2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

## 3.0 MATERIALS

3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

3.2 For forgings to ASTM-A-105, carbon content shall be equal to or less than 0.25%.

3.3 Bevel ends of BW Fittings shall be beveled as per ASME B16.25 with weld contour as described below:

Material	Wall thickness, " t "	Weld contour
Carbon steel (except Low temp Carbon steel)	$3 < t < 22\text{mm}$	Figure 2(a)
	$t > 22\text{mm}$	Figure 3(a)
Alloy Steel, Stainless steel & Low Temp Carbon steel	$3 < t < 10\text{mm}$	Figure 4
	$10 < t < 25\text{mm}$	Figure 5(a)
	$t > 25\text{mm}$	Figure 6(a)

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FITTINGS</b>	PNMP-TS-6300	0
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- 3.4 Length of each Nipple shall be 100 mm.
- 3.5 Nippolets as per MSS SP-97 or TB-RAC 5035 shall be acceptable.
- 3.6 For reducing BW fittings (tee & reducer) having different wall thicknesses at each end, the greater one shall be employed and the ends shall be matched to suit respective thickness.
- 3.7 All welded fittings shall have maximum negative tolerance equivalent to pipe selected.
- 3.8 All welded fittings shall be double welded for size 16" and above. Inside weld projection shall not exceed 1.6mm, and the welds shall be ground smooth at least 25mm from the ends.
- 3.9 For fittings made out of welded pipe, the pipe itself shall be of double welded type, manufactured with the addition of filler material and made employing automatic welding only.
- 3.10 Threaded fittings shall have threaded ends with NPT taper threads as per ASME B1.20.1.
- 3.11 Seamless stub ends shall not have any welds on the body.
- 3.12 Galvanized CS fittings shall be hot dip galvanized, as per ASTM A153.
- 3.13 Seamless fittings are acceptable in place of welded fittings.

#### 4.0 TESTING

- 4.1 Austenitic stainless steel fittings shall undergo Intergranular corrosion (IGC) test as per ASTM A262 Practice B, Corrosion rate upto 48 mils/year shall be acceptable. Two sets of samples shall be drawn from each heat treatment lot, one set corresponding to highest carbon content and other set corresponding to highest wall thickness of the fittings.
- 4.2 All CS welded fittings shall be normalized.
- 4.3 Bevel ends of all BW fittings shall undergo 100% Magnetic particle (MP) / Dye Penetrant (DP) test.
- 4.4 All welded fittings shall be 100% radiographed on all welds.
- 4.5 Alloy steel & stainless steel fittings shall undergo positive material identification (PMI).
- 4.6 All stainless steel fittings shall be supplied in solution annealed condition.
- 4.7 Each fitting of thickness and sizes as mentioned below shall be ultrasonically tested as per ASTM-E-213 or ASTM-A-388.

<u>Size Range</u>	<u>Sch./Thk.</u>
Up to 4"	≥ Sch 120
≥ 5"	≥ 12 mm

Any defects producing signal greater than the appropriate reference groove shall be unacceptable. The allowable defect shall be longitudinal flat bottom groove on the outside or inside surface of the fittings and of length not greater than 25 mm, a width not greater than 1.6 mm and depth not greater than the smaller of 1 mm or 5% of the wall thickness.

- 4.8 In case of pipe fittings (both seamless and welded) for low temperature service, the parent material including weld and heat affected zone shall be impact tested on charpy V-Notch in accordance with requirements of Code/ Specification.
- 4.9 All stabilised grades (type 321, 321H, 347 and 347H) of stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temperature for stabilizing heat treatment shall be 900 deg C & 4 hrs respectively.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FITTINGS</b>	PNMP-TS-6300	0
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## 5.0 INSPECTION

- 5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner or owner's representative to carryout inspection of materials. Approved inspection agencies are Lloyds/BV/ TUV for overseas vendors for both IBR & Non-IBR items. However, PDIL will be inspection agency for Non-IBR items and chief inspector of Boilers for IBR items for Indian vendors.
- 5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.
- 5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.
- 5.4 All fittings shall be inspected during various stages of manufacturing. Fittings shall be considered acceptable for dispatch only after final certificate of acceptance is issued by the inspector.
- 5.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.
- 5.6 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).
- 5.7 Scope of Inspection by TPIA :
- Review of Procedures (Manufacturing / HT / NDT / DT / PQR /WPQ): 100%
- Review of MTC (all batches), test coupons and Supplier's Inspection Report: 100%. NDT Reports: RT 100% Report Review & other NDT Reports 10% random witness. Visual check for dimensional, surfaces, external appearance, cleaning & finishing: 10% Random witness.
- Final Inspection for dimension, marking, color coding: Random witness (10% min.)
- Packing: 10% Random witness before dispatch.
- Documentation (MTC, Inspection Release Note): 100% Review / Approval

## 6.0 DOCUMENTATION

- 6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before dispatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of items quoted, if applicable.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

### NOTES:

(A) for Approval

(I) for information

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FITTINGS</b>	PNMP-TS-6300	0
		DOCUMENT NO	REV
		SHEET 5 of 5	

QAP shall be mutually finalized with Inspection Authority specified in the order. Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The items shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority along with supply of materials.

- a) Purchase order no.
- b) Material specification and grade
- c) Size and Sch. No. /Thickness
- d) Quantity
- e) Heat and lot no.
- f) Results of Chemical analysis
- g) Mechanical test results (as per applicable clause)
- h) Non-destructive test results (as per applicable clause)

6.3 Pipe Fittings under IBR shall be supplied with 8 copies of IBR certificate in form IIIC duly signed by inspecting authority along with supply.

#### 7.0 **MARKING**

7.1 Marking shall be done as per relevant std. on each fitting or on a metal tag attached to the fitting using low stress die stamping method.

7.2 Surface preparation of external surface of carbon steel fittings shall be done before marking is applied.

7.3 Minimum marking information shall include Purchase Order No., item code, material specification, size & thickness/schedule/rating.

#### 8.0 **PRESERVATION AND PACKING**

8.1 Fittings shall be packed separately by the sizes and material grades and clearly tagged for identification.

8.2 CS Fittings shall be adequately protected from both inside and outside with rust preventives. In case of stainless steel fittings, rust preventive coating is not required.

8.3 Bevel End Protectors of plastic caps, securely tightened with belts or wires, shall be used for protection of bevel ends to avoid mechanical damage during transit and storage.

8.4 The packing case shall be clearly marked with purchase order number and shall include complete packing list of all the items contained in the case.

#### 9.0 **GUARANTEE**

9.1 All items shall be guaranteed against poor workmanship and defective material as per commercial terms and conditions.



## INSPECTION & TEST PLAN FOR FITTINGS

PNMP-ITP-03

DOCUMENT NO

SHEET 1 of 2

### 1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Forged, Seamless & Welded Fittings, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

### 2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	H	R/R
2.0	Welding(WPS/PQR/WPQ)				
2.1	Qualification of Welding Procedure	ASME SEC.IX Approved WPS/PQR	ASME SEC.IX	H	R
2.2	Qualification of Welding Personnel	ASME SEC.IX	ASME SEC.IX	H	R
3.0	Manufacturing (Forming, machining etc.)	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
4.0	Heat Treatment(Wherever Applicable)	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
5.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.0	Chemical Composition	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
7.0	Destructive Testing: Tensile strength, Yield strength, Elongation, Hardness Test, Impact test (as applicable) etc.	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
8.0	Non Destructive Testing				
8.1	100% Radiography test on welding	ASTM E94	ASME SEC VIII Div.1, Para. UW-51	H	RT Film Review
8.2	Ultrasonic testing(as applicable)	ASME SEC V / ASTM E213	ASME SEC VIII Div.1/P.O.	H	W
8.3	Dye Penetration (DP) / Magnetic Particle (MP)Test of Bevel Ends	ASTM E 165 for DP Test / ASTM E 709 for MP Test	ASME Sec. VIII	H	W
8.4	Positive Material Identification (PMI) for AS/SS materials	ASTM E1476 / P.O.	ASME Sec. VIII Div.1	H	W
8.5	Intergranular corrosion (IGC) test for SS materials	ASTM A262 Practice B	P.O.	H	W
9.0	Visual examination (Workmanship, Finish, and Appearance)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
10.0	Overall Dimensional check	ASME B16.25/B16.11/B16.9/P.O.	ASME B16.25/B16.11/B16.9/P.O.	H	10% RW
11.0	Galvanizing (as applicable)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R
12.0	Surface Preparation & Painting (If Applicable)	P.O.	P.O.	H	R





INSPECTION & TEST PLAN  
FOR FITTINGS

PNMP-ITP-03

DOCUMENT NO

SHEET 2 of 2

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
13.0	Marking & Packing/End Protection/Dispatch	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R
14.0	Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

**Abbreviation:** DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

 पी डी आई एल <b>PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PNMP-TS-6400	0
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**TECHNICAL SPECIFICATION**  
**FOR**  
**SUPPLY OF FLANGES**

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FLANGES</b>	PNMP-TS-6400	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 2 OF 5</b>	

## 1.0 GENERAL

- 1.1 Scope: This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.
- 1.2 Unless otherwise specified, the ends of flanges shall be to the following standards:  
 Socket Weld (SW) / Threaded (Thd) ends as per ASME B 16.11.  
 Butt Weld (BW) ends as per ASME B16.25 for sizes 2" & above.  
 Threading as per ASME B1.20.1 (NPT, Taper threads).
- 1.3 All the standards referred shall be of latest edition.
- 1.4 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.
- 1.5 The quantities mentioned are tentative and may vary  $\pm$  25% and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

## 2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

- 2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed along with offer without which the offer shall be considered incomplete and rejected without any reference.
- 2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.
- 2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

## 3.0 MATERIALS

- 3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.
- 3.2 Bevel ends of weld neck flanges shall be beveled as per ASME B16.5/ASME B16.47.
- 3.3 For forgings to ASTM A105, carbon content shall be equal to or less than 0.25%.
- 3.4 Flanges manufactured by closed die forging method shall be preferred.
- 3.5 Flanges shall be supplied in finished, machined and drilled condition. Raised face shall have concentric serrations/smooth finish as applicable.
- 3.6 Welding ends of welding neck flanges shall be prepared to suit outside pipe diameter and wall thickness according to ANSI B 36.10.
- 3.7 Flanges shall be coated with zinc by hot dip galvanizing process as per ASTM A153, wherever Galvanized (Galv.) flanges are required.
- 3.8 For bore of socket weld flanges upto 1 ½" NB & upto 600#, the pipe thickness shall be Sch 80 for carbon steel, alloy steel & low temperature carbon steel material and Sch 40S for stainless steel material.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FLANGES</b>	PNMP-TS-6400	0
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3.9 Long weld neck flange shall have 38 mm bore for 1 1/2" NB and 24 mm bore for 1" NB, unless otherwise specified in bill of materials.

#### 4.0 TESTING

4.1 One tension test shall be carried out for each heat in each heat treatment charge.

4.2 For flanges fabricated from plates, one bend test shall be carried out for each heat in each heat treatment charge.

4.3 Impact test for low temp service shall be carried out at the lowest design temperature and shall meet the requirements of the applicable material specifications.

4.4 Austenitic stainless steel flanges shall undergo Intergranular corrosion (IGC) test as per ASTM A262 Practice B, Corrosion rate upto 48 mils/year shall be acceptable. Two sets of samples shall be drawn from each heat treatment lot, one set corresponding to highest carbon content and other set corresponding to highest rating / thickness of the flanges.

4.5 All stainless steel flanges shall be supplied in solution annealed condition.

4.6 Bevel ends of weld neck flanges shall undergo 100% Magnetic particle (MP) / Dye Penetrant (DP) test.

4.7 All stabilised grades (type 321, 321H, 347 and 347H) of stainless steel pipes shall be in a stabilized heat treated condition. Stabilizing heat treatment shall be carried out subsequent to the normal solution annealing. Soaking time & holding temperature for stabilizing heat treatment shall be 900 deg C & 4 hrs respectively.

#### 5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection. . Approved inspection agencies are Lloyds/BV/ TUV for overseas vendors for both IBR & Non-IBR items. However, PDIL will be inspection agency for Non-IBR items and chief inspector of Boilers for IBR items for Indian vendors.

5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.

5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

5.4 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

5.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

5.6 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

5.7 Scope of Inspection by TPIA :

Review of Procedures (Manufacturing / HT / NDT / DT / PQR /WPQ): 100%

Review of MTC (all batches), test coupons and Supplier's Inspection Report: 100%.

NDT Reports: RT 100% Report Review & other NDT Reports 10% /random witness.

Visual check for surfaces, external appearance, cleaning & finishing: 10% Random witness.

Final Inspection (dimension, marking, color coding, positive material identification PMI applicable for Alloy & SS material): Random witness (10% min.)

Packing: Report review before dispatch.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FLANGES</b>	PNMP-TS-6400	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 4 OF 5</b>	

Documentation (MTC, Inspection Release Note): 100% Review / Approval

## 6.0 DOCUMENTATION

6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before dispatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of item supplied.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

### **NOTES:**

(A) for Approval

(I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.

Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

6.2 The flanges shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority along with supply of materials.

- a) Purchase order no.
- b) Material specification and grade
- c) Size and Sch. No. /Thickness
- d) Quantity
- e) Heat and lot no.
- f) Results of Chemical analysis
- g) Mechanical test results (as per applicable clause)
- h) Non-destructive test results (as per applicable clause)
- i) Results of impact test where applicable.

6.3 Flanges under IBR shall be supplied with 8 copies of IBR certificate in form IIIC duly signed by inspecting authority along with supply.

## 7.0 MARKING

7.1 Flanges manufactured according to ANSI B16.5, ASME B16.47, API 605, MSS SP44 shall be marked as per code and MSS SP-25. Schedule number of butt welding ends also shall be marked.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF FLANGES</b>	PNMP-TS-6400	0
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7.2 In addition, information about heat number and heat treatment shall be indicated. Flanges manufactured to other standard shall be marked as per relevant code. If standard is silent on marking, material spec., size and pressure rating shall be marked by punching.

#### 8.0 **PRESERVATION AND PACKING**

8.1 After inspection and before despatch, flanges shall be thoroughly dried and cleaned. All flanges except S.S. flanges shall be coated with hard film type of rust preventive to protect against rusting during transit and storage.

8.2 Exposed faces of flanges shall be protected over their entire surface with a suitable close fitting protector duly attached at not less than four points. The type of protector and method of attachment shall be approved by the purchaser. B.W ends shall be protected with end protectors.

8.3 Flanges shall be secured together with wire of suitable strength passing through the bolt holes in such a manner that the flanges are paired and no flange face remains exposed.

8.4 Flanges shall be adequately protected to avoid damage during transit and storage. For transportation overseas packing shall be suitable to prevent damage from sea atmosphere.

8.5 The packing case shall be clearly marked with purchase order number and shall include complete packing list of all the items contained in the case.

8.6 Flanges shall be packed separately by the sizes and grades and clearly tagged for identification.

#### 9.0 **GUARANTEE**

9.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions.



## INSPECTION & TEST PLAN FOR FORGED FLANGES

PNMP-ITP-04

DOCUMENT NO

SHEET 1 of 1

### 1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Forged Flanges, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

### 2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification	a) Raw Material Identification Report b) Mill Test Certificates	P.O. Specification / Applicable codes & standard	H	R/R
2.0	Manufacturing (Forging, machining etc.)	Supplier's Manufacturing Procedure	Applicable Material STD	H	R
3.0	Selection of Test Coupons	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
4.0	Chemical Composition	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
5.0	Heat Treatment, as applicable	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R/R
6.0	Destructive Testing				
6.1	Tensile Test	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.2	Hardness Test	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
6.3	Impact Test, as applicable	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	W
7.0	Non Destructive Testing				
7.1	Dye Penetration Test/ Magnetic Particle Test	ASTM E 165 for DP Test/ ASTM E 709 for MP Test	ASME Sec. VIII	H	W
8.0	Final Inspection				
8.1	Visual Examination	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
8.2	Flange Facing Finish	ASME B46.1	ASME B46.1 / P.O.	H	10% RW
8.3	Overall Dimensional check	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10% RW
9.0	Marking	MSS-SP25 / P.O.	MSS-SP25 / P.O.	H	R
10.0	Certification	AS PER P.O.	AS PER P.O.	H	R

**Abbreviation:** DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

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**TECHNICAL SPECIFICATION**  
**FOR**  
**SUPPLY OF VALVES**



	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF VALVES</b>	PNMP-TS-6700	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 2 OF 5</b>	

**1.0 GENERAL**

- 1.1 **Scope:** This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.
- 1.2 All the standards referred shall be of latest edition.
- 1.3 In case of conflict between different specifications and technical condition of supply, the vendor shall contact owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.
- 1.4 The quantities mentioned are tentative and may vary  $\pm 25\%$  and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

**2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY**

- 2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete and rejected without any reference.
- 2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.
- 2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

**3.0 MATERIALS**

- 3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.
- 3.2 Forging equivalent of body material + Stellite for seat ring of body and seat of disc is acceptable against material A182 Gr. F6a + Stellite specified in licensor datasheets.
- 3.3 For valve sizes up to NPS 1½", lift/plug check valves are also acceptable in addition to licensor specification of swing check valves.
- 3.4 Stem shall be machined from a forged rolled bar or forged. Casting is not permitted. However, integral stem of cast stainless steel Ball Valves/Plug valves is acceptable.
- 3.5 Minimum thickness of stellite / hardfacing by deposition, wherever required, shall be 1.6 mm.
- 3.6 PN equivalent rating for Class150# butterfly valves shall be minimum PN20.
- 3.7 Forging are acceptable in place of casting but not vice-versa.

**4.0 TESTING**

- 4.1 All valves castings shall be of radiographic quality, the castings of following valves shall be subjected to radiography to the following extent:

Material	Pressure rating (lbs.)	Extent of radiography (min. 1 valve)
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	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF VALVES</b>	PNMP-TS-6700	0
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C.S./LT C.S./A.S./S.S.	150 lbs $\geq$ 26"	100 % valves
-- do --	300 lbs $\geq$ 18"	-- do --
-- do --	$\geq$ 600 lbs - all sizes	-- do --

- 4.2 Butt welded ends of all valves of all ratings shall be 100% radiographed.
- 4.3 All valves with stellite/hard facing shall be subjected to 100% D.P. test of stellite facing and 10% of supplied valves shall be hardness tested for the stellite/hard facing.
- 4.4 Austenitic stainless steel valves shall undergo Intergranular corrosion test as per ASTM A262 Practice B. Corrosion rate upto 48 mils/year shall be acceptable. Two sets of samples shall be drawn from each heat treatment lot, one set corresponding to highest carbon content and other set corresponding to highest rating.

## 5.0 INSPECTION

5.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection. Approved inspection agencies are Lloyds/BV/ TUV for overseas vendors for both IBR & Non-IBR items. However, PDIL will be inspection agency for Non-IBR items and chief inspector of Boilers for IBR items for Indian vendors.

5.2 Scope of inspection by TPIA :

Review of MTC (all batches).

Calibration check of testing instruments.

Visual check of castings / surfaces (10% random witness).

Dimensional check (10% random witness).

Non destructive test as per code requirements (10% random witness).

Hydrostatic testing, pneumatic testing, tightness testing of shutter/seat, leak checks on packing/gaskets of valves (per tag no. & per size), to be witnessed by TPIA as per table below:

Pressure rating (lbs.)	Quantity, Q (Nos.)
$\leq$ 800 and 1500 for NPS $\leq$ 1 1/2"	$Q = \sqrt{N}$
$\leq$ 600 for NPS $\leq$ 14"	$Q = \sqrt{N}$
$\leq$ 600 for NPS $\geq$ 16"	100%
$\geq$ 900 for all the NPS	100%

N= Number of pieces relating to each item of order

Q= Number of pieces to be witnessed by TPIA, rounded off to nearest higher whole number (subject to min. 10% quantity).

Packing: 10% random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% review / approval

- 5.3 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.
- 5.4 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.
- 5.5 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF VALVES</b>	PNMP-TS-6700	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 4 OF 5</b>	

The various stages of inspection of valves include inspection of valve casting, forging, spindle and trim materials received from sub-supplier by co-relating test certificates and check analysis wherever required. Parts assembled in valves such as bonnet, wedge, seats, gland packing etc. shall be inspected for workmanship and long life.

After the assembly of valves, the hydrotest with water or air test for body & seat shall be carried out for each valve as per specified standard and test pressures.

Finally all valves are to be cleaned, dried and painted only after final acceptance certificate is issued by inspector.

- 5.6 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.
- 5.7 Valves meant for steam service shall be tested in accordance with requirements of IBR and certified in Form-IIIIC by authorized inspection agency for the steam conditions as per data sheets.
- 5.8 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).

## 6.0 DOCUMENTATION

- 6.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch
1.	Catalogue & technical literature/ preliminary drawings of quoted items.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

### **NOTES:**

(A) for Approval

(I) for information

QAP shall be mutually finalised with Inspection Authority specified in the order.

Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

- 6.2 The manufacturer shall furnish six copies of sectional assembly drawings within 3 weeks of receipt of L.o.i. incorporating manufacturing, testing stds., valve dimensions, part list including material specification, Tag. no., purchase Order no. etc. for purchaser's approval before starting manufacturing. The valve shall be manufactured as per delivery schedule on the basis of drawings approved by the purchaser within 4 weeks.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF VALVES</b>	PNMP-TS-6700	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 5 OF 5</b>	

- 6.3 The manufacturer shall submit the following drawings and documents in 8 copies each alongwith the supply of material. In addition 4 copies shall be sent to pdil.
- i) Material test certificates for body and trim materials. (in this, supplier must indicate clearly chemical composition and physical properties).
  - ii) Hydraulic test certificate.
  - iii) Manufacturer's guarantee certificate.
  - iv) Approved sectional drawings of the valves showing complete dimensions with part number and description for easy identification along with the material of construction etc.
  - v) I.B.R certificate in Form IIIC duly signed by the inspecting authorities for valves meant for steam service.
  - vi) Inspection and test certificates for Non I.B.R items signed by inspecting authority.
- 6.4 Manufacturer is required to keep proper records of all the certificates such as foundries/forged shop certificates and the check analysis carried out for raw materials.

## 7.0 MARKING

- 7.1 Marking shall be according to ANSI B16.34 or API 6D, Sec.7. For valves with butt-welding ends, Schedule number is also to be marked. In addition tag no. shall be marked on all the valves.
- 7.2 Marking of size, valve tag no. / Code no. shall be done using low stress die stamping method on a corrosion resistant metal tag which shall be securely attached to the valve body.

## 8.0 PRESERVATION AND PACKING

- 8.1 All valves when offered for inspection or when prepared for dispatch to the site shall be free of sand, rust, scale, swarf or any other harmful matter.
- 8.2 Flanged and B.W. ends of all valves shall be protected by means of metal/wooden plates or caps securely fastened to the valve. A joint composed of plastic, rubber and other non-absorbent material shall be placed between the flanges and the plates. Plastic caps are acceptable for small bore valves.
- 8.3 Threaded or exposed machined parts shall be uniformly coated with suitable rust preventive.
- 8.4 Un-machined exterior surface shall be painted with one coat of black or grey finish. However stainless steel valves shall not be painted.
- 8.5 Valves shall be painted only after inspection is complete in all respects.
- 8.6 Valves shall be packed for dispatch in such a way as to minimize the possibility of damage during transit. All valves shall be suitably boxed before dispatch.
- 8.7 Valves shall be dispatched with packing installed. Hand wheels of valves of size 4" and smaller shall be attached to them. In larger sizes, hand wheels shall be removed and wired to the valves.
- 8.8 The packing case shall be marked with purchase order no. and shall include complete packing list of all the items contained in the case.

## 9.0 GUARANTEE

- 9.1 All valves shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions.



# INSPECTION & TEST PLAN FOR VALVES

PNMP-ITP-07

DOCUMENT NO

SHEET 1 of 2

## 1.0 SCOPE:

This Inspection & Test Plan covers the minimum requirements of Valves, as per Purchase Order / Purchase Requisition / codes & standards specified / approved documents.

## 2.0 INSPECTION AND TEST REQUIREMENTS:

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification (Forging /Casting)	Raw Material Identification Report	P.O. Specification / Applicable codes & standard	H	R/R
1.1	Heat Treatment Forging /Casting	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
1.2	Dimensions of Forging/Casting	Supplier's Drawing	Supplier's Drawing	H	R
1.3	Surface Finish of Forging/Casting	MSS-SP-55	MSS-SP-55	H	R
1.4	Chemical Properties of Forging/Casting	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
1.5	Physical Properties of Forging/Casting	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
1.6	Dye Penetrant Test of stellite facing	ASTM E 165 for DP Test	ASME SEC VIII	H	RW
1.7	Hardness Test of stellite facing	Applicable STD/ P.O.	Applicable STD/ P.O.	H	RW
1.8	Radiography of Castings	P.O./ASTM E94	ASME SEC VIII	H	RT Film Review
2.0	Chemical & Physical Properties of Valve Body parts	Applicable Material STD /P.O.	Applicable Material STD /P.O.	H	R
3.0	Intergranular corrosion test (IGC) (For Austenitic SS Valves only)	ASTM A262 Practice B	P.O.	H	R
4.0	Hydraulic and Pneumatic Test				
4.1	Shell Test	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10%RW
4.2	Seat Test	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10%RW
4.3	Pneumatic Test	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10%RW
5.0	Fire safe test (as applicable)	API 607/ API 6FA	API 607/ API 6FA	H	R
6.0	Performance Test for Hand wheel/Lever /Gear Operator.	Applicable STD/ P.O.	Applicable STD/ P.O.	H	RW
7.0	Positive Material Identification (PMI) for AS/SS Valves	ASTM E1476 / P.O.	ASME Sec. VIII Div.1	H	RW
8.0	Final Inspection of finished valves (Visual & Dimensional)	Applicable STD/ P.O.	Applicable STD/ P.O.	H	10%RW
9.0	Surface preparation & Painting	P.O.	P.O.	W	R
10.0	Marking	Applicable API STD./	Applicable API STD./	H	R



INSPECTION & TEST PLAN  
FOR VALVES

PNMP-ITP-07

DOCUMENT NO

SHEET 2 of 2

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
		MSS-SP25 & P.O.	MSS-SP25 & P.O.		
11.0	Certification	Applicable STD/ P.O.	Applicable STD/ P.O.	H	R

**Abbreviation:** DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection

	<b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PNMP-TS-6610	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 1 OF 4</b>	

**TECHNICAL SPECIFICATION**  
**FOR**  
**SUPPLY OF STUD & NUTS**

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF STUD &amp; NUTS</b>	PNMP-TS-6610	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 2 OF 4</b>	

## 1.0 GENERAL

- 1.1 **Scope:** This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.
- 1.2 All the standards referred shall be of latest edition.
- 1.3 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.
- 1.4 The quantities mentioned are tentative and may vary  $\pm 25\%$  and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

## 2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

- 2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete and rejected without any reference.
- 2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.
- 2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

## 3.0 MATERIALS

- 3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.
- 3.2 Nuts as per A194 Gr.7 shall also be acceptable over and above tender requirement of A194 Gr. 4.
- 3.3 Each Stud shall be threaded full length and provided with two heavy hex nuts.
- 3.4 Galvanized studs & nuts shall be as per ASTM A307 & ASTM A563 respectively.
- 3.5 The ends of stud bolts shall be finished with a chamfer of  $45^\circ$  to a depth slightly exceeding the depth of threads. The ends shall be perpendicular to the stud bolt axis and their surface shall be sufficiently smooth to facilitate marking.
- 3.6 Stud bolts shall be free from harmful defects and shall have a good finish. Threads shall be clearly formed and free from burrs, scale, chatter marks or other imperfections.
- 3.7 The nuts shall have a chamfer of  $30^\circ$  on the upper and lower faces. Both faces shall be machined or have a surface equal to that produced by machining.

## 4.0 INSPECTION & TESTING

- 4.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection. Approved inspection agencies are Lloyds/BV/ TUV for





**TECHNICAL SPECIFICATION FOR  
SUPPLY OF STUD & NUTS**

PNMP-TS-6610

0

**DOCUMENT NO.****REV****SHEET 3 OF 4**

overseas vendors for both IBR & Non-IBR items. However, PDIL will be inspection agency for Non-IBR items and chief inspector of Boilers for IBR items for Indian vendors.

- 4.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.
- 4.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.
- 4.4 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.
- 4.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.
- 4.6 Scope of Inspection by TPIA :
- Review of MTC (all batches).
- Visual check of surfaces: 10% Random witness.
- Dimensional check: 10% Random witness.
- Various physical test as per code requirements (min. 01 random per heat / lot / size sample witness).
- Packing: 10% Random witness before dispatch.
- Documentation (MTC, Inspection Release Note): 100% Review / Approval

## 5.0 DOCUMENTATION

- 5.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch of consignment
1.	Catalogue & technical literature/ preliminary drawings of item supplied.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

### **NOTES:**

(A) for Approval

(I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.

Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF STUD &amp; NUTS</b>	PNMP-TS-6610	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 4 OF 4</b>	

5.2 The items shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority along with supply of materials.

- a) Purchase order no.
- b) Material specification and grade
- c) Size and Sch. No. /Thickness
- d) Quantity
- e) Heat and lot no.
- f) Results of Chemical analysis
- g) Mechanical test results (as per applicable clause)
- h) Non-destructive test results (as per applicable clause)
- i) Results of impact test where applicable.

#### 6.0 **MARKING**

6.1 Identification mark shall be clearly stamped at the end of stud and on one of the faces of the nut as per the respective Std.

6.2 The studs and nuts shall be marked with size, length, material specification etc. as per relevant Std.

#### 7.0 **PRESERVATION AND PACKING**

7.1 The packing case shall be clearly marked with purchase order number and shall include complete packing list of all the items contained in the case.

7.2 Studs and nuts after inspection shall be applied with rust preventive coating.

7.3 Each stud shall have the nuts fixed to it and each sizes of studs put in separate polythene bags.

7.4 These bags shall be suitably packed in wooden packing cases in such a way that these are not damaged during transit and storage.

#### 8.0 **GUARANTEE**

8.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and conditions.

# INSPECTION & TEST PLAN FOR STUDS & NUTS

**Doc. No.: PNMP-ITP-05 Rev.0**

**1.0 SCOPE:**

This Inspection & Test Plan covers the minimum requirements of Studs & Nuts, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

**2.0 INSPECTION AND TEST REQUIREMENTS:**

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1.0	Raw Material Identification (Chemical Composition)	a) Raw Material Identification Report b) Mill Test Certificates	ASTM A193/ A194	H	R/R
2.0	Heat Treatment	ASTM A193/ A194	ASTM A193/ A194	H	R/R
3.0	Selection of Test Coupons	ASTM A193/ A194	ASTM A193/ A194	H	W
4.0	Chemical Composition	ASTM A193/ A194	ASTM A193/ A194	H	R
5.0	Mechanical Testing (Tensile strength, Yield strength, Elongation, Hardness Test, Proof Load test for nuts, etc.)	ASTM A193/ A194	ASTM A193/ A194	H	W
6.0	Machining of Studs & Nuts	ASTM A193/ A194	ASTM A193/ A194	H	R
7.0	Visual (Workmanship, Finish, Dimensions and Appearance)	ASTM A193/ A194/ P.O	ASTM A193/ A194/ P.O	H	10% RW
8.0	Certification	ASTM A193/ A194 & P.O	ASTM A193/ A194 & P.O	H	R
9.0	Marking & Dispatch	ASTM A193/ A194 & P.O	ASTM A193/ A194 & P.O	H	10% RW
<p><b>Abbreviation:</b> DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP-Inspection and Test Plan, P- Performed, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC-Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection</p>					

 पी डी आई एल <b>PDIL</b>	PROJECTS & DEVELOPMENT INDIA LTD	PNMP-TS-6620	0
		DOCUMENT NO.	REV
		SHEET 1 OF 4	

TECHNICAL SPECIFICATION  
FOR  
SUPPLY OF GASKETS

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF GASKETS</b>	PNMP-TS-6620	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 2 OF 4</b>	

## 1.0 GENERAL

- 1.1 **Scope:** This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. As a general rule the most stringent requirement shall govern and Owner's option shall be binding.
- 1.2 All the standards referred shall be of latest edition.
- 1.3 In case of conflict between different specifications and technical condition of supply, the vendor shall contact Owner for any clarifications/confirmation; otherwise it shall be assumed that all clauses are clear to the vendors.
- 1.4 The quantities mentioned are tentative and may vary  $\pm 25\%$  and shall be decided at the time of placement of order. The quantity of individual item may vary more than 100%.

## 2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY

- 2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed along with offer without which the offer shall be considered incomplete and rejected without any reference.
- 2.2 The price shall be quoted on the zerox copy of the same sheet of the bill of material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.
- 2.3 Any deviations from the clause stipulated in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref. no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

## 3.0 MATERIALS

- 3.1 All materials, whatsoever, required to complete the supply, shall be procured by the supplier and all such materials shall be covered with due identifiable material test certificates.

## 4.0 INSPECTION & TESTING

- 4.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the owner to carryout inspection. Approved inspection agencies are Lloyds/BV/ TUV for overseas vendors for both IBR & Non-IBR items. However, PDIL will be inspection agency for Non-IBR items and chief inspector of Boilers for IBR items for Indian vendors.
- 4.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.
- 4.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.
- 4.4 All items shall be inspected during various stages of manufacturing. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF GASKETS</b>	PNMP-TS-6620	0
		DOCUMENT NO.	REV
		SHEET 3 OF 4	

4.5 Testing performed in the presence of the Purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

4.6 Scope of Inspection by TPIA :

Review of MTC (all batches).

Visual check of surfaces (10% random witness).

Dimensional check (10% random witness).

Various physical test as per manufacturing standard requirements (01 random sample witness).

Packing: 10% Random witness before dispatch.

Documentation (MTC, Inspection Release Note): 100% Review / Approval

#### 5.0 DOCUMENTATION

5.1 The following documents (Technical), as a minimum, are required to be submitted by the supplier along with bid, after placement of order for approval purposes and final documentation before despatch of consignment.

Sl. No.	Description of document	Along with bid	After placement of order	
			For approval/ information	Final documents before despatch of consignment
1.	Catalogue & technical literature/ preliminary drawings of item supplied.	Yes	x	x
2.	Deviation if any, from the technical spec., giving justification for the same.	Yes	x	x
3.	Drawings & documents	x	Yes (A)	Yes
4.	All types of testing & inspection certificates.	x	x	Yes
5.	Quality Assurance Plan (QAP)	x	Yes (A)	Yes

#### **NOTES:**

(A) for Approval

(I) for information

QAP shall be mutually finalized with Inspection Authority specified in the order.

Number of sets shall be as stipulated elsewhere in the bid document. Final documentations shall be supplied in hard copies (4 Nos.) as well as soft copies in CD formats. Applicable software is MS Office, Word, Excel and Acrobat.

5.2 The items shall be supplied with 4 copies of the mill test certificates indicating the following and duly signed by the inspecting authority along with supply of materials.

- a) Purchase order no.
- b) Material specification and grade
- c) Size and Sch. No. /Thickness
- d) Quantity
- e) Heat and lot no.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF GASKETS</b>	PNMP-TS-6620	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 4 OF 4</b>	

- f) Results of Chemical analysis
- g) Mechanical test results (as per applicable clause)
- h) Non-destructive test results (as per applicable clause)

**6.0 MARKING**

- 6.1 All the items shall be marked as per relevant std. on a metal tag attached to the items using low stress die stamping method.
- 6.2 Each gasket shall be marked with size, rating, material specification and dimensional std. etc. as per relevant standard.

**7.0 PRESERVATION AND PACKING**

- 7.1 Gaskets shall be packed separately by the sizes and grades in polythene bags or sheets and clearly tagged for identification with purchase order no.

**8.0 GUARANTEE**

- 8.1 All items shall be guaranteed against poor workmanship and defective material as per the clauses mentioned in the commercial terms and condition.

**INSPECTION & TEST PLAN  
METALLIC GASKETS**

**Doc. No.: PNMP-ITP-08 Rev.0**

**1.0 SCOPE:**

This Inspection & Test Plan covers the minimum requirements of Spiral Wound Metallic Gaskets, as per Purchase Order / Purchase Requisition / codes & standards specified /approved documents.

**2.0 INSPECTION AND TEST REQUIREMENTS:**

SL. NO.	ACTIVITY	REF. DOCUMENTS	ACCEPTANCE NORMS	SCOPE OF INSPECTION	
				SUPPLIER	TPIA
1	Raw Material Identification (Chemical & Physical)	a) Raw Material Identification Report b) Mill Test Certificates	ASME B16.20 / P.O.	H	R/R
2	Compression Test	ASME B16.20	ASME B16.20	H	W
3	Hardness test	ASME B16.20	ASME B16.20	H	10% RW
4	Final Inspection (Visual & Dimensional)				
4.1	Surface Finish	ASME B16.20	ASME B16.20 / P.O.	H	10% RW
4.2	Dimensions	ASME B16.20	ASME B16.20 / P.O.	H	10% RW
5	Marking	ASME B16.20 / P.O.	ASME B16.20 / P.O.	H	10% RW
6	Certification	ASME B16.20 / P.O.	ASME B16.20 / P.O.	H	R
Abbreviation: DT- Destructive Testing, H- Hold (Do not proceed without approval), HT- Heat treatment, R-Review, R/R- Report Review, ITP- Inspection and Test Plan, PO- Purchase Order, PQR- Procedure Qualification Record, PR-Purchase Requisition, RW- Random Witness, TC- Test Certificate, TPI or TPIA- Third Party Inspection Agency, W-Witness / Inspection					





PDIL

PROJECTS & DEVELOPMENT INDIA LIMITED

ES : 6108

ISSUE : APRIL '99

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ENGINEERING STANDARD  
TECHNICAL NOTES  
FOR  
STRAINERS

01-17  
S. Chattaraj  
14.07.99

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M.K.DAS  
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0	28.4.99	FOR IMPLEMENTATION	S.N.G.	PCC 28/4	<i>Hony. Secy 28/4</i>
RFV.	DATE	PURPOSE	PREPARED	REVIEWED	APPROVED

FORM NUMBER 02-0000-0021 F1 REV 0



PDIL

**ENGINEERING STANDARD  
TECHNICAL NOTES  
FOR STRAINERS**

**ES : 6108**

ISSUE : APRIL '99

SHEET 1 OF 4

**1.0 GENERAL**

- 1.1 This specification defines the responsibility of the supplier and covers supplementary requirements relating to manufacturing, fabrication, inspection, testing, painting, packing and despatch etc. This specification shall be read in conjunction with code and enquiry documents. The vendor must contact PDIL for clarification. As a general rule the most stringent requirement shall govern and PDIL's option shall be binding.
- 1.2 All the standards referred shall be of latest edition.
- 1.3 In case of conflict between different specification and technical condition of supply, the later shall govern. The vendor shall contact PDIL for any clarifications/ confirmation, otherwise it shall be assumed that all clauses are clear to the vendors.
- 1.4 The quantities mentioned are tentative, may vary  $\pm 25\%$  and shall be decided at the time of placement of order. The price shall be firm for these variation.
- 1.5 Approval of design calculation and drawings by PDIL will not in any way absolve the supplier from their responsibilities.
- 1.6 The filtering element shall not vibrate or move during operation. It shall be easily removable.
- 1.7 The ratio of the filtering area to the bore of the strainer shall be unless otherwise indicated, equal to
- 3:1 Minm. for NPS  $\leq 2''$   
2:1 Minm. for NPS  $\geq 3''$
- 1.8 Sub-orders of castings shall be placed on foundries approved by PDIL inspection department for Indian Vendors.
- 1.9 For strainers with body-bonnet joint flanged or pressure-seal, the body thickness shall be as provided for by API 600.
- 1.10 End flanges shall be integral with the body, unless otherwise specified. The flanges may be added with body by full penetration butt-welding with 100% radiography as per ASME code only with purchaser's approval.
- 2.0 GENERAL INSTRUCTIONS FOR BIDDING PURPOSE ONLY**
- 2.1 Each sheet of technical condition of supply and specification sheets shall be duly signed and stamped by competent authority and shall be enclosed alongwith offer without which the offer shall be considered incomplete.

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION WHICH IS THE EXCLUSIVE PROPERTY OF PDIL AND IS LENT TO THE BORROWER. IN THE CONDITION THAT IT SHALL NOT BE REPRODUCED, SOLD, LENT OR OTHERWISE DISPOSED OF NOR USED FOR ANY PURPOSE OTHER THAN FOR WHICH IT IS INTENDED.



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FOR STRAINERS

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2.2 The price shall be quoted on the zerox copy of the same sheet of Bill of Material attached with the enquiry specification and any deviation from the required specification shall be marked therein. Prices typed on other format shall not be considered for evaluation and rejected without any reference.

2.3 Any deviations from the clause stipulated here in the code and other enquiry documents shall be clearly mentioned in a separate "Deviation List" with proper ref.no. In the absence of any such indications, it shall be assumed that the offer complies with all the requirements in totality and such assumptions shall be strictly binding on the supplier.

2.4 All testing charges shall be included in individual prices of the items. If third party inspection charges are not indicated, it shall be assumed that it is included in the offer. If third party inspection charges are extra, it shall be indicated as percentage basis of individual item. In no case third party inspection charges shall be indicated as lumpsum amount.

3.0 MATERIALS

3.1 All materials, whatsoever, required to complete the supply shall be procured by the supplier and all such materials shall have due identifiable material test certificates.

3.2 For forgings to ASTM A 105, carbon content shall be equal to or less than 0.25%.

3.3 In case of material type 316L + G510 (CR.UR.510), ferrite contents shall not exceed 0.6% for forging and 1.0% for welded items.

4.0 TESTING

4.1 The body and bonnet of each strainer shall be of radiographic quality. The body & bonnet castings of following strainers shall be subjected to radiography as per ASME B 16.34 to the following extent.

Material	Pressure Rating (Lbs)	Extent of Radiography
C.S. / LT (CS)	150 Lbs $\geq$ 26"	100%
C.S./A.S./S.S.	300 Lbs $\geq$ 18"	-- do --
-- do --	$\geq$ 600 Lbs for all sizes	-- do --

Butt welded ends of all strainers for all ratings shall be 100% radiographed.



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If due to shape of piece or location of the piece to be radiographed, it is deemed to have radiographic films of doubtful or poor interpretation, then magnetic particle or liquid penetrant exam shall be carried out.

- 4.2 Each strainer shall be hydrotested as per test pressure specified in data sheet. On completion of tests, all strainers shall be painted unless otherwise specified except stainless steel.

**5.0 INSPECTION**

- 5.1 Inspection authority means the inspection agencies approved by the Owner. Approved inspection agencies are Lloyds/BVIS for overseas vendors for both IBR & Non-IBR items. However, Lloyds/BVIS will be inspection agency for Non-IBR items and chief inspector of boilers for IBR items for Indian vendors.

- 5.2 The inspecting authority shall be provided free access at all possible times to those parts of supplier's work engaged in production and testing of materials ordered.

- 5.3 The inspecting authority shall have the right to select random samples for check test and reject materials, if samples furnished as above and tested as per the specifications fail to meet the requirement specified.

- 5.4 All items shall be inspected during various stages of manufacturing starting from identification of raw material up to completion. Items shall be considered acceptable for despatch only after final certificate of acceptance is issued by the inspector.

- 5.5 Testing performed in the presence of the purchaser's representatives shall not relieve the supplier of their own responsibilities and guarantees and any other contractual obligations.

**6.0 DOCUMENTATION**

- 6.1 8 copies of the inspection and material test certificates showing chemical analysis, physical properties, hydraulic test reports etc. shall be furnished along with supply. In addition 4 copies shall be sent to PDIL.

- 6.2 The manufacturer shall supply 4 copies of sectional drgs of all items with part list and materials of construction within 3 weeks of L.O.I. for approval. The supply shall be in accordance with these approved drgs.

- 6.3 The manufacturer shall supply 8 copies of final approved drgs along with supply of materials.

- 6.4 8 copies of IBR test certificates in form IIIC shall be furnished for all items meant for steam service alongwith supply.

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**7.0 MARKING**

- 7.1 Nominal bore, pressure rating, material of construction shall be die stamped on strainer body.
- 7.2 Strainers meant for IBR service shall have marking "IBR" on strainer body.
- 7.3 Strainer shall have an arrow marked on body itself indicating direction of flow.

**8.0 PRESERVATION AND PACKING**

- 8.1 Strainers shall be packed in packing cases, clearly indicating purchase order no. & packing list.
- 8.2 Preservation and packing shall be done in such a way that the strainers are not damaged during transit and storage.
- 8.3 Flanged or butt welded ends shall be protected with wooden covers of a diameter not less than the diameter of the ends. Screwed & socket welding ends shall be protected with plastic or card board plugs.

**9.0 GUARANTEE**

- 9.1 All items shall be guaranteed against poor workmanship and defective material as per the "Warranties and Guaranties" clauses mentioned in the commercial terma and conditions of "ITB".

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# DATASHEET FOR SAFETY SHOWER AND EYE WASH UNIT (COMBINED)

## SUPPLY WATER CONDITIONS

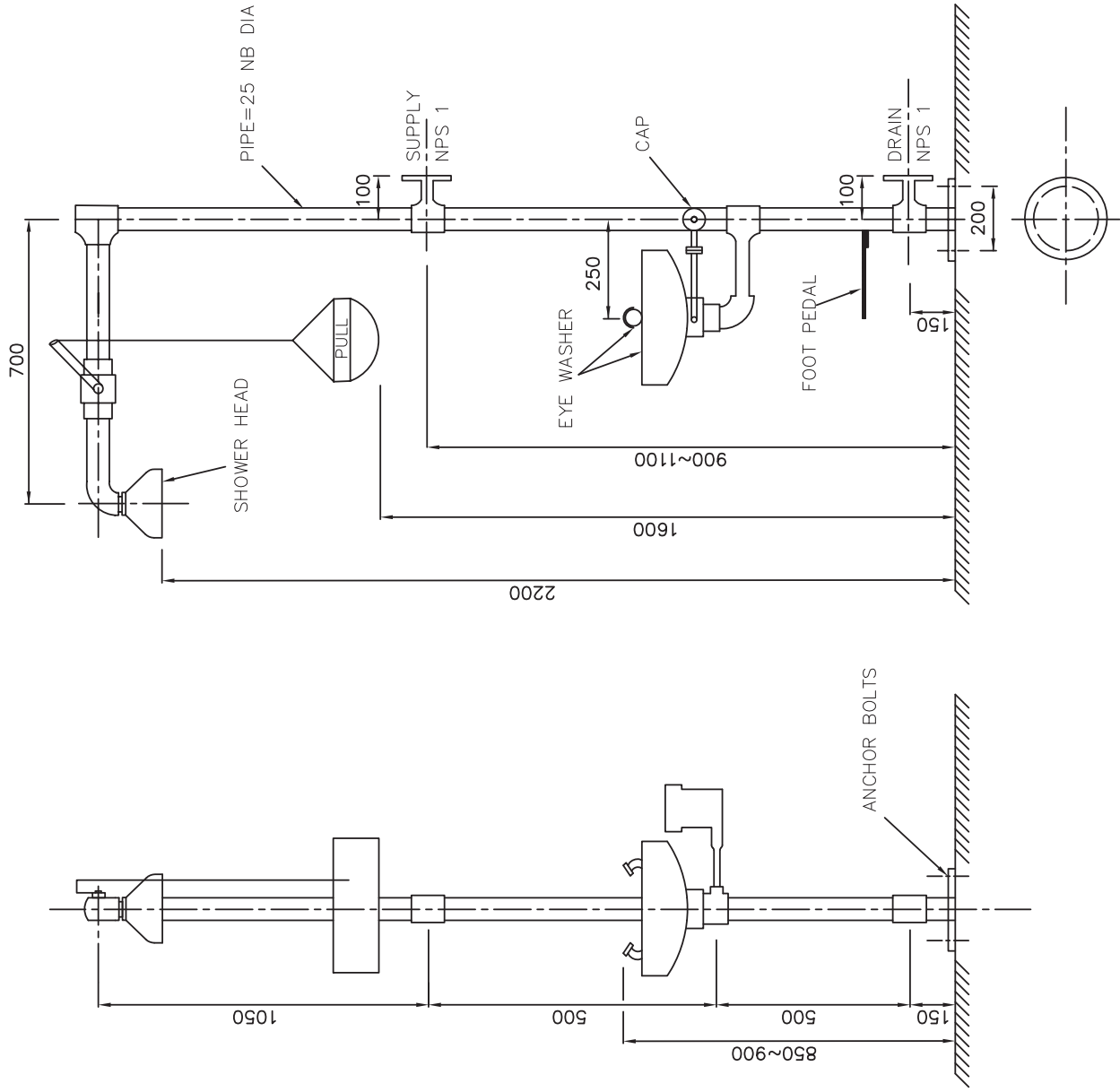
- 1) SUPPLY WATER : POTABLE WATER
- 2) DESIGN PRESS. : 7 kg/cm<sup>2</sup>g
- 3) DESIGN TEMP. : 70 °C
- 4) HYDRO. TEST PRESS. : 1.5 times of Design Pr.
- 5) MINIMUM FLOW. : 110 Lit./min.
- a) SAFETY SHOWER : 12 Lit./min.
- b) EYE WASH

## MATERIAL

- 1) PIPE : SS304
- 2) FITTING : SS304
- 3) FLANGE : SS304
- 4) VALVES/STRAINER : SS304
- 5) BOWL FOR EYEWASH : SS304
- 6) EYE WASH NOZZLE : SS304
- 7) SHOWER HEAD : SS304
- 8) PULL CHAIN : SS304
- 9) FOOT PEDAL : SS304
- 10) SPRING : SS304
- CODE/STANDARD : IS 10592

## NOTES:



- 1) THE GIVEN DIMENSIONS ARE ONLY FOR REFERENCE; THE MANUFACTURER'S STANDARD DIMENSIONS MAY BE APPLIED, SUBJECT TO APPROVAL.
- 2) THE COMBINED UNIT OF SAFETY SHOWER & EYE WASH SHALL BE PULL ROD AND FOOT PEDAL OPERATED AND PROVIDED WITH DUST COVER & FILTER.
- 3) ALL SAFETY SHOWER & EYE WASH UNIT SHALL BE PAINTED WITH FLOURESCENT PAINT SO THAT IT CAN BE VISIBLE IN NIGHT. NAME PLATE TO BE PROVIDED ON EACH SAFETY SHOWER & EYE WASH UNIT.
- 4) SAFETY SHOWER & EYE WASH UNIT SHOULD BE ISI MARKED.
- 5) THE COMBINED UNIT OF SAFETY & EYE WASH SHOULD BE CAPABLE TO PROVIDE A CUIOUS FLOW OF WATER FOR ATLEAST 15 MINUTES.
- 6) ALL DIMENSIONS ARE IN MILLIMETERS.
- 7) OTHER SIZES BY VENDOR.
- 8) The spray nozzles shall be so designed as to deliver a spray of rinse water without harsh jets or misting. The water cone shall have vortex angle of 45°.



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**SECTION-VI-9.0**  
**TECHNICAL SPECIFICATION**  
**ROTATING EQUIPMENTS**  
**SUPPLY & CONSTRUCTION**  
**OF**  
**ASH POND AND ALLIED SERVICES**

**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX**  
**AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

	<b>NIT FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED FACILITIES TFL, ODISHA</b>  <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS</b>	PC183/E/206/ S -VI/9.0	0	
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### LIST OF ATTACHMENTS

ATTACHMENT NUMBER	DESCRIPTION	NUMBER OF SHEETS
ANNEXURE - 1	INSPECTION & TESTING GUIDE LINES – ROTATING EQUIPMENT	2



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## 1.0 SCOPE

### 1.1 General

1.1.1 This Philosophy states that Bidder's scope of work shall include basic & detailed engineering, procurement, supply, manufacturing, fabrication, transportation, loading, unloading, insurance during transit, storage, construction, erection/ installation of all **Mechanical Rotating Equipment** with allied electrical, instrumentation and civil works, obtaining all necessary statutory approvals from concerned government authorities as applicable, testing & TPIA Inspection, mechanical completion, pre-commissioning, commissioning, performance guarantee test runs including total project management and handing over of '**Ash Pond and Allied Services**' on SOR basis and Single-Point responsibility basis to **M/s TFL, Odisha**.

1.1.2 In addition, all statutory rules & regulations shall also be complied with.



## 2.0 DESIGN PHILOSOPHY FOR MACHINERY

### 2.1 Codes and Standards



The **Latest Edition** of codes and standards as listed below shall be followed for design and manufacturing of different machinery items. Generally the manufacturer will comply with these codes and standards as indicated therein with minor deviations that are normally adopted by manufacturer and are reasonably accepted as per good engineering practice.

A list of such deviations, if any, shall be furnished by the Bidder along with offer.

Code	Description
API 610	Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industry
ANSI/ ASME B 73.1 M	Horizontal, End Suction centrifugal Pumps for Chemical Process
International Standard	Horizontal Centrifugal Pumps for Clear Cold Water
API 611	General-Purpose Steam Turbines for Refinery Service.

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API 612	Petroleum, Petrochemical and Natural Gas Industries Steam Turbine - Special Purpose application
API 613	Special Purpose Gear Units for Petroleum, Chemical and Gas Industry Services
API 614	Lubrication, Shaft-Sealing, and Control Oil System for Petroleum, Chemical and Gas Industry Services
API 670	Vibration, Axial-Position, and Bearing- Temperature Monitoring Systems.
API 671	Special Purpose Coupling for Refinery Services, Petrochemical and Gas Industry .
API 673	Special Purpose Centrifugal Fans for General Refinery Services.
API 674	Positive Displacement Pumps-Reciprocating
API 675	Positive Displacement Pumps-Controlled Volume
API 676	Positive Displacement Pumps-Rotary.
API 678	Accelerometer and Vibration Systems.
API 682	Shaft sealing Systems for Centrifugal and Rotary Pumps.
API 685	Sealless Pump (Magnetic & Canned)
ISO / DIN	Centrifugal Pumps for smaller size & Non Critical Services.
International Standard, ASHRAE / ISHRAE	HVAC
<b><u>Performance Testing (ASME Codes)</u></b>	
PTC 8.2	Centrifugal Pump
PTC 9	Displacement Compressors
PTC 11	Centrifugal Fans
<b><u>AGMA Standard</u></b>	
420	Practise for Enclosed Reducers or Increasesers using Spur, Helical, Herringbone and Spiral Bevel Gears.
421	Practise for High Speed Helical Gear Units.
<b><u>NEMA Standards</u></b>	
SM 23	Steam Turbine for Mechanical Drive Service.

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## 2.2 Design Life

All equipment shall be designed for a minimum service life of 25 years and at least 3 years of uninterrupted operation under normal operating conditions. This requirement excludes specialised components requiring periodic maintenance and replacement.

## 2.3 Essential Project Reference Documents

The following documents shall be observed, and relevant aspects incorporated into specifications and datasheets:

- Process Description, Specifications and Data Sheets from Licensor
- Hazardous Area Classification
- Electrical and Instrumentation Design Criteria

## 2.4 Regulations

Besides codes & standards, Bidder shall follow National Laws and Regulations together with Local by Laws for the state including statutory requirements as applicable.

## 2.5 Site Conditions

Site conditions shall be as defined elsewhere.



## 2.6 Material of Construction

Generally Materials of construction shall be as per the process licensor's recommendation. However, API guideline / applicable codes may be adapted to the extent applicable.



Use of equivalent & superior material may be selected & shall be furnished with the offer along with chemical composition.

## 2.7 Quality Assurance & Control

2.7.1 The quality assurance shall be as per the approved procedures, test methods & facilities to be developed by the Bidder to ensure that the supplied equipment shall

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- be of highest quality. The quality control shall mean that all the tests , measurements, checks & calibration which are to be carried out may be compared with the actual specified characteristics of the equipments/unit /system.
- 2.7.2 Quality Assurance (QA) shall mean the organizational set up, procedures as well as test methods and facilities developed by Bidder in order to assure that the machines & associated auxiliaries leaving Bidder's shop are of the highest possible quality i.e. either equal to or better than the requirement specified.
- 2.7.3 Quality Control (QC), shall mean all the tests, measurement, checks and calibration which are to be carried out in Bidder's shop in order to compare the actual characteristics of the equipment/unit/system with the specified ones, along with furnishing of the relevant documentation (certificates/records) containing the data or result of these activities.
- 2.7.4 Bidder shall submit a comprehensive description (manual) of QA/QC measures contemplated by him for implementation with regard to this specification. It is contractual obligation of the Bidder to develop and implement adequate QA/QC systems.
- 2.7.5 QA/QC system shall cover all products and services required for the complete machine unit as per scope of work including job sub contracted by the Bidder.
- 3.0 DESIGN REQUIREMENTS**
- 3.1 General**
- 3.1.1 All machines shall be directly coupled to their prime movers. Gears/any other forms of transmission shall be avoided. the drivers shall have rated output at least 10% greater than the power requirement at design operating condition of the driven equipment.
- 3.1.2 All pumps shall have Mechanical Seals. Single seals will be used in most cases.
- 3.1.3 Special tools and wrenches required for installation and maintenance shall be provided.
- 3.1.4 Bidder have to submit the reference list for similar equipment's models (minimum 2 nos.) supplied in past for similar duty conditions. Reference list must contain at least

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the following: Fluid handled Capacity, Suction Pressure, Discharge Pressure, Model No., Power consumption, Client Name, Address, and Year of supply.



- 3.1.5 Gear unit shall be provided in accordance with AGMA standard. Gear box rating shall be selected based on minimum service factor of 1.5.

### 3.2 Centrifugal Pumps

The pumps shall be designed as per API 610, latest edition / ISO / DIN. The pumps shall be of robust design to ensure long service life and minimum maintenance requirement. The pumps shall be designed for easy access for inspection and maintenance. All continuously running pumps shall have a spare pump.

In addition to codes & standards, following points shall also be applicable:

- 3.2.1 All pumps shall have continuously rising head curve from any specified operating point to shut off point. Pumps running in parallel shall have equal head rise to shut off point.
- 3.2.2 All pumps shall be designed for 20% overload.
- 3.2.3 The pumps should have stable operating characteristics. The pump head at shut off shall be approximately 110% of head at rated capacity and not exceeding 120%.
- 3.2.4 Best efficiency point shall be as close as possible to normal operating point.
- 3.2.5 Impellers of multistage pumps shall be secured positively against axial movement.
- 3.2.6 For multistage pumps, a lateral critical speed analysis shall be carried out.
- 3.2.7 Pumps with centre line support shall be provided for pumps handling fluids of operating temperature more than 177<sup>0</sup>C.
- 3.2.8 The maximum calculated axial load shall not in any operating condition exceed 50% of bearing manufacturer's load rating.
- 3.2.9 Metastream type of coupling shall be provided. Coupling guard shall be non-sparking for pumps located in hazardous area.
- 3.2.10 Mechanical seal of Leak proof engineering pvt. Ltd. / Eagle-Burgmann make only shall be provided. Only balanced mechanical seal shall be used.

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3.2.11 For pumps with forced lubrication system, the lubrication system shall be designed as per API 614 latest edition.

3.2.12 All continuously running pumps shall have a spare pump.

### 3.3 Reciprocating Pump / Metering pumps

3.3.1 Reciprocating pump shall be designed as per API 674 latest edition and metering pump shall be designed as per API 675 latest edition.

3.3.2 The metering pumps shall be suitable for continuous capacity variation from 0 to 100%. The capacity variation should be possible while the pumps are working.

3.3.3 All continuously running pumps shall have a spare pump.

### 3.4 Centrifugal Fans

Centrifugal fans shall be designed as per API 673, latest edition for critical services and for non-critical services manufacturer's standard shall be applicable.

3.4.1 Forced and induced draught fans shall preferably be direct coupled to drivers through flexible coupling, and the complete assembly shall be mounted on a substantial bedplate.



3.4.2 First critical speed of the rotor shall be higher than 120% of rated speed.

3.4.3 Capacity control shall be achieved by means of dampers (Preferably on suction side) specially for constant speed fans.

3.4.4 The fan casing shall be suitably split such that impeller assembly can be removed for maintenance without disturbing inlet and outlet ducting.

3.4.5 SS bolts and nuts shall be provided for the split casing joints of fans for corrosive service.

3.4.6 The drive motors of the fans should be designed with additional capacity to take care of surge loading. However Motor rating shall be minimum 125 % of shaft power for

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shaft power up to 22 KW, 115 % of shaft power for shaft power between 22 – 55 KW and 110 % of shaft power for shaft power above 55 KW.

### 3.5 Agitator / Mixer

- 3.5.1 Assembly shall be such as to enable replacement of bearings, shaft sealing devices, gear unit and driver without dismantling other major parts of unit and without emptying or depressurising the vessel.
- 3.5.2 First critical speed of the rotor shall not be less than 140% of rated speed.
- 3.5.3 Adequate space shall be provided for packing replacement without removing or dismantling of any part other than the gland and the seal cage.
- 3.5.4 Motor rating shall be minimum 125% of shaft power.
- 3.5.5 Flexible coupling shall be provided between the power drives and agitator shaft or gear, and shall have minimum service factor of 2.
- 3.5.6 Spacer type coupling shall be provided for units provided with Mechanical Seals. The spacer shall be of sufficient length to permit replacement of the seal assembly without removing the driver / gear.
- 3.5.7 Gear unit shall be provided in accordance with AGMA standard. Gear box rating shall be selected based on minimum service factor of 1.5.

### 3.6 EOT Cranes

Bidder to provide EOT Cranes of adequate capacity in various Pump Houses, Fan & Blower and other location wherever required for ease in operation and maintenance activities . Cranes to be provided in nearest multiple of 5 Metric Tonnes considering maximum weight to be lifted. Relevant Indian/ ISO Standards to be applicable for EOT Crane . All statutory guidelines to be complied by the contractor/ sub-contractor.

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#### 4.0 INSPECTION & TESTING

Machines shall be inspected by Third Party Inspection Agency (Lloyds/BV/TUV/PDIL). The Inspection and testing shall be in accordance with the all relevant codes, standards, specifications, including the minimum guide line given in Annexure – 1 (attached).

4.1 All testing accessories, measuring instruments including NDT testing equipment, etc. shall be arranged by LSTK / PACKAGE Contractor. DM water shall be used for hydro testing of the equipment which shall be supplied by client on chargeable basis.

4.2 In general, following tests shall be conducted for all rotating equipments:



- Material test
- Non-destructive test
- Hydrostatic test for all the pressure containing parts
- Dynamic balancing of rotor
- Over speed test of impeller (only for compressors)
- Helium leak test of compressor casing (if required as per API Code)
- Mechanical running test of compressor and turbine
- Barring over check for reciprocating compressor
- NPSHR test for pumps
- Performance Test
- Disassembly Test

The tests required to be conducted and witnessed shall be specified in the equipment data sheet. Disassembly test for Fans, Blowers & small Pumps can be waived –off in case no problem occurs during mechanical / performance Test.

#### 5.0 SPARES

5.1 All erection & commissioning spares shall be supplied by Bidder & cost shall be included in the cost of main equipment.



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5.2 Mandatory spares shall be supplied by the contractor as per spare part list .

## 6.0 PAINTING

6.1 All exterior non-stainless steel surfaces subject to atmospheric corrosion with the exception of machined surfaces shall be epoxy painted.

6.2 All exterior machined surfaces shall be coated with suitable rust preventives.



## 7.0 VENDORS LIST

All equipment shall be procured / fabricated as per approved vendor list. However, Bidder may have to furnish Proven track record / reference record of any vendor opted for specified services / equipment, if, owner desires.

For Any equipment for which vendor list is not enclosed, the Bidder may furnish a list of proposed vendors along with their references for supply of similar type of equipment along with bid. However all proposed additional sub-vendor shall have well proven track record and shall be subjected to consultant / owner's approval.

## 8.0 BIDDER's DRAWING & DOCUMENTATION:

Drawings & Documents of machinery items/ rotating equipment shall be as mentioned elsewhere in the ITB.

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## **ANNEXURE-1**

### **INSPECTION & TESTING GUIDE LINES – ROTATING EQUIPMENT**

#### **1.0 SCOPE**

This document covers the minimum guide lines for the Inspection & Testing for the rotating Equipments.

All rotating Equipments shall be inspected by Third Party Inspection Agency (Lloyds/BV/TUV/PDIL). The Inspection and testing shall be in accordance with the all relevant codes, standards, and specifications as specified in Specification sheet.

#### **2.0 PUMPS, FANS AND DRIVERS**

- 2.1 Pump and fan casings to be identified against foundry test certificates and thickness checked to conform to approved drawings.
- 2.2 Witness hydrostatic test on casings.
- 2.3 Dynamic balancing of rotor
- 2.4 Witness running tests on pumps including N.P.S.H. where applicable.
- 2.5 Non- destructive test
- 2.6 Strip inspection of pumps on completion of running tests. Wearing surfaces to be checked and recorded. As a general principle, mechanical seals will not be dismantled after running tests. This necessity will be discussed on a case to case basis if abnormal noise or temperature has need records during testing. All materials to be checked against test certificates or VENDOR'S bill of materials.
- 2.7 Final inspection and dimensional check of pump (including driver, when mounted on base plate).
- 2.8 Heat run or standard abbreviated tests, as specified, to be witnessed on electric motor drives.
- 2.9 Final inspection and dimensional check to be carried out on motor drivers.
- 2.10 For steam turbine drivers, hydrostatic test on pressure parts to be witnessed.
- 2.11 Running tests on steam turbines to be witnessed.
- 2.12 Final inspection and dimensional check on steam turbines to be done.
- 2.13 Check all test certificates.

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## **PART –II (TECHNICAL)**

### **SECTION –10.0**

#### **SPARE PARTS**

**PLANT: SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES**

**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

	<b>CONSTRUCTION OF ASH POND AND ALLIED FACILITIES AT TFL, TALCHER</b> <b>SPARES PARTS</b>	PC183/E/206/S-VI-10.0	0	
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3.0	Vendor recommended spare parts

**LIST OF ATTACHMENTS**

ATTACHMENT NUMBER	DESCRIPTION	NUMBER OF SHEETS

	<b>CONSTRUCTION OF ASH POND AND ALLIED FACILITIES AT TFL, TALCHER</b> <b>SPARES PARTS</b>	PC183/E/206/S-VI-10.0	0	
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## 1.0 SPARES PARTS FOR COMMISSIONING:

Bidder shall supply free of cost spare parts and consumables (except raw materials and Utilities supplied by others) required during Pre-commissioning & Commissioning of the plants until the plant is handed over to the Owner after Performance Test.

## 2.0 MANDATORY SPARE PARTS

Bidder shall supply mandatory spare parts as per list of spares as detailed below:

- i) Centrifugal Fan
- ii) Centrifugal Pump
- iii) Reciprocating Pump
- iv) Metering Pump
- v) Agitator

## 2.5 Fan / Blower:

SL. NO.	DESCRIPTION	QUANTITY FOR EACH EQPT
1.0	Completely dynamically balanced rotor assembly including impeller, wheel, key etc.	1 Set
2.0	Shaft sleeve	1 Set
3.0	Complete set of all Bearings	1 Set
4.0	Stuffing box packing rings	1 Set
5.0	Complete set of all Gasket & 'O' rings	1 Set
6.0	Complete mechanical seal , if applicable	1 Set
7.0	Coupling bushes	1 Set
8.0	Complete set of coupling with elements	1 Set
9.0	V-Belt (If applicable)	2 nos
10.0	Instrumentation	
	As per Instrumentation specification	
11.0	Electrical	
	As per Electrical specification enclosed with enquiry / order specification.	

## 2.8 Centrifugal Pump:

SL. NO.	DESCRIPTION	QUANTITY			
		NO. OF PUMPS WORKING			
		1	2	3	4
1.	Impeller	1 set	1 set	1 set	1 set
2.	Impeller locking nut	2 sets	2 sets	2 sets	2 sets
3.	Wear Rings complete set	1 set	2 sets	3 sets	4 sets
4.	Shaft with keys	1 No.	1 No.	1 No.	1 No.
5.	Shaft Sleeve	1 set	2 sets	3 sets	4 sets

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6.	Interstage sleeves	1 set	2 sets	3 sets	4 sets
7.	Interstage Bushes	1 set	2 sets	3 sets	4 sets
8.	Complete Set of Mech. Seal where applicable	1 set	1 set	2 sets	2 sets
9	Constant level Oiler	2 sets	2 sets	2 sets	2 sets
10	Deflectors	2 sets	2 sets	3 sets	3 sets
11	Complete set of coupling with element and fasteners	1 set	1 set	2 sets	2 sets
12	Complete set of all Bearings	1 set	2 sets	2 sets	2 sets
13	Complete set of Gaskets & 'O' Rings	2 sets	3 sets	4 sets	6 sets
14	Labyrinths	2 sets	3 sets	4 sets	5 sets
15	Throat Bushing	1 No.	2 Nos.	3 Nos.	4 Nos.
16	Throttle Bushing	1 No.	2 Nos.	3 Nos.	4 Nos.
17	Complete set of Oil Seals	2 sets	3 sets	4 sets	6 sets
18	Balancing drum & sleeves, as applicable.	1 set	1 set	2 sets	2 sets
19	Leak-off valve-gaskets, 'O' Rings and springs	2 sets	3 sets	4 sets	5 sets
20	Spares for gear box ( complete set of bearings, all gears wheels with shaft and seals)	1 set	1 set	1 set	1 set
	<b>Instrumentation</b>				
	As per Instrumentation specification				
	<b>Electrical</b>				
	As per Electrical specification enclosed with enquiry / order specification.				

## 2.9 Reciprocating Pump:

SL NO.	DESCRIPTION	QUANTITY			
		NO. OF PUMPS WORKING			
		1	2	3	4
<b>A</b>	<b>Main Frame</b>				
1.	Main Bearings	1 set	1 set	1 set	1 set
2.	Big End Bearings	1 set	1 set	1 set	1 set
3.	Thrust Bearings	1 set	1 set	2 sets	2 sets
4.	Crosshead shoes	1 set	1 set	1 set	1 set
5.	Crosshead bushes	1 set	1 set	1 set	1 set
6.	Connecting rod with complete Fasteners for all size	2 sets.	2 sets	4 sets	4 sets
7.	Crank shaft	1 No.	1 No.	1 No.	1 No.
8.	Lube oil pump	1 No.	1 No.	1 No.	1 No.
9.	Spare parts for lube oil pump (set of gears, bushes, gaskets etc.)	1 set	1 set	2 sets	2 sets
10.	Cartridge for oil filter.	2 Nos.	2 Nos.	4 Nos.	4 Nos.
11.	Special gaskets, oil seals, 'O'	2 sets	2 sets	4 sets	4 sets

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	rings, special bolts etc.				
<b>B</b>	<b>Fluid End</b>				
1.	Cylinders	1 No.	1 No.	2 Nos.	2 Nos.
2.	Plungers / piston & piston rod assembly, piston rings (if applicable)	1 set	1 set	1 set	1 set
3.	Stuffing box Packings	2 sets	2 sets	4 sets	4 sets
4.	Plunger Packings	2 sets	2 sets	4 sets	4 sets
5.	Complete set of Suction valve & seat	1 set	2 sets	3 sets	4 sets
6.	Complete set of Discharge valve & seat	1 set	2 sets	3 sets	4 sets
7.	Flushing pump (if applicable)	1 No.	1 No.	1 No.	1 No.
8.	Spares for flushing pump.	1 set	1 set	2 sets	2 sets
	- Plunger - Plunger Packings - Valves - Gaskets				
9.	Special gaskets, springs, 'O' rings, and ring nuts for stuffing box packing, cylinder bolts.	2 sets	2 sets	4 sets	4 sets
<b>C</b>	<b>Gear Reducer (If Applicable)</b>				
	Spares for gear box ( complete set of bearings, all gears wheels with shaft and seals)	1 set	1 set	2 sets	2 sets
<b>D</b>	<b>Lube Oil Coolers (If Applicable)</b>				
1.	Special gaskets, if any	2 sets	2 sets	4 sets	4 sets
2.	Spare tubes.	10 %	10 %	10 %	10 %
	<b>Instrumentation</b>				
	As per Instrumentation specification				
	<b>Electrical</b>				
	As per Electrical specification enclosed with enquiry / order specification.				

## 2.10 Metering Pump:

SL. NO.	DESCRIPTION	QUANTITY			
		NO. OF PUMPS WORKING			
		1	2	3	4
<b>A</b>	<b>POWER END</b>				
1.	Main Bearings	1 set	1 set	1 set	1 set
2.	Big End Bearings	1 set	1 set	1 set	1 set
3.	Crosshead shoes	1 set	1 set	1 set	1 set
4.	Crosshead bushes	1 set	1 set	1 set	1 set
5.	Connecting rod with complete Fasteners for all size	2 sets.	2 sets	4 sets	4 sets
6.	Special gaskets, oil seals, 'O'	2 sets	2 sets	4 sets	4 sets

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	rings , special bolts etc.				
<b>B</b>	<b>FLUID END</b>				
1.	Cylinders	1 No.	1 No.	2 Nos.	2 Nos.
2.	Plungers	1 set	1 set	1 set	1 set
3.	Diaphragm	1 set	2 sets	3 sets	4 sets
4.	Stuffing box Packings	2 sets	2 sets	4 sets	4 sets
5.	Complete set of Suction valve & seat	1 set	2 sets	3 sets	4 sets
6.	Complete set of Discharge valve & seat	1 set	2 sets	3 sets	4 sets
7.	Special gaskets , springs , 'O' rings , ring nuts for stuffing box packing , cylinder bolts	2 sets	2 sets	4 sets	4 sets
	<b>Instrumentation</b>				
	As per Instrumentation specification				
	<b>Electrical</b>				
	As per Electrical specification enclosed with enquiry / order specification.				

## 2.12 Agitator:

SL. NO.	DESCRIPTION	QUANTITY			
		NO. OF AGITATOR WORKING			
		1	2	3	4
1.	Complete set of all Bearings	1 set	1 set	1 set	1 set
2.	Complete set of High speed flexible coupling with bushes / elements.	1 set	1 set	1 set	1 set
3.	High speed Coupling bushes	3 sets	3 sets	4 Sets	4 Sets
4.	Complete set of Low speed flexible coupling with bushes / elements.	1 set	1 set	1 set	1 set
5.	Low speed Coupling bushes	3 sets	3 sets	4 Sets	4 Sets
6.	Complete set of all Oil seal for gear box	1 set	1 set	1 set	1 set
7.	Complete set of all Oil seal for bearing housing	4 set	4 set	6 set	6 set
8.	Complete set of Seal packing.	2 sets	2 sets	4 sets	4 sets
	<b>Instrumentation</b>				
	As per Instrumentation specification				
	<b>Electrical</b>				
	As per Electrical specification enclosed with enquiry / order specification.				



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### 2.13 EOT Cranes:



SL. NO.	DESCRIPTION	QUANTITY
1.	Wire rope for main hoist	1 set
2.	Wire rope for auxiliary hoist	1 set
3.	Rope guide for main hoist	1 set
4.	Rope guide for auxiliary hoist	1 set
5.	Brake linings of each type	2 sets
6.	Gear sets	2 sets
7.	All type of bearings	2 sets
8.	All type of Seal, Gaskets, O-rings	2 sets

#### Notes:

- 1) 'Set' means complete replacement of particular part in the machine.
- 2) Vendor's Recommended Spare Parts: Bidder shall submit list of recommended spare parts of specialised items not covered mandatory spares, along with itemised price. Owner will review and decide the recommended spares required for the project.

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## SPARE PARTS - MATERIAL HANDLING

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SECTION NUMBER	DESCRIPTION
1.0	Spare parts for Commissioning
2.0	Mandatory spare parts
3.0	Vendor recommended spare parts

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## 1.0 SPARES PARTS FOR COMMISSIONING:

Contractor shall supply free of cost spare parts and consumables (except raw materials and Utilities supplied by others) required during Pre-commissioning & Commissioning of the plants until the plant is handed over to the Owner after Performance Test.

## 2.0 SPARE PARTS FOR TWO YEARS OPERATION (MANDATORY SPARES):

Contractor/Bidder shall provide the list of spare parts for first two years of operation of the equipment as recommended by OEM (Original Equipment Manufacturer) with recommended quantities and itemized prices covering the below listed spares. Proper coding and referencing of spare parts shall be done so that later identification with appropriate equipment is facilitated. Recommended spares and their quantities shall take into account related factors of equipment reliability, effect of equipment downtime upon production or safety, cost of parts and availability of vendor's service facilities around the proposed location of equipment.

### A. Material Handling

SL. NO.	Description	Quantity (In % of total actual qty. used/Nos./Sets)
<b>1.0</b>	<b>Conveyors System</b>	
<b>A.</b>	<b>Pulleys</b>	
1.	Head Pulley for conveyors	10%, min. 1 no.
2.	Tail Pulley for conveyors	10%, min. 1 no.
3.	Snub Pulley for conveyors	10%, min. 1 no.
4.	Bend Pulley for conveyors	10%, min. 1 no.
5.	Take-up Pulley for conveyors	10%, min. 1 no.
<b>B.</b>	<b>Plummer Blocks</b>	
1.	Plummer block with bearing for Head Pulley	10%, min. 2 nos.
2.	Plummer block with bearing for Tail Pulley	10%, min. 2 nos.
3.	Plummer block with bearing for Snub Pulley	10%, min. 2 nos.
4.	Plummer block with bearing for Bend Pulley	10%, min. 2 nos.
5.	Plummer block with bearing for Take-up Pulley	10%, min. 2 nos.
<b>C.</b>	<b>Rollers</b>	
1.	Carrying Rollers for conveyors	10%
2.	Return Rollers for conveyors	10%



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3.	Impact Rollers for conveyors	40%
4.	Guide roller for self-aligning idler	40%
<b>D.</b>	<b>Idlers</b>	
1.	Carrying Idlers for conveyors	10%
2.	Return Idlers for conveyors	10%
3.	S.A Carrying Idlers for conveyors	10%
4.	S.A Return Idlers for conveyors	10%
5.	Impact Idlers for conveyors	40%
<b>E.</b>	<b>Couplings</b>	
1.	Coupling	10%
<b>F.</b>	<b>Gear Box</b>	
1.	Gear box	10%
<b>G.</b>	<b>Vibrating Screens &amp; Feeder</b>	
1.	Vibrator Assembly for Oversize Process screens	1 No.
2.	Vibrator Assembly for Oversize Fine Process screens	1 No.
3.	Vibrator Assembly for Polishing screens	1 No.
4.	Clamp Plate (Wire Mesh)	6 Nos.
5.	Clamp Plate ( Perforated Plate)	6 Nos.
6.	Washer seat	30 Nos.
7.	Spherical Washer	30 Nos.
8.	Wire Cloth ( 01 Set)	5 Nos.
9.	"J" Bolt	30 Nos.
10.	Bearing	2 Nos.
11.	Bearing Cartridge	2 Nos.
12.	Vibrator Assembly for Feeders	1 No.
13.	Spring	8 Nos.
14.	Spring Mount Bolts	4 Nos.
15.	Perforated Plate Top Deck	9 Nos.
16.	V Belt	2 Sets
17.	Sheave (Drive)	1 No.
18.	Sheave (Driving)	1 No.

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## SPARE PARTS-INSTRUMENTATION

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## 1.0 SPARES PARTS FOR COMMISSIONING:

LSTK Contractor shall supply free of cost spare parts and consumables required during Pre-commissioning & Commissioning of the plants until the plant is handed over to the Owner after Performance Test.



## 2.0 MANDATORY SPARE PARTS

LSTK Contractor shall supply mandatory spare parts as per list of spares as detailed below:

### 2.1 Instrumentation Items:



- 1) Set means complete replacement of particular part in one machine.
- 2) Wherever "Each Type" is specified, it means "of the Type/make/model/size/rating and exactly replaceable"
- 3) Wherever "% qty." is specified, Bidder to quote in next higher rounded figure
- 4) Out of % age spares and minimum qty specified against each item - higher of the two shall be supplied.

Sl. No.	DESCRIPTION	QUANTITY
1.0	<b>Field instruments</b>	
	Pressure Gauges, Differential Pressure Gauge, Draft Gauges, Field Indicators, RTD/T/C with Thermowells, welded thermowell, Skin Thermocouple Sets, Speed Probes with Cables and Fixing Screws and Bolts, Vibration Probes, with Cables (including extension cable) and Fixing Screws and Bolts, Speed Transmitter with Cables and Fixing Screws and Bolts, Proximeters of diff. model and Fixing Screws and Bolts, Gas Sensors with Cables and Fixing Screws and Bolts	10% of each type of instruments, subject to minimum 2 nos. of each type
	Pressure Switches, DP Switches, Purge Rotameters	10% of each type of instruments, subject to minimum 2 nos of each type
	Special thermocouples ( like reactors) /multipoint thermocouples,	10% of each length subject to minimum 1 number of each type.
	Skin Type Thermocouple-	10% of total subject to minimum 1 number Complete Set of each type.
	Float and micro switch assembly for level switch	10% of each length subject to minimum 1 number of each type.
	Transmitters for Flow, Pressure, Temperature, Level, Diff. Pressure application, Remote Seal Transmitter, Transmitter for LEL/GAS Detector System including Sensors .	10% of each type of instruments, subject to minimum 2 nos of each type
	Hydra Step	1 no. Electronic unit or 10% subject to minimum. 20% or Min 3 Nos of Sensor Probes



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	Mass flow meter & Mag Flow meter	A) Power fuses 6 nos per set B) Sensor assembly-10% min 1 no C) 10% or minimum one number complete electronic head unit
	Vortex Flow Meter	A) One sensing probe ,one set of gasket and Packing for each type and Size B) 10% or minimum one number complete electronic head unit
	Ultrasonic Flow meter	A) 1 pair probe for each instrument B) 1 number electronic card of each type C) 2 numbers fuses of all Types.
	<b>Glass tube Rota meters</b>	<b>20% or min 2 Nos of glass tubes of each size/rating /make.</b>
	Variable Area Metal tube Flow meter (Rota meters)	10% or minimum one no. float & set of Packing for each type, size, rating and material
	Averaging Pitot Tube	Set of Gasket, O-ring, Packing for Retract Mechanism and one no. Needle Valve with each Pitot Tube.
	Flame scanners and optical pyrometer a) Electronics b) Detectors / sensors or spares with limited life	a)10% subject to minimum 1 No. of each type. b)As required for 1 year operation or Min 2 Nos Complete flame scanner
2.0	Displacer type Level Transmitters	A) 10% of each type of instruments head with Torque Tube Assembly and Transmitter, subject to minimum 2 nos of each type. 1 No of float of each type. B) 10% Electronic cards and Display module – Minimum 1 no. of each type
2.1a	Ultrasonic / Guided Wave Radar Type – Level Instrument	A) 10% complete Instrument – Minimum 1 No. of each Type / Range / Material B) 10% Electronic – module / Cards /Display module – Minimum 1 no. of each type
2.2	Level gauge- Transparent / Reflex Type	20% subject to minimum 10 numbers of glass along with pair of Gaskets and glands sets for I/V valves of each type, size (Cushion & Wet Gaskets), whichever is higher.





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2.2.1	Level Gauge- Magnetic Type	10% subject to minimum 1 set of Float, Magnet/ball follower-ring gaskets of each type.
3.0	<b>Control Valve, Shut Down, On-Off, Butterfly, Ball Valves, Gate Valves, Angle Valves, PCV, MOV, Safety Valve Spares</b>	
3.1	Soft part / actuator spares, including actuator diaphragm, actuator seal kit and spring sets, for each type of actuator	20% of each type of instruments, subject to minimum 1 no. of each type
3.2	Trim Set	Trim set consisting of seat ring / seal ring, plug with stem, cage (wherever applicable), packing material for each make, type, size, pressure rating valve to be provided as spare
3.3	Complete Actuator with Hand Wheel assembly	one complete Actuator for each type and size
3.4	<b>Complete Spare Control Valve for Antisurge Control Valve</b>	<b>One No</b>
3.5	Gland packing, O rings, Packing and Bonnet gasket, seat gasket	100 % for each valve. i.e. one set for each tag.
3.6	Greases and grease guns	5 sets of each type of grease and 1 grease gun of each type
3.7	Solenoid valves	10% of each type of instruments, subject to minimum 2 nos of each type
3.8	Proximity switches including enclosure	10% of each type of instruments, including enclosure- subject to minimum 2 nos of each type
3.9	SMART Positioners	10% of each type of instruments, subject to minimum 2 nos of each type
3.11	Other accessories: Quick Exhaust relay, Volume Boosters, Air Filter regulators, position Transmitters, change over relay, NRV, Pilot valves.	10% of each type of instruments, subject to minimum 3 nos of each type. Air filter regulator shall be minimum 20%.
3.12	PRDS & De-super heater unit	a) Same as those of Control Valves b) Gaskets for valve and connections per unit (if such gaskets, are special and supplied by PRDS/De-Super heater vendor
3.13	For PCV Repair kit consisting of (orifice, plug, spring, gasket, diaphragm, spring, O-ring for each valve.	20% or minimum 1 no. in each type
3.14	HHT loaded with latest HART configurator software (Emerson make)	1 no. minimum
3.15	Safety Valve:	Set of each type/ size. 1 Set comprising of 1 upper adjusting ring, 1 lower adjusting ring, 1 disk, 1 Nozzle, 1 stem & 1 Gasket set

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		20% of each size and rating of Discs, Nozzles, bellows, springs etc. Additionally Minimum 2 Nos of Complete PSV for critical application (Very high pressure PSV's e.g Boiler drum application etc.)
4.0	DCS, ESD, F&G PLC, Storage PLC, Analyser PLC, Any other Control and PLC system.	
4.1	CPU	10% or minimum 1 no. each type.
4.1a	Communication cards, Processor cards (Controller) ,FTA cards	2 nos of each type of cards.
4.2	System Pre-fab cables, I/O Card cables, communication bus cables.	10% or min. 5 sets of each type with all connectors, plugs,
4.3	Racks, Backplane units	2 Nos each type
4.4	Local Panel, Hardwire console & annunciator All items like Push buttons, indicators, hand switches lamps, relays selector switches, IS type indicators / Annunciators, holders etc. mounted in the local panel	10% or minimum 2 no. each type.
4.5	HDD unit	2 set of each type (normal as well as Raid-5) with all connectors, plugs.
4.6	Various Keyboards (including operator keyboard) /mouse	2 nos. of keyboard each type and 5 Nos. of mouse.
4.7	Relays	5% of each type of relays, including relevant terminal modules/sockets minimum 5 nos of each type
4.8	Pushbuttons, Lamps, Selector switches	10% of each type , including relevant terminal modules/accessories as a complete set
4.10	All type of system/PDB/Marshalling cabinet /console filters	100%
4.11	All type of system/PDB/Marshalling cabinet/console fan	2 Nos of each type including relevant terminal modules/pre-fab system cables.
4.12	All type of system/PDB/Marshalling cabinet/console Tube light	2 Nos of each type.
4.13	All type of various PDBs Voltmeters	2 Nos of each type.
4.14	I/O Cards	20% of each type of card, including relevant terminal modules/pre-fab system cables, etc., subject to minimum of 5 nos. each
4.15	Various System Battery, Terminators	1 no. of each type
4.16	All system Fuses and various glass fuses	100% for imported fuses
4.17	All PDB fuses, like HRC, GSA Fuses	100% of total qty. of each type
4.18	MCBs	5 Nos. of each type
4.19	Terminal Blocks	Spare Terminal Blocks along with DIN

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		rail – 100 nos each type
4.20a	Cables for wiring inside Marshalling Racks of DCS of relevant size	100 mtr of each color and size
4.20b	Cables for wiring inside Marshalling Racks of ESD of relevant size	100 mtr of each color and size
4.21	24 V DC Bulk Power Supply modules	Min. 2 nos of each type
4.22	System DC Power supply for DCS	Min. 2 nos of each type
4.23	System DC Power supply for ESD	Min. 2 nos of each type
4.23 a	Diode-o ring modules	10% or minimum 1 no. each type.
4.24	Safety barriers, active isolators, signal convertors, trip amplifiers, signal multipliers	10% of each type of instruments, subject to minimum 5 nos of each type
4.25	Hubs, Bus units, Switches, Routers	20% or Min 1 nos of each type
4.26	OPC / Modbus interface Cards	1 No each along with connectors / cables
4.27	DCS operator and engineering subsystem	
	Communication card Operator Station communication bus	1 No.
	Communication card for Engineering Station communication bus	1 No.
	Motherboard for Operator Workstation	1 No.
	Motherboard for Engineering Workstation	1 No.
	SMPS	1 No.
4.28	PLC operator and engineering subsystem	
	Communication card for PLC programming Station communication bus	1 No.
	Communication card for PLC SOE Station communication bus	1 No.
	Communication card for PLC Operating Station communication bus	1 No.
5.0	<b>Special control system modules</b> a) Woodward Digital Governor, b) Woodward PROTECH 2003/Braun Speed Trip unit, Speed Probes c) Any other Control system module associated with Speed trip and Monitoring system. d) Voith Make E/H Converters.	1 no. of each (Controller, IOs ,cables, barriers Complete unit). Speed Probe - 2 nos of Speed Governing, 2 nos for Over speed Trip. <ul style="list-style-type: none"> <li>• 1 no of each electronics &amp; sensor</li> <li>• 1 no I/H converter complete set.</li> </ul>
6.0	<b>Bentley Nevada 3500 Series Vibration Monitoring System Spares</b>	
6.1	Central Rack cards : Power supply card, Vibration/Thrust Monitoring card, Axial displacement card, Speed monitor card, Key phasor module, Relay module, Display Unit., transducers and transmitters	20% of each type of cards, subject to minimum 2 nos of each type

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6.2	Vibration probes with leads, axial displacement probes with leads, Bearing thermo elements, speed probes with leads, I/H converter, E/H Converter, trip solenoid valves, transducers, barriers for vibration probes/ Proximeter.	10% or minimum 1 no. of each type. Proximeter 20%
<b>7.0</b>	<b>Consumables for DCS</b>	
7.1	Printer papers A3, A4 size	A3- 10 Rims, A4- 50 Rims
7.2	Laser Cartridges (Black and Color)	For 6 month usage, min. 2 sets for each printer
7.3	DATs of HP/ 3-M	25 nos. each
7.4	CDs of HP/Samsung	200 with individual casing
7.5	DVDs of HP/Samsung	200 with individual casing
<b>8.0</b>	<b>GC Spares</b>	
a	Set of Filters	1 set
b	Detector Assembly	1 set
c	PCB assembly Power Supply	2 nos.
d	PCB assembly Digital temp control	2 nos each type
e	Pressure Regulator	1 no
f	Thermocouple Assembly	1 no
g	Sol Valve	1 no
h	Backplane Assembly	1 no
i	PCB Assembly	1 no
j	Ignitor Assembly	1 no
k	Pressure Sensor	1 no
l	Filament Kit	2 nos
m	Set of Fuses	1 no
n	Set of Fittings	1 no
o	Pressure Gauge	1 no
p	Temperature gauge	1 no
q	Sample flow meter	1 no
r	Bypass flow meter	1 no
<b>9.0</b>	<b>Gas Analyzer Spares applicable for all Gas Analyzers / MassSpectrometer</b>	
a	Sample Flow Meter	1 no
b	By pass Flow meter	1 no
c	Solenoid Valve	1 no
d	Communication board	1 no of each type
e	Display Unit	1 no each type
f	CPU Board	1 no each type
g	Sensor Electronic	1 no each type
h	Modulation Unit	1 no each type
i	Sample Cell	1 no
j	Sensor	1 no each type
k	O Ring	3 sets

	<b>CONSTRUCTION OF ASH POND AND ALLIED FACILITIES AT TFL, TALCHER</b> <b>SPARES PARTS</b>	PC183/E/206/S-VI-10.0	0	
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l	Thermal fuses	2 sets
m	Heating cartridge	1 set
n	Thermal trip	2 set
o	Analogue module	1 set each type
p	Filter membrane (pack of 25)	1 set
q	Fuse	1 set each type
10.0	<b>pH / Conductivity Analyzer</b>	2 (Two) Complete Analyzer complete with sensor, cables, transmitters etc of each type
11.0	<b>Silica Analyzer/Sodium/chlorine/ moisture /Turbidity /density/O2/CO/NOx/SPM Spares</b>	
a	Sensor board	1 no.
b	Sensor and Detector	1 no each type
c	Rotameter ( if applicable)	1 no.
d	Pressure Control Valve ( if applicable)	1 no.
e	Fuses	5. sets.
f	Electronic card	1 no. each type
g	Other Aux. Cards	1 each
h	Probe	1 no. each type
i	Filters, O-rings, Gaskets	2 sets
j	Consumable Kit	2 sets
12.0	<b>Sample Conditioning system applicable for all analyzers / Mass spectrometer</b>	
a	Complete sample kit for sample pumps inclusive of 'O' rings, Seal ring, Diaphragm	1 set
b	Solenoid valve for, more than one stream application	1 no
c	Flow switch	1 no
d	Vaporization system if required, which includes vaporizer, thermostat, electrical tracing cable and heater	1 set
e	Cooling system if required, which includes one cooler, flow conditioning system	1 set
f	Sample handling system fitting, valves, pressure gauges, regulators, solenoid valves, flow meters / flow switches and other components, etc	10% or minimum 1 no. of each type
g	Consumables like filters, membranes, reagents, cal. Gas, carriers	For 1 year of continuous operation
13.0	<b>Flame Scanner</b>	Two complete instrument of each type
13A	<b>Ignition System</b>	
1.	Ignition Transformer	1 no
2.	Trip Amplifier	1 no
3.	Solenoid Operated Valve	1 no
4.	PCV	1 no
5.	Push Buttons	1 Set

	<b>CONSTRUCTION OF ASH POND AND ALLIED FACILITIES AT TFL, TALCHER</b> <b>SPARES PARTS</b>	PC183/E/206/S-VI-10.0	0	
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6.	Auto Manual Switch	1 Set
7.	Pilot Burner	1 no
8.	Pressure Gauges for each range	1 no + 1 Set
14.0	Ferruling machine	1 no along with printer ribbon and sleeves size of 5.0 mm <sup>2</sup> and 3.5 mm <sup>2</sup> 100 meter each
	<b>Other Items</b>	
15.0	Snubber, Syphon, Gauge Saver	10% (subject to minimum of 2) of each item used, whichever is higher
16.0	Loop powered indicators	10% (subject to minimum of 2) of Loop powered indicators used, whichever is higher
17.0	Panel mounted instruments	10% or minimum one no. whichever is higher
25.0	<b>Tools</b>	
25.1	Technician's Tool Kit Set including screw drivers, slide wrench, O & D Spanners Kits	10 nos
25.2	Crimping Tool for RJ-45 Connector, Tapria	5 nos
25.3	Crimping Tool 0.5 to 4.0 mm <sup>2</sup> wire, Tapria	5 nos
25.4	Crimping Tool BNC connector for Bentely Nevada	2 nos
25.5	Torque Wrench (Adjustable)	2 nos
25.6	Insulation Remover	5 nos
25.7	IC Puller	2 nos of each type
25.8	Logic probe	2 nos.
25.9	Screw driver kit (Taparia make)	5 set
25.10	Allen Key Set ( 1mm to 8 mm)	5 set
25.11	Lamp puller	3 nos.
25.12	Torches (LED) handheld	10 nos
25.13	Torches (Head Lamp)	10 nos
25.14	Battery charger alongwith 1 set of batteries	2 nos of each type
26.0	CCTV camera, camera station, lens with zoom, Pan & Tilt Unit, Receiver Unit, electronic unit, , power supply, etc.	10% or minimum one of each type of module.
27.0	EPABX Unit, Electronic Card each type	10% or minimum one of each type of module.
28.0	Gas Detector system a) Transmitter assembly (including field display) b) Sensors	10% subject to minimum 1 No. of each type.  20% subject to minimum 2 No. of each type
29.0	Smoke Detectors , MCP, Sounders, Hooters	10% or minimum one of each type of module.
30.0	Pressure Relief Valves/Thermal Relief Valves/ Vacuum Relief Valves / Low Pressure Relief Valves / Pilot Operated Valves	10% of minimum one of each type & size for nozzle, disc insert, guide whichever is higher

	<b>CONSTRUCTION OF ASH POND AND ALLIED FACILITIES AT TFL, TALCHER</b>  <b>SPARES PARTS</b>	PC183/E/206/S-VI- 10.0	0	
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30.0a	Rupture Disc	2 spare disc for each Tag.
31.0	MOVs Main PCB of each type Local / Remote / off Selector Switch each type Open / close / stop Selector Switch each type	1 Nos 1 Nos 1 Nos
31.0	<b>Installation Material</b>	
31.1	Instrument valves and	10% subject to minimum 1 no. of each type.
31.1.1	Valve manifolds	10% subject to minimum 3 no. of each type.
31.2	Tube fittings	10% subject to minimum 10 no. of each type.
31.3	Tubes	10% of the total length of each type
31.4	Cables	10% of the total length of each type
31.5	Junction boxes and cable glands	10% subject to minimum 1 no. of each type

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<b>SPARES PARTS</b>				

## SPARE PARTS-PIPING



 <b>पी डी आई एल PDIL</b>	<b>CONSTRUCTION OF ASH POND AND ALLIED FACILITES AT TFL, TALCHER</b>  <b>SPARES PARTS</b>	PC183/E/206/S-VI/10.0	0	
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### **PIPING ITEMS:**

Following spares are to be supplied for the Piping Bulk Materials:

Sl. No.	Part Description	Size Range (NB)	Quantity Required (% of as built)	Remark
1	Pipes & Fittings	≤1.5"	5%	min. qty. 6 mtr. / 1 No.
2	Pipes & Fittings	≥ 2"	2%	min. qty. 6 mtr. /1 No.
3	Flanges	≤1.5"	5%	min. qty. 1 No.
4	Flanges	2" to 6"	5%	min. qty. 1 No.
5	Flanges	8" to 36"	2%	min. qty. 1 No.
6	Valves	≤1.5"	5%	min. qty. 1 No.
7	Valves	2" to 14"	5%	min. qty. 1 No.
8	Valves	≥16" with rating ≥900#		Note-5
9	Bolts, Nuts & Gaskets (For each size, rating, material)		10%	min. qty. 1 No.
10	Traps (For each size, rating, material)		2%	min. qty. 1 No.
11	Expansion Bellow (For each size, rating, material)		10%	min. qty. 1 No.
12	Strainer element (For each size, rating, material)		10%	min. qty. 1 No.
13	Complete Gear Box for gear operated Valves		5%	min. qty. 1 No.
14	Seal ring for the Pressure seal type valves		5%	min. qty. 10 Nos.
15	Hose assembly		50%	min. qty. 10 Nos.
16	Bolt torque wrenches (Manual)		1 set (Note-6)	min. qty. 1 set.
17	Bolt torque wrenches (Hydraulic)		1 set (Note-6)	min. qty. 1 set.
18	Bolt tensioning for equipment		1 set (Note-6)	min. qty. 1 set.

### **Note (Piping items):**

1. Percent of quantity required as mandatory spares is for each and every item/size/material consumed in as built.
2. No substitution in size, rating and material is allowed.
3. Pipe length in meter and other items in No. or Set shall be supplied.
4. Fractional part of quantity shall be converted into nearest upward whole part.
5. For rating ≥900# and sizes ≥16", minimum one qty. valve spare shall be supplied for each size, rating & material.
6. Quantity shall be supplied irrespective of as built/installed.



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## **VENDOR LIST**

**FOR**

### **SUPPLY & CONSTRUCTION OF ASH POND AND ALLIED SERVICES**

**PROJECT: INTEGRATED COAL BASED FERTILISER  
COMPLEX, AT TALCHER, ANGUL  
DISTRICT, ODISHA (INDIA)**

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TALCHER FERTILIZER PLANT, ODISHA VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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## MATERIAL HANDLING

### SUB-VENDOR LIST:

Contractor/Bidder shall select sub vendors from the vendor list as specified below. However, if, bidder is the manufacturer of any item, it shall be acceptable subject to furnishing of proven track record/credential by bidder for similar or comparable plant design capacity and approval of owner/consultant during detail engineering stage. Bidder shall ensure that sub vendor for the specified item has supplied item for the specified service & the supplied item is in satisfactory service since last 3 years as on date of offer.

Any equipment/item for which vendor list is not enclosed; Contractor/Bidder shall furnish a list of proposed vendors along-with their references for supply for the specified services of similar type of equipment. However, all proposed additional sub-vendors shall have proven track record/credential and shall be subjected to owner's / consultant approval during detail engineering.

### A. MATERIAL HANDLING

SL. No.	Vendor's Name	Country
<b>Conveyor Belting</b>		
1.	MRF Ltd.	India
2.	Phoenix conveyor belt limited	India
3.	Oriental Rubber Industries Ltd.	India
4.	Universal Conveyor belting ltd.	India
5.	Anil Rubber pvt. Ltd.	India
<b>Gear Reducer &amp; Gear Boxes</b>		
1.	Radicon	India
2.	New Allenbury Works.	India
3.	FMG	India
4.	Elecon Engg. co. Ltd.	India
5.	Shanti	India
6.	Premium	India
<b>Couplings</b>		
1.	Fenner India ltd.	India
2.	New Allenbury Works	India
3.	Elecon Engg. co. Ltd.	India
4.	Hi-Cliff	India
5.	David Brown	India
6.	FMG	India



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SL. No.	Vendor's Name	Country
<b>Bearings</b>		
1.	SKF India Ltd.	India
2.	FAG Bearing India Ltd.	India
<b>Skirt Board Sealing System</b>		
1.	TEGA India Ltd.	India
2.	Kaveri ultra-polymers Ltd.	India
<b>External Belt Cleaner</b>		
1.	Hosch equipment India Ltd.	India
2.	Kaveri ultra-polymers Ltd.	India
<b>Continuous Belt weigher</b>		
1.	Encardio-rite Electronics pvt. Ltd.	France
2.	Transweigh (India) ltd.	India
3.	Weitex India limited	India
4.	Preciamolen	India
5.	Schenck Process	India
<b>Vibrating Screen</b>		
1.	Elecon Engg. Co. Ltd	India
2.	Mcnally Bharat Engg. Co.	India
3.	TRF Ltd.	India
4.	International Combustion India Ltd.	India
5.	J&H Equipment	USA
6.	Rhewum	Germany
<b>Electric Hoists</b>		
1.	Elecon Engg. Co. Ltd	India
2.	Greaves Ltd.	India
3.	W.H. Brady & Co. Ltd	India
4.	Hercules Hoists Ltd.	India
<b>Chain Pulley Block</b>		
1.	Hercules Hoists Ltd.	India
2.	W.H. Brady & Co. Ltd	India
3.	Mangla Hoist & Hydraulics Ltd.	India
4.	Tractel Tirfor India Pvt. Ltd.	India

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## VENDOR LIST-ELECTRICAL

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TALCHER FERTILIZER PLANT, ODISHA VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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## A. ELECTRICAL

<b>Transformers – 11 kV &amp; Below</b>		
1.	GE T&D India Limited ( Formerly known as Alstom T&D Ltd)	India
2.	ABB Power Products and System India Ltd	India
3.	CG Power and Industrial Solution Limited ( Formerly known as Crompton Greaves Ltd)	India
4.	Siemens Ltd.	India
5.	Toshiba Transmission & Distribution System India Pvt Ltd	India
6.	Bharat Bijlee Ltd	India
7.	Kirloskar Electric Company Ltd.	India
8.	Voltamp Transformers Ltd.	India
9.	Indcoil Transformers Pvt. Ltd.	India
10.	Esennar Transformers (P) Ltd.	India
<b>Auxiliary Supply Transformers</b>		
1.	Esennar Transformers (P) Ltd.	India
2.	Gujarat Plug-In Devices Pvt. Ltd. (Upto 300 KVA)	India
3.	IMP Power Ltd.	India
4.	Indcoil Transformers Pvt. Ltd.	India
5.	Kalpa Electrical Pvt. Ltd.	India
6.	Mehru Electricals (Formerly Automatic Electric Limited)	India
7.	Shephard Transformers Ltd.	India
8.	Vardhman Electro-mech Pvt. Ltd.	India
<b>415 V SWITCH BOARD(PCC/MCC/PMCC)</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	GE Power Controls India Pvt. Ltd.	India
3.	Larsen & Toubro Ltd.(EI.Products Divn)	India
4.	Siemens Ltd.	India
5.	Schneider	India
6.	Intrelec	India
<b>Floor Mounting Type Distribution Boards</b>		
1.	Associated Switchgears & Projects Ltd.	India
2.	C & S Electric Ltd	India
3.	Elecmach Corporation	India
4.	GE Power Controls India Pvt. Ltd.	India
5.	Intrelec	India
6.	Jakson Engineers Ltd	India
7.	Larsen & Toubro Ltd.(EI.Products Divn)	India



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8.	Lotus Powergear Pvt Ltd	India
9.	Siemens Ltd.	India
10.	Spaceage Switchgears Limited	India
11.	Tricolite Electrical Industries Pvt. Ltd.	India
12.	United Electric Co. (Delhi) Pvt. Ltd	India
13.	Venus Controls & Switchgear (P) Ltd.	India
14.	Schneider	India
<b>Wall Mounting Type Distribution Boards</b>		
1.	Anand Power Limited	India
2.	Associated Switchgears & Projects Ltd.	India
3.	C & S Electric Ltd	India
4.	Cosmic Power Systems Pvt. Ltd.	India
5.	Elecmech Corporation	India
6.	GE Power Controls India Pvt. Ltd.	India
7.	Intrelec	India
8.	Larsen & Toubro Ltd.(EI.Products Divn)	India
9.	Lotus Powergear Pvt Ltd	India
10.	Siemens Ltd.	India
11.	Spaceage Switchgears Limited	India
12.	Tricolite Electrical Industries Pvt. Ltd.	India
13.	Trident Switchgears Pvt. Ltd. (Upto 3200 A)	India
14.	United Electric Co. (Delhi) Pvt. Ltd	India
15.	Venus Controls & Switchgear (P) Ltd.	India
16.	Schneider Electric	India
<b>Control &amp; Relay Panel</b>		
1.	Alstom Limited (Areva T&D)	India
2.	ABB.	India
3.	Elecmech Corporation	India
4.	Larsen & Toubro Ltd. (EI. Products Divn)	India
5.	Siemens Ltd.	India
6.	Schneider Electric	India
<b>Protective Relays (other than BMR)</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	ABB.	India
3.	Schneider – MICOM Model	India
4.	SEL – Schweitzer Engineering Laboratories	India
5.	Woodward	India
6.	Siemens Ltd.- SIPROTEC Model	India



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<b>Vacuum Circuit Breakers (VCB)</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	ABB	India
3.	BHEL (Electrical Machines Divn.)	India
4.	Siemens Ltd.	India
5.	Schneider Electric	India
<b>Air Circuit Breakers (ACB)</b>		
1.	GE Power Controls India Pvt. Ltd.	India
2.	Larsen & Toubro Ltd.(EI.Products Divn)	India
3.	Siemens Ltd.	India
4.	ABB	India
5.	Schneider Electric	India
<b>Moulded Case Circuit Breakers (MCCB)</b>		
1.	Crompton Greaves Ltd.	India
2.	GE Power Controls India Pvt. Ltd.	India
3.	Larsen & Toubro Ltd.(EI.Products Divn)	India
4.	Siemens Ltd.	India
5.	ABB	India
6.	Schneider Electric	India
<b>Miniature Circuit Breakers (MCB) / RCBO</b>		
1.	Indo Asian Fusegear Ltd	India
2.	Legrand India Ltd	India
3.	S & S Power Switchgear Ltd	India
4.	Standard Electricals Limited	India
5.	Siemens Ltd.	India
6.	ABB	India
7.	Schneider Electric	India
<b>ELCB</b>		
1.	GE Power Controls India Pvt. Ltd.	India
2.	Havells India Ltd.	India
3.	Indo Asian Fusegear Ltd	India
4.	Legrand India Ltd	India
5.	S & S Power Switchgear Ltd	India
6.	Siemens Ltd.	India
7.	Standard Electricals Limited	India
8.	ABB	India





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9.	Schneider Electric	India
<b>Low Voltage Industrial Switches/Isolators</b>		
1.	ABB	India
2.	GE Power Controls India Pvt. Ltd.	India
3.	Havells India Ltd.	India
4.	Kaycee Industries Ltd	India
5.	Larsen & Toubro Ltd.(EI.Products Divn)	India
6.	Siemens Ltd.	India
7.	Schneider Electric	India
<b>Current Transformers (11 kV &amp; 3.3 kV)</b>		
1.	Anant Powertech	India
2.	ABB	India
3.	Kalpa Electrical Private Limited	India
4.	Mehru Electricals (Formerly Automatic Electric Limited)	India
5.	Perfect Sales Corporation	India
6.	Silkans	India
7.	Kappa	India
8.	Pragati	India
<b>Potential Transformer (11 kV &amp; 3.3 kV)</b>		
1.	Anant Powertech	India
2.	ABB	India
3.	Kalpa Electrical Private Limited	India
4.	Mehru Electricals (Formerly Automatic Electric Limited)	India
5.	Perfect Sales Corporation	India

<b>Current Transformers (415V)</b>		
1.	Alstom Limited ( Areva T & D)	
2.	Anant Powertech	India
3.	Indcoil Transformers Pvt. Ltd.	India
4.	Kappa Electricals	India
5.	Mehru Electricals (Formerly Automatic Electric Limited)	India
6.	Perfect Sales Corporation	India
7.	Siemens Ltd.	India
8.	Silkans	India
9.	Pragati	India
10.	Automatic Electric	India



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11.	Rishabh	India
<b>Potential Transformers (415V)</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	Indcoil Transformers Pvt. Ltd.	India
3.	Kalpa Electrical Private Limited	India
4.	Kappa Electricals	India
5.	Larsen & Toubro Ltd.(El. Products Divn)	India
6.	Mehru Electricals (Formerly Automatic Electric Limited)	India
7.	Perfect Sales Corporation	India
8.	Siemens Ltd.	India
<b>Meters</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	IMP Power Ltd.	India
3.	M.B. Control & Systems Pvt. Ltd. (Only For Multifunctional Meter)	India
4.	Meco Instruments	India
5.	Mehru Electricals (Formerly Automatic Electric Limited)	India
6.	Rishabh Instruments Pvt. Ltd.	India
7.	Seahorse Industries Ltd.	India
<b>Multi Function Meter (MFM)</b>		
1	Secure meter Limited	India
2	SEMS	India
3	Larsen & Toubro Ltd.	India
4	SATEC	India
5	Alstom Limited ( Areva T & D)	India
6	Siemens Ltd.	India
7	Asea Brown Boveri Ltd.	India
8	Schneider Electric	India
<b>Induction Motors – LV (415 V) ( Safe Area)</b>		
1.	ABB	India
2.	Bharat Bijlee Ltd	India
3.	Crompton Greaves Ltd	India
4.	Kirloskar Electric Company Ltd	India
5.	Siemens Ltd	India
6.	HEM Industries	India
7.	Laxmi Hydraulics Pvt. Ltd. (Upto 355L Frame Size)	India
<b>Industrial Type Sw. Socket &amp; Plug</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Chloride Power Systems and Solutions Ltd.	India



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	(formerly CALDYNE)	
3.	Crompton Greaves Ltd	India
4.	Cyclo Electric Devices & Services Co.	India
5.	Ex-protecta	India
6.	FCG Flameproof Control Gears Pvt. Ltd. (Formerly CEAG Flame	India
7.	FCG Power Industries Ltd	India
8.	Flameproof Equipments Pvt. Ltd.	India
9.	Legrand India Ltd	India
<b>Street/Flood Lighting Fixtures</b>		
1.	Bajaj Electricals Limited	India
2.	Crompton Greaves Ltd	India
3.	Havells India Ltd.	India
4.	Philips India Ltd.	India
5.	Surya Roshni Ltd.	India
6.	Wipro Lighting	India
<b>Hose Proof Industrial Lighting Fixtures</b>		
1.	Bajaj Electricals Limited	India
2.	Crompton Greaves Ltd.	India
3.	Philips India Ltd.	India
4.	Surya Roshni Ltd.	India
5.	Wipro Lighting	India
<b>Battery Charger</b>		
1.	Amco Power Systems Limited	India
2.	Chloride Power Systems and Solutions Ltd. (formerly CALDYNE)	India
3.	Chhabi Electricals Pvt. Ltd.	India
4.	HBL Nife Power Systems Ltd.	India
5.	Universal Industrial Products	India
<b>Battery (Ni-Cd)</b>		
1.	AMCO Power Systems Ltd.	India
2.	HBL Nife Power Systems Ltd.	India
<b>HT Power Cables</b>		
1.	Cable Corpn. of India Limited	India
2.	KEC International Ltd. (Formerly RPG Cables Limited	India
3.	KEI Industries Limited (Upto 33 kV)	India



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4.	Ravin Cables Limited	India
5.	Torrent Cables Ltd.	India
6.	Universal Cables Ltd.	India
7.	Uniflex	India
8.	Polycab	India
<b>LT Power Cables</b>		
1.	Cable Corpn. of India Limited	India
2.	Cords Cable Industries Ltd	India
3.	Delton Cables Ltd	India
4.	Finolex Cables Ltd	India
5.	KEC International Ltd. (Formerly RPG Cables Limited)	India
6.	KEI Industries Limited	India
7.	Plaza Cable Industries Limited	India
8.	Ravin Cables Limited	India
9.	Torrent Cables Ltd	India
10.	Universal Cables Ltd.	India
11.	Polycab	India
<b>LT Control Cables (1.1 kV)</b>		
1.	Cable Corpn. of India Limited	India
2.	Cords Cable Industries Ltd	India
3.	Delton Cables Ltd	India
4.	Finolex Cables Ltd	India
5.	KEC International Ltd. (Formerly RPG Cables Limited)	India
6.	KEI Industries Limited	India
7.	Plaza Cable Industries Limited	India
8.	Radiant Cables Pvt. Limited	
9.	Ravin Cables Limited	India
10.	Torrent Cables Ltd	India
11.	Universal Cables Ltd.	India
12.	Miracle cables	India
13.	Polycab	India
<b>Cables For Earthing</b>		
1.	Advance Cable Technologies (P) Ltd.	India
2.	Delton Cables Ltd	India
3.	Finolex Cables Ltd	India
4.	Gupta Electric & Machinery Stores (GEMSCAB)	India
5.	J K Cables Limited	India
6.	Netco Cable Industries (Pvt.) Ltd.	India
7.	Prestige Cable Industries	India



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8.	Shyam Cables Industries	India
9.	Special Cables Pvt. Ltd.	India
10.	T C Communication Pvt Ltd	India
11.	Universal Cables Ltd.	India
<b>Cable Jointing Kits</b>		
1.	Raychem RPG Ltd.	India
<b>Pre-Fabricated Al-Cable Trays</b>		
1.	Globe Electrical Industries	India
2.	Hindustan Vidyut Products	India
3.	Indiana Engg Works Pvt Ltd	India
4.	Indmark Formtech Pvt. Ltd.	India
5.	Jamna Metal Company	India
6.	Kanade Anand Udyog Pvt. Ltd.	India
7.	Maheshwari Electrical Mfrs. (P) Ltd.	India
8.	Metalite Industries	India
9.	Parekh Engineering Company	India
10.	Premier Power Products (Calcutta) Pvt. Ltd.	India
11.	Rukmani Electricals & Components Pvt Ltd	India
12.	Sadhana Engineering Corporation	India
13.	Sree Atreya Enterprises	India
14.	Stealite Engg Co	India
<b>Pre-Fabricated G.I. Cable Trays</b>		
1.	Globe Electrical Industries	India
2.	Indiana Engg Works Pvt Ltd	India
3.	Jamna Metal Company	India
4.	Maheshwari Electrical Mfrs. (P) Ltd.	India
5.	Premier Power Products (Calcutta) Pvt. Ltd.	India
6.	Rukmani Electricals & Components Pvt Ltd	India
<b>Hose Proof Local Control Station</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Bhartia Industries Ltd. (Divn. Bch)	India
3.	C & S Electric Ltd.	India
4.	Ex-Protecta	
5.	FCG Flameproof Control Gears Pvt. Ltd. (Formerly CEAG Flame)	India
6.	FCG Power Industries Ltd.	India
7.	Flameproof Equipments Pvt. Limited	India
8.	Hotline Switchgear & Controls	India
9.	Power Engg Co	India



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<b>Hose proof Junction Boxes</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Bhartia Industries Ltd. (Divn. Bch)	India
3.	Ex-protecta	India
4.	FCG Flameproof Control Gears Pvt. Ltd. (Formerly CEAG Flame)	India
5.	Flameproof Equipments Pvt. Ltd.	India
6.	FCG Power Industries Ltd	India
<b>Limit Switches</b>		
1.	A G System Controls	India
2.	AG Mechanical Enterprises (P) Ltd.	India
3.	Balaji Electricals	India
4.	Bhartia Industries Ltd. (Divn. Bch)	India
5.	Jayashree Electrodevices Pvt. Ltd.	India
6.	Protocontrol Instruments (I) Pvt. Ltd.	India
7.	R.K. Electrical Engg. Works	India
<b>Horn/Hooter/Klaxon</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Flameproof Equipments Pvt. Ltd.	India
3.	Worthmax Engineers	India
<b>Capacitors</b>		
1.	BHEL (Electrical Machines Divn.)	India
2.	Crompton Greaves Ltd.	India
3.	Kapsales Electricals Ltd.	India
4.	Shreem Capacitors Pvt. Ltd.	India
5.	Universal Cables Ltd.	India
6.	ABB	India
<b>Earthing &amp; Lightning Protection Material – (Al) Wire/Strip</b>		
1.	Anand Electric Trading Co.	India
2.	C & S Electric Ltd.	India
3.	Indmark Formtech Pvt. Ltd.	India
4.	Jayant Metal Mfg. Co.	India
5.	Premier Power Products (Calcutta) Pvt. Ltd.	India
6.	Jamna Metal Company	India
7.	Mahavir Industrial Corporation	India
8.	Metropolitan Industries	India
9.	Sai Galvanisers & Fabricators Pvt Ltd	India
<b>Earthing &amp; Lightning Protection Material – (GI) Wire/Strip</b>		
1.	Anand Electric Trading Co.	India
2.	Controls & Switchgear Co. Ltd.	India
3.	Jayant Metal Mfg. Co.	India



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4.	Indmark Formtech Pvt. Ltd.	India
5.	Premier Power Products (Calcutta) Pvt. Ltd.	India
6.	Jamna Metal Co.	India
7.	Mahavir Industrial Corporation	India
8.	Metropolitan Industries	India
9.	Sai Galvanisers & Fabricators Pvt Ltd	India
10.	Bharti Exports	India
11.	Metalite Industries	India
12.	Rukmani Electricals & Components Pvt Ltd	India
13.	Sadhana Engineering Corporation	India
14.	Stealite Engg Co	India
<b>GI Pipes &amp; Conduits</b>		
1.	Bharti Exports	India
2.	Indian Tube Co. (Tata Div. of Tubes & Pipes)	India
3.	Jindal Pipes Ltd.	India
4.	Meghjyot Enterprises	India
5.	Rukmani Electricals & Components Pvt Ltd	India
6.	Steelcraft	India
<b>Industrial Cable Gland</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Comet Brass Products	India
3.	Comet Industries	India
4.	Dowell's Electricals	India
5.	Electromac Industries	India
6.	FCG Flameproof Control Gears Pvt. Ltd. (Formerly CEAG Flame	India
7.	Gland-Mech. Industries	India
8.	Industrial products Equipment	India
9.	Power Engg Co	India
10.	Quality & Precision Indl. Equipment	India
11.	S J Metal Industries (Jainson)	India
<b>Cable Lugs</b>		
1.	Dowell's Electricals	India
2.	Forward Engg Industries	India
3.	KSE Electrical Pvt. Ltd.	India
4.	MG Electrica	India
5.	Power Engg Co	India
6.	S J Metal Industries (Jainson)	India
7.	Usha Martin Industries Ltd. (Ismal Divn)	India
<b>Explosion Proof Exhaust Fan</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	Crompton Greaves Ltd	India
3.	FCG Flameproof Control Gears Pvt. Ltd. (Formerly CEAG Flame)	India



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4.	Flameproof Equipments Pvt. Ltd.	India
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<b>Fuse</b>		
1.	Larsen & Toubro Ltd. (El. Products Divn.)	India
2.	Siemens Ltd.	India
3.	Alstom Power	India
4.	Havells India Ltd.	India

<b>Contactor / Relay /</b>		
1.	Larsen & Toubro Ltd. (El. Products Divn.)	India
2.	Siemens Ltd.	India

<b>Timer</b>		
1.	ABB	India
2.	Alstom Power	India
3.	Bhartia Cutler Hammer	India
4.	Siemens Ltd	India

<b>Control Switches</b>		
1.	Alstom Power	India
2.	Siemens Ltd.	India
3.	Kaycee	India
4.	Larsen & Toubro Ltd. (El. Products Divn.)	India

<b>Push Buttons</b>		
1.	Alstom Power	India
2.	Larsen & Toubro Ltd. (El. Products Divn.)	India
3.	Siemens Ltd.	India
4.	Tecnik	India
5.	Tulsi	India

<b>Signal Lamps</b>		
1.	Alstom Power	India
2.	Binoy	India
3.	Larsen & Toubro Ltd. (El. Products Divn.)	India
4.	Siemens Ltd.	India
5.	Tulsi	India

<b>Terminal Blocks</b>		
1.	Connectwell	India
2.	Elmex	India
3.	Larsen & Toubro Ltd. (El. Products Divn.)	India
4.	Siemens Ltd.	India

<b>Optical Fiber Cable</b>		
1.	Finolex	India
2.	DLink	India





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3.	Molex	India
4.	Lucent	India
5.	Ericson	India
6.	Sterlite	India
7.	HFCL	India
8.	OPTEL	India
9.		

**Transducer**



1.	Crompton	UK
2.	Elster (ABB)	India

**HDPE Pipe**

1.	Astral	India
2.	Reliance Industries 'RELPIPE	India
3.	APOLLO	India
4.	Cliamx Synthesis	India



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## 1.0 INSTRUMENTATION:



Sl.No	Vendor's Name	Country
<b>Gas Analysers (IR, Thermal Conductivity, Paramagnetic)</b>		
1.	ABB Ltd (BU – Analytical &Adv)	India
2.	Chemtrols Industries Limited (Maihak Make)	India
3.	Emerson Process Management (I) Pvt. Ltd	India
4.	Endress+ Hauser (India) pvt. Ltd.	India
5	Yokagawa	India
6	Ametek ,INC	U.S.A
7	Emerson Process Mgt Singapore Ltd.	Singapore
8	MaihakAktiengesellschaft	Germany
9	M.S.A International	U.S.A
10	Siemens AG	Germany
<b>Sodium Analyser</b>		
1.	ABB	
2.	HACH	
3.	THERMOFISHER	
4.	WALTRON	
5.	AWA	
<b>Chlorine Analyser</b>		
1.	ABB	INDIA
2.	HACH	FRANCE
3.	KROHNE	U.K
4.	E&H	
5	WALTRON	
6	THERMOFISHER	
<b>Turbidity Analyser</b>		
1.	HACH	
2.	YOKOGAWA	JAPAN
<b>SDI Analyser</b>		
1.	RODI	USA
<b>pH, conductivity &amp; ORP Analyser</b>		
1.	ABB India Limited	India
2.	BELA INSTRUMENTS (For Knick, GmbH make), Mumbai(For ConductivityAnalyser )	India
3	Chemtrols Industries Limited	India
4	Emerson Process Management (I) Pvt. Ltd	India
5	Endress+ Hauser (India) pvt. Ltd. (Liquid Analyser)	India
6	Forbes polymetron Pvt. Ltd.	India
7	POTENCE CONTROLS (for GLI International make), Mumbai.(For ConductivityAnalyser)	India
8	Yokogawa India Ltd.	India
9	Emerson Process Mgt Singapore Ltd.	Singapore
10	Foxbro Far East PTE Ltd.	Singapore
11	Hach Company	U.S.A

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12	Yokogawa Electric Corporation	Japan
13	Zellweger SA	France
<b>Trace Analyser/ Ion Selective</b>		
1.	ABB India Limited	India
2	Chemtrols Industries Limited	India
3	Forbes Polymetron Pvt. Ltd	India
4	Bran & Luebbe Ltd	U.K
5	Hach company	U.S.A
6	Zellweger SA	France
<b>PC / SERVERS</b>		
1.	DELL	INDIA
<b>Fire alarm System</b>		
1.	HONEYWELL	INDIA
2	SIEMENS	INDIA
<b>SO<sub>x</sub>/ NO<sub>x</sub> Analyser</b>		
1.	ABB India Ltd.	India
2.	Chemtrols Industries Limited	India
3.	Emerson Process Management (I) Pvt. Ltd	India
4.	Yokogawa India Ltd.	India
5.	Emerson Process Management Singapore Ltd	Singapore
6.	Horiba Ltd.	Japan
7.	Lear Siegler Meas. Controls Corp.	U.S.A
8.	M.S.A International	U.S.A
9.	Sick AG	Germany
10.	Siemens AG	Germany
11.	Thermo Environment Instruments Inc	U.S.A
12	Yokogawa Electric Corporation	Japan
<b>Mass Spectrometer</b>		
1.	ABB India Ltd.	India
2.	Orbital Science Corporation	U.S.A
3.	VG Gas Analysis Systems	U.K.
<b>Gas Chromatograph</b>		
1.	ABB India Limited	India
2.	Emerson Process Management (I) Pvt. Ltd.	India
3	Applied Automation Inc	Singapore
4	ABB Process Analytics	U.K
5.	Foxbaro Far East Pte Ltd	Singapore
6.	Siemens	Germany
7	Yokogawa India Ltd.	India
<b>Flue Gas Analyser (ZrO<sub>2</sub> type)</b>		
1.	ABB Ltd (BU – Analytical & Adv)	India
2.	Chemtrol (For MAIHAK Only)	India
3.	Emerson Process Management (I) Pvt. Ltd	India
4.	Endress+Hauser	India
5	Yokogawa India Ltd.	India
6	Ametek Inc	U.S.A
7.	GE Panametrics	Ireland
<b>H<sub>2</sub>S/ Total Sulphur Analysers</b>		
1.	ABB India Ltd.	India
2.	Barton Instrument Systems Limited	U.K

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System House Analysers		
1.	ABB Ltd (BU – Analytical &Adv)	India
2.	Adage Automation Pvt. Ltd.	India
3.	Analyser Instrument Co.Pvt. Ltd.	India
4.	Chemtrols Industries Limited	India
5.	Emerson Process Management (I) Pvt. Ltd	India
6.	Yokogawa India Ltd.	India
7.	Intech	Italy
Density Analysers		
1.	Chemtrols Industries Limited	India
2.	Emerson Process Management (I) Pvt. Ltd (coriolis type)	India
3.	Bopp & Reuther MesstechnikGmbh (coriolis type)	Germany
4	Solartron Mobrey	U.K
Moisture Analysers		
1.	Chemtrols Industries Limited	India
2.	AmetekInc	U.S.A
3	GE Panametrics	Italy
Gas & Fire Detection System		
1.	Andrew Yule & Company Ltd. (Fire)	India
2.	Chemtrols Industries Limited	India
3.	Honeywell Automation India Limited (Gas)	India
4.	J B Boda And Brothers Pvt. Ltd. (Gas Make-International Sensor Technology)	India
5.	Pollution Protection System Mumbai Pvt Ltd (Gas)	India
6.	General Monitors (Gas)	U.K
7	Teledyne Fluid Systems (Gas)	Thailand
Air Quality Monitoring System		
1	Chemtrol Industries Ltd.	India
Sample Handling System		
1.	Analyser Instrument Co.Pvt. Ltd.	India
Flow Element: Orifice/ Venturi/ Flow Nozzle		
1.	Baliga Lighting (only Orifice)	India
2.	Chemtrol Industries Ltd.	India
3.	Delta Engineering, Pune	India
4.	Eureka Industrial Equipments Pvt. Ltd.	India
5	FORBES MARSHALL	India
6	Flowtech Instruments (Orifice/Venturi)	India
7	General Instruments Consortium	India
8.	Instrumentation Ltd.	India
9.	Micro Precision Products Private Ltd.	India
10.	Micro India Flow Elements Pvt. Ltd.	India
11	Minco(India) Flow Instruments Pvt. Ltd.	India
12	Unicontrols Instrument Pvt. Ltd.	India
13	Bopp & Reuther Messtechnik GMBH	Germany
14	Daniel Measurement & Control	USA
15	ISA Controls Limited	U.K
16	Technomatic SPA	Italy
Pitot Tube/ Annubar		
1.	ABB India Limited	India
2.	Control Engineers	India
3.	Emerson Process Management (I) Pvt. Ltd.	India

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4	Micro Precision Products Private Ltd.	India
5.	Unicontrols Instruments Pvt. Ltd.	India
6.	Daniel Measurement & Control	U.S.A
7.	ISA Controls Limited	U.K
8	Technomatic Spa	Italy
<b>Rotameters</b>		
1.	ABB india Ltd.	India
2.	Chemtrols Industries Ltd.	India
3.	Delta Control	India
4.	Eureka Industrial Equipments Pvt. Ltd.	India
5	Flowtech Instruments services	India
6.	Instrumentation Engineers Pvt. Ltd.	India
7.	Krohne Marshall Pvt. Ltd.	India
8.	Placka Instruments & Controls Pvt. Ltd. (Purge Rotameter Only)	India
9.	Rota Instrumentation	India
10	Yokogawa	India
11	Rota Yokogawa Gmbh & Co. Kg	Germany
12	Tokyo Keiso Co.Ltd.	Japan
13	Azbil Corporation	Japan
14	Emerson Process Mgt	U.S.A
15	Krohne	Germany
<b>Mass Flow Meter (Coriolis Type)</b>		
1.	ABB India Limited	India
2	Chemtrol Industries Ltd	India
3.	Emerson Process Management (I) Pvt. Ltd.	India
5	Endress + Hauser	India
6.	SIEMENS Ltd.	India
7.	Yokogawa	India
8.	Bopp & Reuther Messtechik GMBH	Germany
7	Krohne	Germany
8	Schlumberger resource management Ltd.	U.S.A
<b>Turbine Flowmeter</b>		
1.	ABB India Ltd.	India
2.	Chemtrol Industries Ltd	India
3.	Krohne	India
4.	Yokogawa	India
5.	Azbil Corporation	Japan
6.	Bopp & Reuther Messtechnik Gmbh	Germany
7.	Barton Instrument System Ltd.	U.K.
8.	Emerson Process Mgt	U.K.
9.	Emerson Process Mgt.	U.S.A
10.	Instromet International N.V.	Holland
11.	Itochu Corporation	Japan
12.	Oval Asea Pacific Pte Ltd.	Singapore
13.	Rockwell International Corporation	U.S.A
<b>Vortex meter</b>		
1.	ABB India Ltd.	India
2.	Emerson Process Management (I) Pvt. Ltd.	India
3.	Krohne Marshall Pvt. Ltd.	India
4	Siemens Ltd.	India



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5.	Yokogawa Limited	India
6	Bopp & Reuther MesstechnikGmbh	Germany
7.	Endress + Hauser	Germany
8..	Itochu Corporation	Japan
9.	Krohne	Germany
10.	Schlumberger resource management Ltd.	U.S.A
<b>PD Meter</b>		
1.	Chemtrols Industries Ltd.	India
2.	Rock Flow Meters (i) Pvt. Ltd.	India
3.	Bopp & Reuther MesstechnikGmbh	Germany
4.	Emerson Process Managment	U.S.A
5.	Oval Asea Pacific Pte Ltd.	Singapore
6.	Schlumberger resource management Ltd.	U.S.A
<b>Magnetic Flow meter</b>		
1.	ABB India Ltd.	India
2.	Chemtrol Industries Ltd	India
3.	Emerson Process Management (I) Pvt. Ltd.	India
4.	Endress + Hauser (India) Pvt. Ltd.	India
5.	Krohne Marshall Pvt. Ltd.	India
6	Siemens Ltd.	India
7	SBEM Pvt. Ltd.	India
8	Yokogawa	India
9.	Azbil Corporation	Japan
10.	Bopp & Reuther MesstechnikGmbh	Germany
11	Krohne	Germany
<b>Insertion Type Flow Meter</b>		
1	Emerson Process Management (I) Pvt. Ltd.	India
2	Siemens Ltd.	India
<b>Ultrasonic Flow Meter</b>		
1	Chemtrol Industries Ltd	India
2.	Endress + Hauser (India) Pvt. Ltd.	India
3.	Emerson Process Management	India
4	Siemens Ltd.	India
5	Yokogawa	india
<b>Orifice Meter</b>		
1	Chemtrol Industries Ltd	India
<b>Metering Skid</b>		
1.	Chemtrol Industries Ltd.	India
<b>Pressure Gauges</b>		
1.	Ashcroft India(P) Ltd. (standard normal type)	India
2.	A.N. Instruments Pvt. Ltd.	India
3.	Baumer Technologies India Pvt . Ltd	India
4.	Forbes Marshall	India
5.	General Instruments Consortium,	India
6.	H.Guru Industries	India
7.	Peejee Engg. Works	India
8.	Precision Industries Ltd. (standard normal type)	India
9.	Premium Instrument & Controls Ltd.	India
10.	Manometer (India) Pvt. Ltd.	India
11.	Walchand Nagar Industries Ltd.	India



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12.	Wika	India
13.	Budenberg Gauge Co. Ltd	U.K
14.	Dresser Europe S.A	Germany
15.	Nagano keiki Seisakusho	Japan
16.	Rueger Sa	Switzerland
17.	Spriano Spa	Italy
18.	WikaAlexanderWiegardGmbh& Co.	Germany
<b>Local D/P Indicators</b>		
1.	Precision Mass Products Pvt. Ltd	India
2.	Switzer Instrument Co.	India
3.	Wika	India
4.	Barton Instrument Systems Limited	U.K
5.	Delta Controls Ltd.	U.K
<b>Pressure &amp; D/P Transmitters</b>		
1.	ABB India Ltd.	India
2.	Emerson Process Management (I) Pvt. Ltd.	India
3.	Endress + Hauser (India) Pvt.Ltd.	India
4.	Honeywell Automation India Limited	India
5.	Siemens Ltd.	India
6.	Yokogawa Limited	India
7.	Azbil Corporation	Japan
8.	Emerson Process Mgt Singapore Ltd	Singapore
9.	Honeywell Inc.	U.S.A
10.	Moore Products Company	U.S.A
11.	Siemens Ag, Germany	Germany
12.	Smar Singapore Pte. Ltd.	Singapore
13.	VEGA Grieshaber KG	Germany
14.	Yokogawa Electric Corporation	Japan
<b>Pressure &amp; D/P Switches Including Vol. Seal</b>		
1.	Endress + Hauser( India ) Pvt. Ltd.	India
2.	Indfos Industries Ltd. (Except Vol.Seal)	India
3.	Kaustubha Udyog (Except Vol.Seal)	India
4.	Precision Mass Products Pvt. Ltd	India
5.	Switzer Instrument Co. (Except Vol.Seal)	India
6.	Azbil Corporation	Japan
7.	Delta Controls Ltd.	U.K
8.	Nagano Keiki Seisakusho	Japan
9.	SOR Inc.	U.S.A
10.	United Electric Controls Co.	U.S.A
<b>Transparent/ Reflex / Bicolor Mag.Level Gauges</b>		
1.	ABB India Ltd.	India
2.	Bliss Anand Private Ltd.	India
3.	Chemtrols Samil(India) Pvt Ltd.	India
4.	Flowtech Instruments services	India
5.	LEVCON INSTRUMENTS PVT. LTD.	INDIA
6.	Nisan Scientific Process Equipments Pvt. Ltd	India
7.	Pune Techtrol Pvt. Ltd. (= < 300#)	India
8.	Technomatic (India) Pvt. Ltd.	India
9.	V-Automat Instruments Pvt. Ltd. (upto 300#)	India
10.	Clark-Reliance Corp.	U.S.A





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11	CesareBonetti	Italy
12	Jerugson Gauge & Valve Co.	U.S.A
13	Nihon Klingage Co. Ltd.	Japan
14	Richard Klingner Ag	Austria
15	Technomatic Spa	Italy
<b>Level Switches (Float &amp; Displacer Type)</b>		
1.	ABB India Ltd.	India
2.	Bliss Anand Private Ltd.	India
3.	Chemtrols Samil(India) Pvt Ltd.	India
4.	Pune Techtrol Pvt. Ltd.	India
5.	SBEM Pvt. Ltd.	India
6.	Siemens Ltd.	India
7.	V.Automat & Instruments (P) Ltd.	India
8.	ISA Controls Limited	U.K.
9.	KDG. MOBREY Ltd.	U.K.
10.	Magnetrol International N.V	Belgium
11.	SOR Inc.	U.S.A
12.	Vega Grieshaber KG	Germany
<b>Displacer Type Level Transmitters</b>		
1.	Chemtrols Industries Limited (Eckdart Make Electronics)	India
2.	Dresser Valve India Pvt Ltd (Rating <= 600#)	India
3.	Dresser Masoneilan	France
4.	Foxboro EckardtGmbh	Germany
5.	Magnetrol International N.V. (Lvdt)	Belgium
6.	Parcol Spa (Pneumatic Transmission Only)	Italy
<b>Tank Level Instruments</b>		
1.	ABB India Limited	India
2.	Emerson Process Management (i) Pvt. Ltd.	India
3.	Pune Techtrol Pvt. Ltd.	India
4.	Siemens Ltd. (Radar level Transmitter, guided wave Radar)	India
5.	SBEM Pvt. Ltd.	India
6.	EnrafSingaporePte. Ltd.	Singapore
7.	Endress + Hauser Gmbh& Co., (Non-Contact & Servo)	Germany
8.	Krohne (Non-Contact Type)	Germany
9.	L& J Technologies	U.S.A
10.	Toyo Keiso Co. Ltd.	Japan
<b>Ultrasonic Level Transmitter</b>		
1.	Forbes Marshall	India
2.	Siemens Ltd.	India
3.	Vega Grieshaber KG	Germany
<b>Tank Farm Management</b>		
1.	Endress + Hauser ( India) Pvt. Ltd. (Servo,Radar)	India
<b>Guided wave Rdar</b>		
1.	Endress + Hauser ( India) Pvt. Ltd	India
2.	Forbes Marshall	India
3.	Magnetrol	India
4.	Vega Grieshaber KG	Germany
<b>Temperature Elements (Thermocouple, Rtd)</b>		
1.	Altop Industries Ltd.	India
2.	ABB India Ltd.	India

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3.	Detriv Instrumentation & Electronics Ltd.	India
4.	Electrical & Electronics Ltd.	India
5.	Eleind Engineering Pvt. Ltd.	India
6.	Endress + Hauser (India) Pvt. Ltd.	India
7..	Exotherms Instruments	India
8.	General Instruments Consortium	India
9.	Goa Instruments Industries Ltd.	India
10.	Industrial Instrumentation	India
11.	Precision Mass Products Pvt. Ltd.	India
12.	Pyro Electric Instruments Goa Pvt. Ltd.	India
13.	Tempsens Instruments (I) Pvt. Ltd.	India
14	Thermal Instruments India Pvt. Ltd.	India
15	Unicontrols Instruments Pvt. Ltd.	India
16	Azbil Corporation	Japan
17	Okazaki Manufacturing Co.	Japan
18	Sensycon	Germany
19	Thermo Electric Co.Ltd.	Holland
20	W.C.Heraeus GMBH	Germany
<b>Bimetallic Thermometer</b>		
1.	A N Instruments Pvt. Ltd.	India
2.	Ashcroft India(P) Ltd.	India
3.	Baumer Technologies India Pvt. Ltd.	India
4.	General Instruments Consortium	India
5.	Goa Instruments Industries Ltd	India
6.	H.Guru Industries	India
7	Krohne Marshall Pvt. Ltd.	India
8	Precision Mass Products Pvt. Ltd.	India
9	Nagano Keiki Seisakusho	Japan
10	Rueger SA	Switzerland
11	Technomatic SPA	Italy
12	Trend Instrument Inc.	U.S.A
<b>Vibration Fork type Level Switches</b>		
1.	ABB India Ltd.	India
2.	Protocontrol Instruments (I) Pvt. Ltd. (non-critical)	India
3.	Endress + Hauser	Germany
4.	SOR Inc.	U.S.A
<b>Dial Thermometer (Hg In Steel/Glass)</b>		
1.	A N Instruments Pvt. Ltd.	India
2.	Ashcroft India(P) Ltd.	India
3.	Baumer Technologies India Pvt. Ltd.	India
4.	General Instruments Consortium,	India
5.	Goa Instruments Industries Ltd	India
6.	H.Guru Industries	India
7.	Precision Mass Products Pvt. Ltd	India
8.	Pejee Engg Works	India
9.	Walchand Nagar Industries Ltd.	India
<b>Radiation Pyrometer</b>		
1.	Tempsens Instruments Pvt. Ltd.	India
2.	C.C.R Technico	Italy
3.	Chino Corpn.	Japan

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4.	Land Infrared	U.K.
5.	Siemens AG	Germany
6.	Wahal Instruments	U.S.A
<b>Temperature Transmitters</b>		
1.	ABB India Limited	India
2.	Emerson Process	India
3.	Endress+ Hauser (India) Pvt. Ltd.	India
4.	Siemens Ltd.	India
5	Yokogawa	India
<b>Gate/Plug Valves</b>		
1.	Audco India Limited(L&T Valves Divn.)	India
2.	BHEL(Valves Division)	India
3.	Chemtrols Engineering Limited (Plug Valves)	India
4.	Flowserve India Control Pvt. Ltd.(Plug Valve upto 12"300# upto 6" 600#)	India
5.	Ksb Pumps Limited (Valves Divn)	India
6	NU Tech Controls (MOV Gate :1/2" to 8" 2500#, 10" to 14",300#)	India
7.	Samsons Contols Pvt. Ltd. (Upto 34", 300#)	India
8.	Valve Tech Industries (Mov -8" upto 2500#)	India
9.	Velan Inc.	Canada
10	Weir Bdk Vlaves	India
11	Bel Valves	Japan
12	CesareBonetti	Italy
13	Fasani S.P.A	Italy
14	MalbraqueS.A.	France
15	Matsura H. P Machine works co. Ltd.	Japan
16	Petrol Valves S.R.L	Italy
<b>Globe / Angle Valves</b>		
1.	AST S.P.A (Upto 8"900#)	India
2	Chemtrol Industries Ltd.	India
3	Circor Flow Technologies India Pvt. Ltd.	India
4	Dresser Valve India Pvt. Ltd.(Rating =<600#,size ¾" to 6")	India
	Emerson Process Management India Ltd	India
5	Emet Controls Pvt. Ltd.(Globe Valve up to 4",300# angle valve upto 1-1/2",2500#)	India
6	Flowserve india control pvt. Ltd. ( globe valve upto 30" 600# upto 24" 900#, upto 16" 2500# upto 4" 4500# )	India
7	Koso fluids controls pvt. Ltd. ( globe valves: upto 8" 2500# 10 to 18" 300# angle valves upto 8" 300# )	India
8	Instrumentation Ltd. (Palakkad)	India
9.	Mil Controls Limited	India
10.	NU Tech Controls	India
11	Pneucon valves Pvt. Ltd. (upto 6" 300#) noncritical)	India
12	Samson Control Pvt Ltd(upto 6" &=<600#)	India
13	Tecnik valves pvt Ltd. (air & water service upto 4" 150#)	India
14	Valve-Tech Inducstries (non-critical)	India
15	Azbil Corporation (= < 2500#)	Japan
16	Arca Regler GMBH	Germany
17	Dresser Masoneilan	France
18	Flowserve (= < 2500#)	U.S.A

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19.	Fisher Xomox (=< 2500#)	Singapore
20.	Parcol Spa	Italy
21	Nippon Fisher Co. Ltd. (=<2500#)	Japan
22	Severn Glocon (1 to 12" 600#)	U.K.
<b>Ball Valves</b>		
1.	Tyco Valves & Controls (I) Ltd (=< 150 #)	India
2.	Virgo Engineers Ltd. (=<600# With Maccair Actuators)	India
3.	Anand teknow aids engineering india limited (upto 6",600# (ON-OFF)	India
4.	Bray Controls India Pvt. Ltd.(upto 4",300#)	India
5.	Emerson	India
6	EMET controls pvt. Ltd.(upto 8",150# for air service)	India
7	Fisher Xomox Sanmar	India
8	Flowserve India controls Pvt. Ltd. ( upto 16" 600# )	India
9	Intervalve ponnawalla limited (uptp 10",150#)	India
10	Koso Fluid Controls pvt. Ltd. ( upto 8 " ,2500# ,10" to 18" 900# )	India
11	NU Tech Controls (14",600# for non-critical purpose)	India
12	Pentair Valves and controls India Pvt. Ltd. (<=150#)	India
13	Pneucon valves pvt. Ltd. (upto 6",150# non-critical)	India
14	Samson Control Pvt Ltd(upto 24" &=<1500#)	India
15	Valve tech industries ltd. (18",150# non critical)	India
16	Weir Bdk Vlaves (upto 16",150#)	India
17	G.T.C. Italia S.R.L(=<300#)	Italy
18	Metso Automation (=<2500#)	Singapore
19	Orbit Valves PLC (=<2500#)	Singapore
20	Petrol Valves S.R.L	Italy
21	PERRIN Gmbh (size ½" to 12",& rating 150# to 2500#,size 14"to 18", rating 150# to 1500# ,size 20"to 24" rating 150# & 300#)	Germany
22	Pibiviesse S.P.A. (Rating Upto 2500 #)	Italy
23	Rotex manufacturers & Engineers Pvt. Ltd. (upto 6" 600#, 6" to 10" 150#)	India
24	Velan Inc. ( ball valves on/off size: ¼" to 6" (rating upto 2500#) size 8"to 16" (rating upto 900#) size 18" to 30 " (rating upto 300#)	Canada
<b>Butterfly Valves</b>		
1	Advance valves pvt. Ltd.(size 2"to 24" upto 600#)	India
2	Bray controls india pvt. Ltd. (upto 300#)	India
3	Dresser Masonelian Valves	India
4	Emet controls pvt. Ltd. (upto 4",900#, 6",150# to 16",150# double eccentric )	India
5	Flowserve india control pvt. Ltd. ( upto 30",300# upto 12" 600#)	India
6	Fisher	India
7	Intervalve ponnawaala ltd. (2" to 48",150#)	India
8	Instrumentation Ltd. (Palakkad) (=< 300#)	India
9	Koso fluid controls (pvt.) ltd. (=< 150#)	India
10	Nu tech controls (16",300# for non-critical services )	India
11.	Pneucon valves pvt. Ltd. (upto 8",150# non critical )	India
12.	Samson controls pvt. Ltd.	India
13	Tyco Valves & Controls (I) Ltd (=< 150 #)	India
14	Valve tech industries ( non-critical services)	India
15	Virgo Engineers Ltd. (=<300#)	India
16	Weird BDK valves (upto 16",300#0)	India
17	Bray Controls(=<300#)	U.S.A
18	Keystone (Upto 2500#)	Singapore

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19	Leeds valve ltd.	UK
20	Korea Unicom Valve Co. Ltd.	Korea
21	Parcol Spa (= < 2500# Urea Service Also)	Italy
22	Pentair Valves and controls India Pvt. Ltd. (<=150#)	
23	Metso Automation (Upto 2500#)	Singapore
24	Orton S.r.l. (upto 2500#)	
<b>PRDS &amp; SPRAY NOZZLE, VENT VALVES upto 2500#</b>		
1.	ARCA (Forbes Marshal) (Mech. Spray nozzle type desuperheater only)	India
2.	Chemtrols Industries Ltd. (PRDS Combine & Split)	India
3.	Circor Flow Technologies India Pvt. Ltd. (1" to 20", upto 150#, 1 to 10" upto 1500#, 1" to 8", upto 2500#)	India
4	Control components INC	India
5	FisherControls	India
6.	Samson Controls Pvt. Ltd. (upto 6", 150#)	India
7.	CCI Valve Technology AB	Sweden
8	SPX Valves & Controls (COPES-VULCAN LTD.)	U.S.A
<b>Electric Actuator</b>		
1.	Biffi Italia S.R.L	Italy
2.	Limitorque, U.S.A	U.S.A
3.	Rotork Control (Deutschland) GmbH	Germany
4.	Auma, Usa	U.S.A
<b>Air Filter cum Pressure Regulator</b>		
1.	ABB India Limited	India
2.	Divya Control Elements Pvt. Ltd.	India
3.	Dresser	India
4.	Emerson Process Management	India
5.	Mil Controls Limited	India
6.	Placka Instruments & Controls Pvt. Ltd.	India
7.	Shavo Norgren (India) Pvt Ltd.	India
8.	Schrader Duncan Ltd. (1/4" to 2" port size)	India
<b>Valve Actuator (Pneumatic/Rotary)</b>		
1.	Bray Control India Pvt. Ltd.	India
2.	EL-O-Matic India Pvt. Ltd.	India
3	Rotex Manufacturers & Engineers Pvt Ltd	India
4	Schrader Ducan Ltd.	India
<b>Self actuated pressure control valve</b>		
1	FisherControls	India
2	Nirmal Industrial controls private limited ( size 1/2" to 6 " & rating : < =300# )	India
3	Nu tech Controls (upto 10", 600#)	India
4	Pneucon Valves Pvt.Ltd. (upto 4", 150#)	India
5	Samsons Controls Pvt. Ltd. (upto 2", 150#)	India
<b>Electropneumatic Positioner</b>		
1.	FisherControls	India
2	Siemens Ltd.	India
<b>Desuperheaters</b>		
1.	Circor Flow Technologies India Pvt. Ltd (upto 24", 300# upto 28", 150#, multinozzle 3" to 4", upto 2500#)	India
2.	Chemtrols	India
3	CCI	India
4	EMET Controls Pvt. Ltd. (Desuperheating Control Valves 1-1/2", 600# * )	India

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	3",2500#)	
5	Fisher	India
6	Tyco	India
<b>Pressure reducing Station</b>		
1.	Circor Flow Technologies India Pvt. Ltd (1" to 20",upto 150# ,1 "to 10", upto1500#,1"to 8 " upto 2500#))	India
<b>Pressure Regulator</b>		
1.	Chemtrol Industries Ltd.	India
<b>Safety Valves &amp; Thermal Relief Valves Upto 2500#</b>		
1.	AST S.P.A	India
2.	Bliss anand private limited (8" * 10" 300#, 6" * 8 " 600# ,4 * 6" 1500#)	India
3.	Fainger Leser Valves (P) Ltd. (Upto 600#, ½" To 6")	India
4.	Instrumentation Ltd. (Palakkad)	India
5.	Keystone	India
6	Pentair Sanmar Ltd.	India
7	Nu tech controls (upto 2",300# * 3",150#)	India
8	Valve Tech Industries	India
9	Weir Bdk Valves	India
10	BOPP & Reuther Messtechnik GMBH	Germany
11	Crossby valve & Engg. Company Ltd.	U.K
12	Dresser Industries Incorporated	U.S.A
13	Dresser Valve & Controls	Canada
14	Farris	U.K
15	Itochu Corporation	Japan
16	Parcol Spa (For Urea Service Also)	Italy
17	Sapag Gec Alsthom	France
18	Tai Milano S.P.A	Italy
19	Teledyne Fluid Systems	Thailand
<b>Vaccum Breakers</b>		
1.	Fainger Engineering	India
2.	Potego India Pvt. Ltd.	India
3.	Braunschweiger Flammenfilter	
4.	Itochu Corporation	Japan
5.	Parcol Spa	Italy
6.	Safety Systems UK Ltd.	U.K
7.	Tai Milano S.P.A	Italy
8.	Whessoe Varc Limited	U.K
<b>Rupture Discs</b>		
1.	Bs&B Safety Systems (India) Limited	India
2.	Fainger Engineering	India
3.	Tyco Sanmar	India
4.	Continental Controls Inc.	U.S.A
5.	Fike Europe	Belgium
6.	Sapag GEC Alsthom	France
7.	Teledyne Fluid Systems	Thailand
<b>Pilot relief valves</b>		
1.	AST S.P.A (inlet size upto 3", upto 1500#, outlet size upto 4", upto 300#,inlet size upto 4",upto 300# ,inlet size upto 6", upto 150#,outlet size upto 8", upto 150#)	India
2.	Bliss Anand Private Limited (Size 1"* 2" 2500#)	India



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<b>Low pressure relief valve</b>		
1.	Protego India Pvt. Ltd. (less than 1 BAR with flame arrestor)	India
<b>Flame arrestor</b>		
1.	Protego India Pvt. Ltd	India
<b>Control Panel</b>		
1.	Electronics corporation of india ltd.	India
2.	Ex protecta	India
3.	Hulasi metals pvt. Ltd.	India
4.	Industrial control appliances (p) ltd.	India
5.	Jaisun & hutchisun control ltd.	India
6.	Prima automation (india) pvt. Ltd.	India
7.	Pyrotech electronics pvt. Ltd.	India
8	Tan swa technologies INC	India
9	United electric co (delhi ) pvt. Ltd,	India
10	Yokogawa india limited	India
11	Instromet international N.V.	Holland
<b>Programmable Logic Controller- Package</b>		
1.	ABB India Limited	India
2.	Emerson Process Management (I) Pvt. Ltd.	India
3.	Ge Fanuc Systems Prvitate Limited	India
4.	Honeywell Automation India Limited	India
5.	Rockwell Automation India Ltd.	India
6	Siemens Ltd.,	India
7.	Yokogawa	India
8	GE fanuc automation north America INC (fault tolerant TMR)	U.S.A
9	Hima paul Hildebrandt Gmbh +Co KG (fail safe )	Germany
10	Marconi italiana (non fail safe )	Italy
11.	Omron corporation (Relay)	Japan
12	RTP Control system	U.S.A /India
13	Triconex (fault tolerant TMR)	Singapore
14	Triconex ( Schenider)	Singapore
<b>Distributed Control System</b>		
1.	ABB India Limited	India
2.	Emerson process management India Pvt. ltd.	India
3.	Foxboro	India/Intl.
4.	Honeywell Automation India Limited	India
5.	Siemens Ltd.	India
6	Yokogawa Limited	India
7	Bailey controls company	U.S.A
8	Emerson process management Singapore ltd.	Singapore
9	Honeywell Inc.	U.S.A
10	Invensys	Holland
11	Siemens AG	Germany
12	Yokogawa Electric Corporation	Japan
<b>ESD SHUT- DOWN SYSTEM</b>		
1	HONEYWELL	
2	HIMA CONTROLS	
3	PAUL HILDEBRANDT (HIMA)	
4	RTP Control system	
5	Rockwell automation pvt. Ltd.	



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6	SIEMENS AG	
7	TRICONEX / IMPROTEC	
8	YOKOGAWA	
<b>Multiplexer / Remote I/O</b>		
1.	Mtl Instrument Limited	India
2.	Pepperl + Fuch	India
3.	M.system Co. Ltd. ( Remote I/O; Model No.R3)	Japan
4	M.T.L., U.K.	U.K
5	Pepperl + Fuchs Pte Ltd.	Singapore
6	Stahl-Und Apparatebau Hans LefferGmbh	Germany
<b>Receiver Instruments (Indicator,Controller,Recorder)</b>		
1.	ABB India Limited	India
2.	Chino-Laxsons (India) Limited (Only Recorder)	India
3.	Eurotherm Del India Limited	India
4.	Honeywell Automation India Limited	India
5.	Masibus Automation & Instrummentation Pvt.Ltd. (Receiver Instruments except recorder)	India
6.	Moore Controls Ltd.	India
7.	Yokogawa Limited	India
8	ChinoCorp.	Japan
9.	Heraeus Electro-Nite International N.V.	Japan
10.	Honeywell Inc.	U.S.A
11	Siemens Ag, Germany	Germany
12	Yokogawa Electric Corporation	Japan
<b>Alarm Annunciator</b>		
1.	Industrial Instruments & Controls	India
2.	Shree Electronics	India
3.	M.T.L., U.K.	U.K
4.	Rochester Instrument Systems Ltd.	U.K
5.	Riley Panalarm	U.S.A
6.	Ronan Engg. Co.	U.S.A
<b>Temperature Scanner</b>		
1.	Industrial Instrumentation	India
2.	Protocontrol Instruments (I) Pvt. Ltd.	India
<b>Cctv / Access System</b>		
1.	Honeywell Automation India Limited	India
2.	Yokogawa Limited	India
<b>Miscellaneous Items (Rtu / ScadaEtc)</b>		
1	ABB India Limited	India
2.	Rockwell Automation India Pvt. Ltd.	India
3.	Siemens Ltd. (Simatic WINcc)	India
<b>Energy meter</b>		
1.	M.system co. Ltd.( Model No. 53U)	India
<b>Surge Protection Devices</b>		
1.	Phoenix Contact (India) Pvt. Ltd.	India
<b>Wiring Ducts</b>		
1.	Trinity touch Pvt.Ltd.	India
<b>DIN Rail</b>		
1.	Trinity touch Pvt.Ltd.	India





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<b>Interface Module</b>		
1.	Trinity touch Pvt.Ltd.	India
<b>Cable connector</b>		
1.	Phoenix contact (India) Pvt. Ltd.	India
<b>Advance Process Control System</b>		
1.	Yokogawa India Limited	India
<b>Speed Indicator</b>		
1.	Bentley NevedaLlc	U.S.A
2.	Jacquet	Switzerland
3.	Pepperl + Fuch	Germany
4.	Pepperl + Fuchs Pte Ltd.	Singapore
5.	Shinkawa Electric Co.	Japan
<b>Burner Management System</b>		
1.	Siemens (TMR/QMR)	
2.	Triconex (TMR/QMR)	
3.	Honeywell (TMR/QMR)	
4.	Yokogawa (TMR/QMR)	
5.	Rockwell Automation Pvt. Ltd. (TMR/QMR)	
<b>Instrument Power &amp; Control Cables</b>		
1.	Associated Cables Ltd.	India
2.	Associated Flexibles & Wires Pvt. Ltd.	India
3.	Cords Cable Industries Ltd.	India
4.	Delton Cables Ltd	India
5.	Insucon Cables & Conductors (P) Ltd. (For Smaller Non-Critical Projects)	India
6.	J K Cables Limited	India
7.	Kei Industries Limited	India
8.	Leoni cable solutions	India
9.	Paramount Cable Corporation	India
10.	T C Communications Pvt Ltd	India
11.	Thermo Cables Limited	India
12.	Toshniwal Cables	India
13	Udey Pyro Cables Pvt Ltd	India
<b>Extension &amp; Compensating Cables</b>		
1.	Associated Cables Ltd.	India
2.	Associated Flexibles & Wires Pvt. Ltd.	India
3.	Cords Cable Industries Ltd.	India
4.	Delton Cables Ltd	India
5.	General Instruments Consortium,	India
6.	J K Cables Limited	India
7.	Kei Industries Limited	India
8.	Paramount Cable Corporation	India
9.	ThermopadsPvt. Ltd.	India
10.	Toshniwal Cables	India
<b>Cable Trays &amp; Accessories (Al./Gi)</b>		
1.	D-Y Engineers	India
2.	Globe Electrical Industries	India
3.	HOPPES	India
4.	Indiana Engg Works Pvt Ltd	India
5.	Metalite Industries	India
6.	Parekh Engineering Company	India

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7	Sadhana Engineering Corporation	India
8	Steelite Engineering Limited	India
<b>Multi Transit Inlet System</b>		
1.	Hawke International	U.K
2.	MctBrattbergAktiebolag	Sweden
3.	RoxtecAb	Sweden
<b>Junction Box &amp; Cable Gland</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Ceag Flameproof Control Gears Pvt.Ltd.	India
3.	Ex-protecta	India
4.	Flameproof EquipmentsPvt. Ltd.	India
5.	Flexpro Electricals Pvt. Ltd.	India
6.	TAN SWA technologies Inc (Junction Box)	India
7.	Trinity Touch Pvt. Ltd. (Only cable Glands upto size 25M)	India
8	Stahl-Und Apparatebau Hans LefferGmbH	Germany
<b>CS Seamless Pipes –As per Piping list</b>		
1	Indian tube Co.(Tata Div of tubes & pipes)	India
2	ISMT limited	India
3	Maharashtra seamless limited	India
4	Dalmine SPA	Italy
5	ETS Trouvay & Cauvin	France
6	Horst kurvers GmbH	Germany
7	Hyundai Corporation	Korea
8	IBF seamless pipes SPA	Italy
9	Mannesmann Hndel AG	Germany
10	Marubeni Itochu Steel	Japan
11	Nippon steel corporation	Japan
12	Nissho IWAI Corporation	Japan
13	Okura & Co. Ltd.	Japan
14	Sojitz Corporation	Japan
15	Sumitomo metal industries Ltd.	Japan
16	Phoceenne	France
17	Vomal International Limited	UK
<b>SS Seamless Pipes-As per piping list</b>		
1	Choksi tube company limited	India
2	Maxim tubes company pvt. Ltd.	India
3	Nuclear fuel complex	India
4	Ratnamani metals & tubes limited	India
5	Remi edelstahl tubular ltd.	India
6	Dalmine SPA	Italy
7	Phoceenne	France
8	TPS technitube Rohrenwerke	Germany
9	T.T.I tubecex tubos inoxidables S.A. (1/2" NB SS pipe)	Spain
<b>SS Tubes</b>		
1.	Choksi Tube Company Ltd.	India
2.	Matim Tubes Company Pvt. Ltd.	India
3.	Nuclear Fuel Complex	India
4.	Ratnamani Metals & Tubes Limited	India
5.	Sandvik	India
6	Itochu Corporation (Rep.KubotaCorpn.)	Japan

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7.	Nishitani& Co. Ltd.	Japan
8	Sumitomo Metal Industries Ltd.	Japan
<b>Pipe Fittings</b>		
1.	Eby industries	India
2.	Excel hydropneumatics pvt. Ltd.	India
3.	Micro precision products pvt. Ltd.	India
4	Precision engineering industries	India
5	Tecnomatic (india) pvt. Ltd.	India
6	Wesmec engineering pvt. Ltd.	India
7	Celleir	France
8	Cesare bonetti SPA	Italy
9	Dewrance & Co. Ltd.	U.K.
10	Hopkinsons Ltd.	U.K.
11	Siemens AG PGI	germany
12	Sumitomo metal industries ltd.	Japan
13	Thysen krupp stahlunion GmbH	germany
14	Tecnomatic SPA	Italy
<b>Instrument Miniature Valves</b>		
1.	Audco India Limited(L&T Valves Divn.)	India
2.	Aura Inc	India
3.	Bhel (valves division)	India
4.	Chemtrol Industries Ltd	India
5.	Chemtrols Samil(India) Pvt Ltd	India
6.	Comfit & Valves Pvt. Ltd.	India
7.	Excel Hydro-Pneumatics Pvt Ltd,	India
8.	Excelsior Engg Works	India
9.	Hyd- Air Engineering works Lonavla	India
10.	Ksb Pumps Limited (Valves Divn)	India
11	Panam Engineers	India
12	Tecnomatic (India) Pvt. Ltd.	India
13	Anderson Greenwood & Co.	U.S.A
14	BFE boneey forge valve License	Italy
15	Celleir S.A.	France
16	Crane Company International Sales	U.S.A
17	Dewrance & Co. Ltd.	U.K.
18	Euromisure Cremona	Italy
19	Hopkinsons Ltd.	U.K.
20	Kosei Sanyog Ltd.	Japan
21	Swagelok company/creximco	U.S.A
22	Sumitomo metal industries ltd.	Japan
23	Technomatic SPA	Italy
24	Velan engineering Co. Limited	U.K.
25	Wesmec engineering pvt. Ltd	India
<b>Purge rotameter</b>		
1	Eureka industrial equipments Pvt. Ltd.	India
2	Instrumentation engineers pvt. Ltd.	India
3	Placka instruments & engineers pvt. ltd	India
<b>AIR HEADER/ADPOT</b>		
1	Wesmec engineering pvt. Ltd.	India
<b>Condensate pot</b>		

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1	HYDROPNEUMATICS	India
2	MICRO-PRECISION PRODUCTS	India
3	TECHNOMATIC (I) P. LTD.	India
4	Wesmec engineering pvt. Ltd.	India
<b>Valve manifolds</b>		
1	Comfit & Valves Pvt. Ltd.	India
2	EXCEL HYDROPNEUMATICS PVT. LTD.	India
3	HYDER	India
4	INSTRUMENTATION LTD.	India
5	MICRO PRECISION	India
6	NORDIVAL (SWAGELOC)	
7	PARKER	India
8	TECHNOMATIC	India
9	Wesmec engineering pvt. Ltd.	India
<b>Calibration equipment &amp; services</b>		
1	Tempsens instruments (i) pvt. Ltd.	India
2	Fluke	Singapore
3	Omega Engineering	US
<b>Enclosures</b>		
1	Trinity touch pvt. Ltd. (weatherproof size 80 * 80 mm)	India
<b>Instrument contractor for inst. Construction /erection works</b>		
1	Blue star	India
2	Bells control ltd.	India
3	Godrej & Boyce mfg. co. ltd	India
4.	ICB Contractor Pvt. Ltd.	India
5.	Jasubhai Industries	India
6.	Koso india pvt. Ltd. ( kent introl control valve divn.)	India
7.	L&T ( construction contracts Divn.)	India
8.	Miraj instrumentation service (upto 0.5 crores)	India
9.	Narayan engineering (< Rs. 5 lacs (small project))	India
10.	Pace process control pvt. Ltd.	India
11	Peron engg. Construction ltd.	India
12.	Protect control pvt. Ltd.	India
13	Technimont ICB ltd.	India

 पी डी आई एल <b>PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LTD.</b>	PC183/E/206/S -VI/11.0	0	 <b>Talcher Fertilizers</b>
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## VENDOR LIST-CIVIL & STRUCTURAL WORK


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## 1.0 CIVIL & STRUCTURAL


### GENERAL NOTES:

- i. Only 'First' Quality materials shall be used.
- ii. Bidder shall select sub vendors from the vendor list as specified below. Bidder shall ensure that sub vendor for the specified item has supplied item for the specified service & the supplied item is in satisfactory service since last 3 years as on date of offer. Vendor shall have well proven record for the specified services and shall be subjected to owner/consultant approval.
- iii. OWNER / CONSULTANT reserve the right to choose any of the approved make / vendor as per this list. Make of the item not indicated and any other make for the specified item shall be subject to owner's / consultant's approval.
- iv. Specifications of manufacturer's items shall be checked against tender item / specifications before selecting any product or brand name. In case of any discrepancy, tender item / specifications shall prevail, and any such brand of item shall not be used which is not conforming to tender specifications even if it is listed in this vendor list.
- v. In case of non-availability of any material among approved vendors / makes in a particular site / region, alternate vendor / make conforming to IS / BS etc. Shall be used subject to approval by OWNER / CONSULTANT team at site and then finally by Head office.
- vi. Contractor shall get the the material sample approved by EIC as per the Vendor list before procurement.

SL. NO.	ITEM	NAME
<b>1.0</b>	<b>FLOOR FINISHING</b>	
1.1	CEMENT TILES (FLOOR/WALL)	a) EUROCON b) ALTRA TILE PVT. LTD. c) DAZZLE
1.2	TERRAZZO TILES	A) NITCO B) HINDUSTAN TILES
1.3	CERAMIC TILES	a. SOMANY CERAMICS b. H&R JOHNSON CERAMICS c. KAJARIA CERAMICS d. ORIENT CERAMICS e. SPARTEK CERAMICS

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		<b>f. BELL CERAMICS</b>
1.4	HEAVY DUTY FLOOR TILES	A) BHARAT TILES B) RESTILE CERAMICS C) PELICAN CERAMIC INDUS. D) PAVIT E) SONA TILES F) DIAMOND REGINA
1.5	INDUSTRIAL FLOOR HARDENER ADMIXTURE	a) PIDILITE INDUSTRIES b) SIKA c) CICO. d) SAMCOCK CHEMICALS (P) LTD. e) STRUCTURAL WATER PROOFING CO. (P) LTD
1.6	PVC ROLLS	A) PREMIER VINYL B) ARMSRONG INARCO C) RMG POLYVINYL D) PREMIER POLYFILM
1.7	PVC TILES	A) ARMSTRONG B) BHOR INDUSTRIES C) SHYAM VINYLES
1.8	PVC TILES/ROLL ANTISTATIC	A) PREMIER VINYL B) RMG POLYVINYL C) ARMSTRONG D) PREMIER POLYFILM
1.9	ACID RESISTANT TILES(BATTERY ROOM)	A) H&R JOHNSON OR APVD. EQUIV.
1.10	MOSSAIC TILE	A) (ITALIA) B) SPECIFIC GLASS MUSSAIC INDIA LTD.
<b>2.0</b>	<b>WOODWORK</b>	
2.1	FLUSH DOOR	A) GREEN B) CENTURY DOORS C) KITPLY PRODUCTS D) SITAPUR PLYWOOD E) WOODCRAFT PRODUCTS
2.2	PLY WOOD/BLOCK BOARD	A) CENTURY B) KITPLY PRODUCTS C) GREEN PLY



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		D) WOODCRAFT PRODUCTS
2.3	PARTICLE BOARD (EXTRA GRADE)	A) BHUTAN BOARD B) NOVAPAN INDIA LTD. C) BEST BOARD D) THE BOMBAY BURMAN TRACING CORPN. LTD.
2.4	MDF BOARD/MD PARTICLE BOARD (EXTRA GRADE) VENEERED/LAMINATED	A) NUCHEM LTD. B) MANGALAM TIMBER PRODUCTS LTD. C) WESTERN BIO SYSTEMS LTD.
2.5	DECORATIVE LAMINATES	A) CENTURY B) GREENPLY INDUS. LTD. C) MERINO D) ARCHID E) THE BOMBAY BURMAN TRADING CORPN. LTD F) BAKELITE HYLAM LTD. G) RAMMICA INDUSTRIES
2.6	MARINE PLYWOOD	A) CENTURY B) GREENPLY INDUS. LTD. C) MERINO D) ARCHID E) INDIAN PLYWOOD MFG. CO. LTD. F) SWASTIC PLYWOOD
<b>2.7.0</b>	<b>DOORS &amp; WINDOWS FITTINGS</b>	
2.7.1	MORTICE LOCKS WITH HANDLES	A) GODREJ & BOYCE B) EVERITE AGENCIES (P) LTD. C) DOORSET D) GOLDEN INDUSTRIES
2.7.2	CYLINDRICAL PIN TUMBLER LOCK WITH KNOBS	A) GODREJ & BOYCE B) EVERITE AGENCIES (P) LTD. C) DOORSET D) SECURE INDUSTRIES E) GOLDEN INDUSTRIES
2.7.3	HYDRAULIC DOOR CLOSER (OVER HEAD/ FLOOR)	A) OZONE B) EVERRITE AGENCIES (P) LTD. C) HARDWYN D) DOORKING INDUSTRIES
2.7.4	MISC. DOOR FITTINGS HINGLE, TOWER BOLTS, LATCHES, SOPPER, STAYS, ALDROPS ETC.	A) EVERITE AGENCIES (P) LTD. B) EBCO DINSUTRIES C) OZONE D) HARDWYN E) ECIE (P) LTD. F) NU-LITE INDUSTRIES
2.7.5	THREE WAY BOLTING LOCKING	A) SRIMA SALES & SERVICES





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	DEVICE HANDLE	B) DHIMAN INDUSTRIES
2.7.6	PANIC BAR LATCH (FOR EMERGENCY DOOR)	A) SRIMA SALES & SERVICE OR APPROVED EQUIV.
2.7.7	UPVC WINDOWS	A) FENESTA B) ENCRAFT C) WINDOW MAGIC
2.7.8	FASTENERS	A) HILTI INDIA PVT. LTD. B) FISCHER
<b>3.0</b>	<b>STEEL / ALUMINIUM DOORS, WINDOWS &amp; VENTILATOR</b>	
3.1	PRESSED STEEL DOORS WINDOWS & SECTION DOORS WINDOWS/ROLLING SHUTTER	A) RAYMUS ENGINEERS B) DHIMAN STEEL C) RDG ENGINEERING D) SUPER STEEL WINDOW CO. E) SKS STEEL INDUS.
3.2	ALMUNIUM / DOORS/ WINDOWS SECTIONS	A) JINDAL ALUMINIUM LTD. B) HINDALCO INDUSTRIES C) INDAL
3.3	FIRE-PROOF DOORS(APPROVED)	A) NAVAIR INTERNATIONAL B) RDG ENGINEERING
3.4	PVC DOORS / WINDOWS	A) SINTEX OR APPVD EQUIV.
3.5	PVC WATER TANKS	A) SINTEX OR APPVD EQUIV.
<b>4.0</b>	<b>PLASTERING</b>	
4.1	WATERPROOFING/ COMPOUND IN CEMENT PLASTER	A) STRUCTURAL WATER PROOFING CO. (P) LTD. B) PIDILITE INDUSTRIES C) SIKA D) KRISHNA CONCHEM
<b>5.0</b>	<b>ROOF TREATMENT (WATER PROOFING)</b>	
5.1	BRICK BAT COBA	A) INDIA WATER PROOFING CO. B) OVERSEAS WATERPROOFING CORPN.
5.2	ACRYLIC BASED CEMENTATIOUS PRIMER COATING FOR ROOF WATERPROOFING	A) STRUCTURAL WATER PROOFING CO. (P) LTD. B) SIKA QUALCRETE LTD. C) PIDILITE INDUSTRIES D) KRISHNA CONCHEM
5.3	APP MODIFIED POLYMERIC WASTER PROOFING MEMBRANE	A) PIDILITE INDUSTRIES LTD. B) SIKA C) STP TEXAS LTD. D) BITUMET CO. LTD.
5.4	PU BASED WATERPROOFING	A) PIDILITE INDUSTRIES LTD. B) SIKA

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		C) BASF D) FOSROC E) AMCHEM PRODUCTS PVT. LTD F) CIPY POLYURETHANE COATING G) EZECOAT by M/s INDUSTRIAL PRODUCTS H) M/s SLP INDUSTRIES LTD. I) M/s SHIVALIX AGRO-POLY PRODUCTS
<b>6.0</b>	<b>PAINTING WORKS</b>	
6.1	PLASTIC EMULSION (INTERIOR/EXTERIOR)	A) ICI INDIA LTD. B) BERGER PAINTS LTD. C) ASIAN PAINTS LTD. D) SHALIMAR PAINTS E) KANSAI NEROLAC PAINTS LTD. F) M/s. JOHNSON & NICHOLSON
6.2	DRY OILBOUND DISTEMBER	A) ASIAN PAINTS LTD. B) KANSAI NEROLAC PAINTS LTD.
6.3	INDUSTRIAL / EPOXY/ ALIPHATIC ACRYLATE/ SYNTHETIC ENAMEL PAINTS	A) ICI/AKZO NOBEL INDIA B) BERGER PAINTS LTD. C) ASIAN PAINTS LTD. D) SHALIMAR PAINTS E) INTERNATIONAL MARINE COATINGS PVT. LTD. F) KANSAI NEROLAC PAINTS LTD. G) BOMBAY PAINT H) KRISHNA CONCHEM
6.4	WATERPROOFING CEMENT PAINT	A) KILLICK NIXON LTD. B) RAJDOOT PAINTS
6.5	WOOD MELAMINE POLISH	A) ASIAN PAINTS B) SHALIMAR PAINTS C) WEMPLY PAINTS
6.6	WATERPROOFING TRANSPARENT EXTERIOR WALL COATING (OVER PAINTED SURFACE)	A) PIDILITE INDUSTRIES B) SIKA C) KRISHNA CONCHEM D) INDUSTRIAL PROD. MFG E) STRUCTURAL WATER-PROOFING CO. (P) LTD.
6.7	FIRE PROOF COATING	A) NAVAIR INTERNATIONAL OR APPVD. EQUIV.
<b>7.0</b>	<b>ROOFING SHEETS &amp; ACCESSORIES</b>	
7.1	ASBESTOS SHEETS	A) ETERNIT EVEREST LTD.

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		B) CHARMINAR INDUSTRIES C) VISAKA
7.2	C.G.I. SHEETS	A) ISPAT INDUSTRIES LTD. B) STEEL AUTHORITY OF INDIA C) TATA STEEL D) JINDAL
7.3	PRECOATED G.I. PROFILE SHEETS FOR ROOFING & WALL CLADDING	A) ISPAT INDUSTRIES LTD. B) LLOYD INSULATION (I) LTD. C) STEEL AUTHORITY OF INDIA D) TATA STEEL E) JINDAL F) SHREE PRECOATED STEELS LTD. G) INTERARCH BUILDING PRODUCTS (P) LTD. H) HARDCASTLE & WAUD MFG. CO. LTD. I) SHIV SHAKTI FIBER UDYOG
7.4	ALUMINIUM SHEET (PLAIN/PROFILE)	A) INDIAN ALUMINIUM CO. LTD. OR APPROVED EQUIVALENT
7.5	FIBRE GLASS SHEETS & PANELS (MACHINE MOULDED)	A) SIMBA FRP (P) LTD. B) GE INDIA C) DUROPLAST D) SHIV SHAKTI FIBER UDYOG
7.6	PROOFING J/L HOOKS, BOLTS & OTHER ACCESSORIES (POLYMER COATED)	A) KATALIST CONSULTANT (P) LTD. B) ADVANCED MACHINE
<b>8.0</b>	<b>SANITARY PLUMBING FITTINGS &amp; FIXTURES</b>	
8.1	SANITARY FITTINGS (W.C. WASH BASIN, URINAL ETC.)	A) HINDUSTAN SANITARY WARE & INDUS. LTD. B) PARRYWARE SANITARY WARE C) MADHUSUDAN CERAMICS D) NYCER CERAMICS
8.2	PLUMBING FITTINGS & FIXTURES	A) JAGUAR B) CERA C) HINDWARE D) GEM E) PARKO F) KINGSTON
8.3	GLASS/MIRROR (SHEET/ FLOAT/ TOUGHENED/ LAMINATION)	A) GUJARAT GUARDIAN LTD. B) SAINT GOBAIN C) ASAHI FLOAT
8.4	GI PIPES	A) JINDAL B) SURYA C) PRAKASH

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		D) SWASTIK
<b>9.0</b>	<b>FALSE CEILING, FALSE FLOORING &amp; UNDERDECK INSULATION</b>	
9.1	FLASE CEILING / WALL CLADDING (ALUMINIUM STRIP/ TRAY TYPE)	A) INTERARCH BUILDING PRODUCTS (P) LTD. B) HUNTER DOUGLAS C) MASCOT OVERSEAS
9.2	FALSE FLOORING	A) MULTI INTERIORS PVT. LTD. B) BESTLOCK SYSTEM & CONCEPTS C) LLOYD INDUSULATION (I) LTD. D) UNITED INSULATION E) A.R. & BROTHERS
9.3	UNDERDECK/WALL HEAT INSULATION	A) BAKELITE HYLAM LTD. B) U.P. TWIGA F.G. LTD. C) LLOYD INDULATION (I) LTD. D) SUPEREME E) PIDILITE
9.4	OVERDECK HEAT INSULATION	A) LLOYD INSULATION (I) LTD. B) BEST PLASTRONICS LTD. C) PIDILITE INDUSTRIES LTD
9.5	GYPNUM BOARD TILES (FIBRE GLASS REINFORCED)/ PRIMA BOARD ARMSTRONG FALSE CEILING	A) SAINT GOBAIN B) INTERARCH BUILDING PRODUCTS (P) LTD. C) INDIA GYPSUM LTD.
10.0	<b>SPECIALITY PRODUCTS (CEMENT ADDITIVES/ ADMIXTURES / CORROSION INHIBITORS / SBR LATEX &amp; ACRYLIC POLYMERS / EPOXY LATEX POLYMERS / FOOD GRADE EPOXY SURFACE TREATMENT/ EPOXY &amp; CEMENTITIOUS GROUT/ EPOXY BONDING AGENTS &amp; ANCHORS / SEALING / COATING</b>	A) PIDILITE INDUSTRIES B) SIKA C) KRISHNA CONCHEM D) FOSROC E) BASF F) MYK ARMENT PVT LTD.
10.1	EPOXY FLOOR COATING (BATTERY ROOM ETC)	A) SIKA B) FAIRMATE C) CIPY POLYURETHANE D) KRISHNA CONCHEM E) FOSROC F) MYK ARMENT PVT. LTD.
10.2	EPOXY PHENOLIC CHEMICAL RESISTANT COATING & MORTAR( SCREED) FOR FLOOR & WALLS	A) KRISHNA CONCHEM B) SIKA C) FOSROC D) BASF E) CIPY POLYURETHANE

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10.3	CONCRETE REPAIR & REHABILITATION PRODUCTS	A) KRISHNA CONCHEM B) SIKA C) FOSROC D) BASF E) PIDILITE
10.4	PREMIXED CEMENTITIOUS MORTARS & MICROCONCRETE	A) KRISHNA CONCHEM B) SIKA C) FOSROC D) BASF E) PIDILITE
10.5	GLASS/CARBON FIBRE WRAPPING FIBRE / LAMINATE / EPOXY	A) KRISHNA CONCHEM B) SIKA C) FOSROC D) BASF
10.6	CORROSION PROTECTION ANODES & CAPLETS	A) KRISHNA CONCHEM B) SIKA C) FOSROC D) BASF
<b>11.0</b>	<b>MISCELLANEOUS ITEMS</b>	
11.1	WOOD PRESERVATIVE	A) ASCU HICKSON LTD.
11.2	WALL SURFACE TEXTURED COATING	A) JOTUN B) SPECTRUM PAINTS C) BAKELITE HYLAM D) OIKOS E) UNITILE
11.3	EXTERNAL ACRYLIC WALL COATINGS	A) KRISHNA CONCHEM B) SIKA C) FOSROC D) BASF E) PIDILITE F) ASIAN G) BERGER
11.4	PVC PLUMBING FITTINGS	A) SUPREME B) POLYPAC C) ASTROL D) PRAYAG POLYMERS (P) LTD.
11.5	REINFORCED FIBRE GLASS WATERPROOFING FELT	A) SIKA B) U.P. TWIGA F.G. LTD. C) FGP LTD.
11.6	ANTI TERMITE TREATMENT	A) PCI OR APPRVD EQUIV.
11.7	MATERIAL TEST HOUSE	A) IIT MADRAS B) GOVT APPROVED AGENCY C) SHRIRAM TEST HOUSE D) SPECTRO ANALYTICAL LABS E) BHARAT TEST HOUSE

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12.0	CEMENT	A) ACC B) J K CEMENT C) BINANI CEMENT D) JP CEMENT E) GUJARAT AMBUJA F) ULTRA TECH CEMENT G) BIRLA CORPN. LTD. H) GRASIM I) SHREE
12.1	SULPHUR RESISTANT CEMENT	A) SAURASHTRA CEMENT LTD. B) SHREE DIGVIJAY CEMENT
13.0	RCC DESIGN MIX	A) GOVT APPROVED AGENCY B) IIT DELHI C) SHRIRAM TEST HOUSE
14.0	WRAPPING COATING	DELETED
15.0	FIRE PROOFING MATERIAL	A) CAFCO B) CARBOLINE
16.0	STRUCTURAL STEEL / CS PLATE	HEAVY SECTIONS MORE THAN 150 MM A) SAIL B) TATA STEEL C) RINL LIGHT SECTIONS LESS THAN 150 MM D) JINDAL E) ESSAR F) ISPAT INDUSTRIES G) JINDAL STEEL & POWER LTD.
16.1	MS PIPES (HAND RAIL APPLICATION)	A) SURYA B) PRAKASH C) JINDAL D) HITEX E) ASHWANI STEELS F) VIKRANT ISPAT UDYOG G)
17.0	TMT BAR / REBAR	A) SAIL B) TATA STEEL C) RINL D) SHYAM STEEL INDUSTRIES LIMITED E) ELECTROSTEEL STEELS LTD F) SHRI RATHI STEEL LTD. G) SRMB SRIJAN PRIVATE LIMITED E) M/s JINDAL STEEL & POWER LIMITED(PANTHER)
18.0	GRATINGS/HANDRAILS	A) INDIANA GRATINGS B) WESTCOAST ENGINEERING



	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TALCHER FERTILIZER PLANT, ODISHA VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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		C) GREATWELD GRATING D) KANADE ANAND UDYOG
19.0	WELDING ELECTRODE	A) ADOR B) ESAB C) D & H D) HANOVAR

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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## VENDOR LIST-ROTATING EQUIPMENTS



	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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SECTION NUMBER	DESCRIPTION
1.0	Rotating Equipments

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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Bidder shall select sub vendors from the vendor list as specified below. Bidder shall ensure that sub vendor for the specified item has supplied item for the specified service & the supplied item is in satisfactory service since last 3 years as on date of offer.

Vendor shall have well proven record for the specified services and shall be subjected to owner/consultant approval.



Any addition to vendor list shall be reviewed and approved by Owner subject to submission of back-up credentials with proven & reliable record of performance for similar or comparable plant design capacity by Bidder.

### 1.0 ROTATING EQUIPMENTS:

<b>Pumps for Chemicals/ Acid/ Alkali/ BFW/ Condensate Use</b>		
1.	A.R WILFLEY INDIA PVT. LTD	INDIA
2.	AKAY INDUSTRIES PVT. LTD	INDIA
3.	BEACON WEIR LTD	INDIA
4.	ITT CORPORATION INDIA PVT. LTD.	INDIA
5.	KIRLOSKAR BROTHERS LTD.	INDIA
6.	KIRLOSKAR EBARA PUMPS LTD	INDIA
7.	KISHORE PUMPS PVT. LTD	INDIA
8.	KSB PUMPS LTD	INDIA
9.	MICROFINISH PUMPS PVT. LTD	INDIA
10.	SAM TURBO INDUSTRY PRIVATE LTD. ( CHEMICAL PUMPS CAPACITY- 900 M3/HR. HEAD- 60 M )	INDIA
11.	SULZER PUMPS INDIA LTD. (SINGLE STAGE ONLY)	INDIA
12.	FLOWSERVE INDIA CONTROLS PVT .LTD	INDIA
13.	PUMPEN FABRIK ERNST VOGEL	AUSTRIA
14.	ENSIVAL S.A	BELGIUM
15.	GE POWER (NUOVO PIGNONE SPA)	ITALY
16.	WEIR GABBIONETA SRL(FORMERLY POMPE GABBIONETA SPA)	ITALY
17.	ARAI PUMP MFG. CO. LTD	JAPAN
18.	SANWA HYDROTECH CORPORATION	JAPAN
19.	GOULD PUMPS INC.	SINGAPORE
20.	FLOWSERVE (IDP)	U.K
21.	LABOUR PUMP CO. LTD	U.K
<b>COOLING WATER PUMPS (HORIZONTAL)</b>		
1.	A.R WILFLEY INDIA PVT. LTD	INDIA
2.	BEACON WEIR LTD	INDIA
3.	FLOWMORE LTD (FORMALLY FLOWMORE PVT. LTD.)	INDIA
4.	JYOTI LIMITED	INDIA
5.	KIRLOSKAR BROTHERS LTD.	INDIA
6.	MATHER & PLATT (INDIA) LTD. (A SUBSIDIARY OF WILO SE GERMAN)	INDIA



	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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7.	SAM TURBO INDUSTRY PRIVATE LTD. ( CHEMICAL PUMPS CAPACITY- 440 M3/HR. HEAD- 44 M )	INDIA
8.	VOLTAS LTD. (PUMPS & PROJECTS BUSINESS DIVISION)	INDIA
9.	FLOWSERVE INDIA CONTROLS PVT .LTD	INDIA
10.	KSB AG	GERMANY
11.	MITSUBISHI HEAVY INDUSTRIES LTD	JAPAN
12.	SHIN NIPPON MACHINERY CO. LTD	JAPAN
13.	TORISHIMA PUMP MFG. CO. LTD	JAPAN
14.	FLOWSERVE (IDP)	U.K
<b>PUMPS FOR SLURRY SERVICE</b>		
1.	A.R WILFLEY INDIA PVT. LTD	INDIA
2.	AKAY INDUSTRIES PVT. LTD	INDIA
3.	BEACON WEIR LTD	INDIA
4.	BEST & CROMPTON ENGG. CO.	INDIA
5.	FLOWMORE LTD. (FORMALLY FLOWMORE PVT. LTD.)	INDIA
6.	GREAVES LTD.	INDIA
7.	KISHORE PUMPS PVT LTD	INDIA
8.	KSB PUMPS LTD	INDIA
9.	MICROFINISH PUMPS PVT. LTD	INDIA
10.	SAM TURBO INDUSTRY PRIVATE LTD.	INDIA
11.	SU MOTORS PVT. LTD	INDIA
12.	SULZER PUMPS INDIA LTD.	INDIA
<b>PUMPS FOR UTILITY SERVICES</b>		
1.	AKAY INDUSTRIES PVT. LIMITED	INDIA
2.	BEACON WEIR LTD	INDIA
3.	BEST & CROMPTON ENGG. CO.	INDIA
4.	FLOWMORE LTD. (FORMALLY FLOWMORE PVT. LTD.)	INDIA
5.	FLOWSERVE INDIA CONTROL LTD.	INDIA
6.	KIRLOSKAR BROTHERS LIMITED	INDIA
7.	KIRLOSKAR EBARA PUMPS LIMITED	INDIA
8..	KISHORE PUMPS LTD	INDIA
9.	MICROFINISH PUMPS PVT. LTD	INDIA
10.	SU MOTORS PVT. LTD	INDIA
11.	SULZER PUMPS INDIA LTD.	INDIA
12.	WEIR BDK VALVES ( A UNIT OF WEIR INDIA PVT. LTD.	INDIA
<b>BARREL PUMP</b>		
1.	KIRLOSKAR EBARA PUMPS LIMITED	INDIA
2.	FLOWSERVE INDIA CONTROL LTD.	INDIA
3.	HI.LIFE MANUFACTURING CO.	INDIA
<b>COOLING WATER PUMPS (VERTICAL)</b>		
1.	A.R WILFLEY INDIA PVT. LTD	INDIA
2.	BEACON WEIR LTD	INDIA
3.	FLOWMORE LTD (FORMALLY FLOWMORE PVT. LTD.)	INDIA
4.	JYOTI LIMITED	INDIA
5.	KIRLOSKAR BROTHERS LTD.	INDIA
6.	MATHER & PLATT (INDIA) LTD.	INDIA



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	(A SUBSIDIARY OF WILO SE GERMAN)	
7.	SAM TURBO INDUSTRY PRIVATE LTD. ( CHEMICAL PUMPS CAPACITY- 440 M3/HR. HEAD- 44 M )	INDIA
8.	VOLTAS LTD. (PUMPS & PROJECTS BUSINESS DIVISION)	INDIA
9.	FLOWSERVE INDIA CONTROLS PVT .LTD	INDIA
10.	KSB AG	GERMANY
11.	MITSUBISHI HEAVY INDUSTRIES LTD	JAPAN
12.	SHIN NIPPON MACHINERY CO. LTD	JAPAN
13.	TORISHIMA PUMP MFG. CO. LTD	JAPAN
14.	FLOWSERVE (IDP)	U.K
<b>CENTRIFUGAL MONOBLOCK PUMP SET</b>		
1.	CG POWER AND INDUSTRIAL SOLUTION LIMITED	INDIA
2.	JYOTI LIMITED	INDIA
3.	KIRLOSKAR BROTHERS LTD.	INDIA
4.	MATHER & PLATT (INDIA) LTD.(A SUBSIDIARY OF WILO SE GERMAN)	INDIA
5.	PRECISION ENGINEERING INDUSTRIES (SMALL PUMPS UPTO 2 HP)	INDIA
6.	UJALA	INDIA
	POT / CAN MOUNTED AND INTANK SUBMERGED MOTOR CRYGENIC PUMPS	
	AGROTECH CORP ( J.C. CARTER) UPTO 1300M3/HR , 2100M HEAD	
<b>SUMP PUMPS</b>		
1.	AKAY INDUSTRIES PVT. LTD	INDIA
2.	BEACON WEIR LTD	INDIA
3.	KISHORE PUMPS PVT. LTD	INDIA
4.	SAM TURBO INDUSTRY PRIVATE LTD. ( CAPACITY – 550M3/HR. HEAD- 35M)	INDIA

<b>PUMPS FOR CHEMICAL DOSING/ METERING</b>		
1.	BRAN & LUEBBE INDIA	INDIA
2.	MATZ PUMPS PRIVATE LIMITED	INDIA
3.	MILTON ROY INDIA (P) LTD	INDIA
4.	POSITIVE METERING PUMPS (I) PVT. LTD.	INDIA
5.	SHAPO TOOLS	INDIA
6.	SWELORE ENGINEERING PVT. LTD	INDIA
7.	V.K PUMPS INDUSTRIES PVT. LTD	INDIA
8.	VARICON SYSTEMS (MOTOR DRIVEN/ PNEUMATIC)	INDIA
9.	DOSAPRO MILLTON ROY	FRANCE
10.	LEWA HERBERTOTT GMBH & CO	GERMANY
11.	PERONI POMPE SPA	ITALY

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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12.	NIGATA WORTHINGTON PUMPS	JAPAN
13.	NIKKISO CO. LTD.	JAPAN
14.	BRAN & LUEBBE LTD.	U.K
<b>ROTARY PUMPS AND SCREW PUMPS</b>		
1.	AIRAUTO INDUSTRIES	INDIA
2.	DELTA CORPORATION	INDIA
3.	ROTO PUMPS LTD	INDIA
4.	UT PUMPS AND SYSTEMS LTD (SINGLE SCREW: CAP. 5M3/HR PR. 0.06 BAR, TWIN SCREW: CAP 25M3/HR PR. 25 BAR, TRIPLE SCREW: CAP 53.4 M3/HR PR. 10 BAR)	INDIA
<b>FANS &amp; BLOWERS</b>		
1.	ABB FLAKT INDIA LTD.	INDIA
2.	AEROVENT PROJECTS PVT. LTD	INDIA
3.	AIR CONDITIONING CORPN LTD	INDIA
4.	AIR CONTROL & CHEMICAL ENGG. CO.LTD.	INDIA
5.	BOLDROCCHI INDIA PVT. LTD. (ID& FD FANS / BLOWERS.CAPACITY 0.84 M3/S TO 423.9 M3/S, PR. 0.16 KPA TO 64.6 KPA, POWER 2 KW TO 2000 KW	INDIA
6.	BHEL	INDIA
7.	DRAFT –AIR INDIA PVT. LTD.	INDIA
8.	M/S CB DOCTOR VENTILATORS PVT .LTD ( 2,30,000 M3/HR)	INDIA
9.	SWAM PNEUMATICES PVT LTD ( CAPACITY – FROM 1485 M3/HR TO 48000 M3/HR, PRESSURE- FROM 0.7 BARG TO 3500MMWC	INDIA
10.	MAXFLOW FANS MANUFACTURING (P) LTD. ( CENTRIFUGAL FAN UPTO 2,25,000 M3/HR ( FOR POWER ENERGY, ENVIRONMENT INDUSTRY USE) – AXIAL FLOW FAN UPTO 78,500 M3/HR ( For power energy ,,environment industry use)	INDIA
11.	Thermax babcock & Wilcox limited	INDIA
12.	TLT ENGINEERING INDIA PVT. LTD	INDIA
13.	ILLONOIS BLOWERS INC	U.S.A
<b>AGITATORS/ MIXERS</b>		
1.	GANSONS LTD.	INDIA
2.	HYTEC GRANT INSTRUMENTS	INDIA
3.	MARS DYE CHEM PVT. LTD	INDIA
4.	RATHI LIGHTNIN MIXERS PRIVATE LIMITED	INDIA
5.	REMI PROCESS PLANT & MACHINERY LTD.	INDIA
6.	SAFE MAX AGITATOR	INDIA
7.	STANDARD ENGINEERS	INDIA
<b>AIR CONDITIONING SYSTEM</b>		
1.	AIR CONDITIONING CORP. LTD	INDIA

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES</b> <b>TALCHER FERTILIZER PLANT, ODISHA</b> <b>VENDOR LIST</b>	PC183/E/206/S -VI/11.0	0	
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2.	BLUE STAR LTD.	INDIA
3.	KIRLOSKAR ELECTRIC COMPANY LTD.	INDIA
4.	PATELS AIR TEMP INDIA LTD.	INDIA
5.	SUVIDHA ENGINEERS	INDIA
6.	VOLTAS LTD.	INDIA
<b>COUPLINGS</b>		
1.	ELECON ENGG. CO. LTD (FOR FLEXIBLE COUPLING)	INDIA
2.	FENNER INDIA LTD. (FOR FLEXIBLE COUPLING)	INDIA
3.	HI-CLIFF (FOR GEAR COUPLING)	INDIA
4.	RATHI TRANSPower PVT. LTD	INDIA
5.	RATHI TURBOFLEX PVT. LTD	INDIA

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## VENDOR LIST-PIPING


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<b>MECHANICAL – PIPING</b>		
	<b>CS PIPES IS-1239 (BLACK &amp; GI)</b>	
1	AMBICA TUBES CO.	INDIA
2	ANIL METAL CORPORATION	INDIA
3	CHETAN STEELS (Upto 6")	INDIA
4	DADU PIPES (P) LIMITED (½" to 6")	INDIA
5	GOOD LUCK STEEL TUBES LTD. (15 mm to 150 mm dia)	INDIA
6	GUJRAT STEEL TUBES LTD.	INDIA
7	HI-TECH PIPES LTD. (ERW MS / GI Pipes:½" NB to 6" NB, (Thickness 2.2 mm to 6.0 mm))	INDIA
8	INDIAN TUBE CO. (TATA DIV. OF TUBES & PIPES) (For >200M)	INDIA
9	INDUS TUBES LIMITED (½" to 6")	INDIA
10	JAY LAKSHMI STEEL & ENGINEERING CO.	INDIA
11	JINDAL PIPES LTD. (1/2" to 4")	INDIA
12	JOTINDRA STEEL & TUBES LTD. (½" to 6")	INDIA
13	KALPESH TUBE(INDIA), (TRADER) (upto a max order value Rs.25.0 lakh)	INDIA
14	MUKAT PIPES LTD	INDIA
15	NAVRATAN PIPE AND PROFILE LTD. (Upto 6")	INDIA
16	P.K.FORGE & FITTING INDUSTRIES	INDIA
17	SAGAR STEEL CORPORATION (TRADER)	INDIA
18	SANGHVI METALS (TRADER)	INDIA
19	SURINDRA ENGINEERING CO. PVT. LTD.	INDIA
20	SURYA ROSHNI LTD. (15mm to 150mm)	INDIA
21	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
22	WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")	INDIA
23	ZENITH LIMITED	INDIA
	<b>CS WELDED PIPES IS-3589</b>	
1	ANIL METAL CORPORATION	INDIA
2	DADU PIPES (P) LIMITED (6" to 12" (Thickness up to 9.5 mm))	INDIA
3	EVERGREEN HARDWARE STORES	INDIA
4	GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)	INDIA
5	GUJRAT STEEL TUBES LTD.	INDIA
6	HEAVY METAL & TUBES LIMITED	INDIA
7	HI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))	INDIA



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8	INDUS TUBES LIMITED (6" to 12")	INDIA
9	JAY LAKSHMI STEEL & ENGINEERING CO.	INDIA
10	JINDAL PIPES LTD. (8" to 14")	INDIA
11	JOTINDRA STEEL & TUBES LTD. (6" to 14")	INDIA
12	KALPESH TUBE(INDIA), (TRADER)	INDIA
13	LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)	INDIA
14	MUKAT PIPES LTD	INDIA
15	NAVRATAN PIPE AND PROFILE LTD. (Upto 10")	INDIA
16	P.K.FORGE & FITTING INDUSTRIES	INDIA
17	PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)	INDIA
18	RATNAMANI METALS & TUBES LIMITED	INDIA
19	SAGAR STEEL CORPORATION (TRADER)	INDIA
20	SANGHVI METALS (TRADER)	INDIA
21	SAW PIPES	INDIA
22	SHRI RAM METALS	INDIA
23	STEEL AUTHORITY OF INDIA LTD.	INDIA
24	SURINDRA ENGINEERING CO. PVT. LTD.	INDIA
25	SURYA ROSHNI LTD. (6" to 16" ,(150mm to 400mm))	INDIA
26	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
27	WELSPUN GUJARAT STAHL ROHREN LIMITED (DAHEJ) (Upto 72" (50 mm thk.))	INDIA
28	WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 100" (30 mm thk.))	INDIA
	<b>CS WELDED PIPES TO API 5L SPIRAL/ LONG. WELDED</b>	
1	HEAVY METAL PIPE CENTRE (UPTO 24" (Upto SCHXXS) (PDIL approved Manufacturer's Make only)	INDIA
2	JINDAL PIPES LTD. (2" TO 14")	INDIA
3	JOTINDRA STEEL & TUBES LTD. (½" TO 14")	INDIA
4	KALPESH TUBE(INDIA), (TRADER)	INDIA
5	LALIT PIPES & PIPES LTD. (16" to 64" thickness upto 20mm)	INDIA
6	MUKAT PIPES LTD.	INDIA
7	P.K.FORGE & FITTING INDUSTRIES	INDIA
8	PRATIBHA INDUSTRIES LTD. (16" to 24" thickness 6mm to 14.27mm)	INDIA
9	RATNAMANI METALS & TUBES LTD.	INDIA
10	SAGAR STEEL CORPORATION (TRADER)	INDIA
11	STEEL AUTHORITY OF INDIA LTD.	INDIA
12	SURINDRA ENGINEERING CO. PVT. LTD.	INDIA
13	SURYA ROSHINI LTD (GR. A, 3" TO 4", GR. B, 6" TO 14")	INDIA

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14	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
15	WELSPUN GUJARAT STAHL ROHREN LIMITED (DAHEJ) (upto 72" (50 MM THK))	INDIA
16	WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (upto 100" (30 MM THK.))	INDIA
17	ETS TROUVAY & CAUVIN	FRANCE
18	PHOCEENNE	FRANCE
19	MANNESMANN HANDEL AG	GERMANY
20	THYSSEN-KRUPP STAHLUNION GMBH	GERMANY
21	DALMINE SPA	ITALY
22	RACCORTUBI SRL	ITALY
23	KOSEI SANGYO LTD	JAPAN
24	MARUBENI ITOCHU STEEL	JAPAN
25	MITSUBISHI CORPORATION	JAPAN
26	NIPPON KOKAN	JAPAN
27	NIPPON STEEL CORPORATION	JAPAN
28	NISHITANI & CO. LTD.	JAPAN
29	NISSHO IWAI CORPORATION	JAPAN
30	OKURA & CO. LTD.	JAPAN
31	SOJITZ CORPORATION	JAPAN
32	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
33	HYUNDAI CORPORATION	KOREA
34	BRITISH STEEL CORPORATION	U.K.
35	CORUS TUBES LIMITED	U.K.
36	SAW PIPES USA, INC	U.S.A
	<b>CS/AS/ LTCS SEAMLESS PIPES</b>	
1	ANAND SEAMLESS TUBES PVT. LTD. (CS Seamless Pipes upto 2")	INDIA
2	BHEL (VALVES DIVISION)	INDIA
3	CHETAN STEELS (Upto 12", SCH80)	INDIA
4	HEAVY METAL & TUBES LIMITED (upto 8", thickness upto 18.26mm)	INDIA
5	HEAVY METAL PIPE CENTRE (UPTO 24" (upto SCHXXS) (PDIL approved Manufacturer's make only))	INDIA
6	INDIAN TUBE CO. (TATA DEV. OF TUBES & PIPES)	INDIA
7	ISMT LIMITED	INDIA
8	JAY LAKSHMI STEELS & ENGINEERING CO.	INDIA
9	JINDAL SAW LTD.	INDIA
10	MAHARASHTRA SEAMLESS LTD.	INDIA

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11	P.K.FORGE & FITTING INDUSTRIES	INDIA
12	RATNADEEP METAL & TUBES PVT. LTD. (<=168.3MM OD)	INDIA
13	SAINEST TUBES PVT. LTD. ( ½ “ NB TO 3” upto SCH. 160 (ASTM A 106 GR. B, A333 GR. 1 & 6 & A335 GR. P11))	INDIA
14	ETS TROUVAY & CAUVIN	FRANCE
15	PHOCEENNE	FRANCE
16	HORST KURVERS GMBH	GERMANY
17	MANNESMANN HANDEL AG	GERMANY
18	DALMINE SPA	ITALY
19	GAM RACCORDI S.P.A	ITALY
20	IBF SEAMLESS PIPES SPA	ITALY
21	RACCORTUBI SRL	ITALY
22	MARUBENI ITOCHU STEEL	JAPAN
23	MITSUBISHI CORPORATION	JAPAN
24	NIPPON STEEL CORPORATION	JAPAN
25	NISHITANI & CO. LTD.	JAPAN
26	NISSHO IWAI CORPORATION	JAPAN
27	OKURA & CO. LTD.	JAPAN
28	SOJITZ CORPORATION	JAPAN
29	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
30	HYUNDAI CORPORATION	KOREA
31	AB SANDVIK STEEL	SWEDEN
32	BRITISH STEEL CORPORATION	U.K.
33	CORUS TUBES LIMITED	U.K.
34	VOMAL INTERNATIONAL LIMITED	U.K.
<b>SS SEAMLESS/ WELDED PIPES</b>		
1	APEX TUBES PVT LIMITED (SEAMLESS upto 8" (SCH. 80S) & WELDED upto 48" (SCH160))	INDIA
2	BHANDARI FOILS & TUBES LIMITED (SEAMLESS upto 4" (SCH. 80) & WELDED UPTO 20" (THK. <= 8MM))	INDIA
3	CHETAN STEELS ( upto 6” SCH. 40 )	INDIA
4	CHOKSI TUBE COMPANY LTD.	INDIA
5	DIVINE TUBES PVT. LTD. (UPTO 8”)	INDIA
6	HEAVY METAL & TUBES LIMITED (UPTO 8" (THICKNESS UPTO 18.26 MM))	INDIA
7	HEAVY METAL PIPE CENTRE (UPTO 8" (upto SCH80S) (PDIL APPROVED MANUFACTURER'S MAKE ONLY))	INDIA
8	JAY LAKSHMI STEEL & ENGINEERING CO.	INDIA

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9	JINDAL SAW LTD.	INDIA
10	KRYSTAL STEEL MANUFACTURING PVT. LTD. (upto 2" (MATERIAL UPTO GRADE SS 321))	INDIA
11	MARDALE PIPES PLUS LTD.	INDIA
12	MODERN TUBE INDUSTRIES LTD. (upto 2" (upto SS Grade 321))	INDIA
13	NUCLEAR FUEL COMPLEX	INDIA
14	P.K.FORGE & FITTING INDUSTRIES	INDIA
15	PRAKASH STEELAGE LTD. (Seamless: upto 12" & Welded: upto 24")	INDIA
16	QUALITY STAINLESS PVT. LTD. (Seamless: upto 6"(SCH40S), Welded: upto 20"(SCH40S)(UPTO SS GRADE 316L))	INDIA
17	RATNADEEP METAL & TUBES PVT. LTD. (SMLS<=168.3MM O.D., WELDED <=50.8MM O.D. )	INDIA
18	RATNAMANI METALS & TUBES LTD.	INDIA
19	REMI EDELSTAHL TUBULARS LTD. (RAJENDRA MECHANICAL INDUSTRIES (Welded Upto 48" seamless upto 8" (Thk: upto 12.7mm))	INDIA
20	SANDVIK ASIA PVT. LTD. (¾" TO 2" (THK: UPTO 8.74 MM))	INDIA
21	SANGHVI METALS (TRADER)	INDIA
22	SCORODITE STAINLESS (INDIA) PVT. LTD. (Seamless UPTO 16"NB, Welding upto 36")	INDIA
23	SUBHLAXMI METALS & TUBES PVT. LTD. (SS Seamless: ¾"NB to 2"NB; Thk:1.2mm to 8mm, L upto 14mtr; SS Welded ¾" NB to 8"NB; Thk:1.2 mm to 8mm Lupto 14mtr (Material: SS 304, SS304L, SS316, SS316L, SS321, SS347, SS347H))	INDIA
24	SURAJ LIMITED (SURAJ STAINLESS LIMITED)	INDIA
25	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
26	WELSPUN SPECIALITY SOLUTIONS LIMITED (UPTO 4"( ONLY FOR SEAMLESS PIPES))	INDIA
27	ZHEJIANG JIULI STAINLESS STEEL PIPE CO. LTD.	CHINA
28	ETS TROUVAY & CAUVIN	FRANCE
29	PHOCEENNE	FRANCE
30	H. BUTTING GMBH & CO. (SEAMLESS : UPTO 30" (UPTO 16MM THK) & WELDED: UPTO 72" (UPTO 64MM )	GERMANY
31	HORST KURVERS GMBH	GERMANY
32	MANNESMANN HANDEL AG	GERMANY
33	THYSSEN-KRUPP STAHLUNION GMBH	GERMANY
34	DALMINE SPA	ITALY
35	GAM RACCORDI S.P.A (THICKNESS 2" TO 24")	ITALY
36	IBF SEAMLESS PIPES SPA	ITALY
37	RACCORTUBI SRL	ITALY
38	MARUBENI ITOCHU STEEL	JAPAN

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39	mitsubishi corporation	JAPAN
40	nippon steel corporation	JAPAN
41	nishitani & co. ltd.	JAPAN
42	nissho iwai corporation	JAPAN
43	okura & co. ltd.	JAPAN
44	sojitz corporation	JAPAN
45	sumitomo metal industries ltd.	JAPAN
46	hyundai corporation	KOREA
47	t.t.i. – tubacex tubos inoxidables, s.a. (upto 10”)	SPAIN
48	ab sandvik steel	SWEDEN
49	sosta bv (upto 72" ( thickness upto 25.4 mm))	NETHERLANDS
50	vomal international limited	U.K.
51	corus tubes limited	U.K.
52	british steel corporation	U.K.
	<b>SS SEAMLESS TUBES</b>	
1	anil metal corporation	INDIA
2	apex tubes pvt. limited (upto 50.8 mm od (thickness upto 4.00 mm))	INDIA
3	bhandari foils & tubes limited (upto 50mm od)	INDIA
4	divine tubes pvt. ltd. (upto 3”)	INDIA
5	heavy metal & tubes limited (upto 8" (thickness upto 18.26 mm))	INDIA
6	krystal steel manufacturing pvt. ltd. (upto 50.8 mm od (material upto grade ss 321))	INDIA
7	modern tube industries limited (upto 50.80 mm od (upto ss grade 321))	INDIA
8	prakash steelage ltd. (114.3 mm od, thickness upto 6 mm)	INDIA
9	ratnamani metals & tubes ltd.	INDIA
10	sandvik asia pvt. ltd. (od upto 60.33 (thk: upto 8.74 mm))	INDIA
11	scorodite stainless (india) pvt.ltd. (19.05 mm od to 50.80mm od, thickness upto 3mm)	INDIA
12	suraj limited (suraj stainless limited)	INDIA
13	welspun speciality solutions limited (upto 114.3mm od)	INDIA
14	t.t.i.-tubacex tubos inoxidables, s.a.(upto 250.0mm od)	SPAIN
	<b>SS PIPES UREA GRADE</b>	
1	key-tech engineering company (upto 8”)	INDIA
2	bhdt gmbh	AUSTRIA
3	schoeller-bleckmann nitec gmbh	AUSTRIA

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4	ETS TROUVAY & CAUVIN	FRANCE
5	PHOCEENNE	FRANCE
6	HORST KURVERS GmbH	GERMANY
7	MANNESMANN HANDEL AG	GERMANY
8	THYSSEN-KRUPP STAHLUNION GmbH	GERMANY
9	DALMINE SPA	ITALY
10	IBF SEAMLESS PIPES Spa	ITALY
11	MARUBENI ITOCHU STEEL	JAPAN
12	MITSUBISHI CORPORATION	JAPAN
13	NIPPON STEEL CORPORATION	JAPAN
14	NISHITANI & CO. LTD.	JAPAN
15	NISSHO IWAI CORPORATION	JAPAN
16	OKURA & CO. LTD.	JAPAN
17	SOJITZ CORPORATION	JAPAN
18.	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
19	HYUNDAI CORPORATION	KOREA
20	T.T.I- TUBACEX TUBOS INOXIDABLES, S.A. (Upto 10")	SPAIN
21	AB SANDVIK STEEL	SWEDEN
22	BRITISH STEEL CORPORATION	U.K
23	CORUS TUBES LIMITED	U.K
24	VOMAL INTERNATIONAL LIMITED	U.K
	<b>HDPE/MDPE PIPES &amp; PIPE FITTINGS</b>	
1	ASTRAL	INDIA
2	AQUAGUARD PLASTICS & POLYMERS	INDIA
3	CLIMAX SYNTHETICS	INDIA
4	FIBRO PLASTICHEM (I) PVT. LTD.	INDIA
5	NATIONAL ORG CHEMICAL INDIA LTD.	INDIA
6	PARTH POLY VALVES PVT. LTD. (3/4" TO 8"(150#))	INDIA
7	PENNWALT AGRU PLASTICS LTD. (UPTO 250MM DIA)	INDIA
8	RELIANCE INDUSTRIES "RELPIPE"	INDIA
9	SONAL ENGG. PLASTIC FABRICATOR	INDIA
	<b>SS WLEDED TUBES</b>	
1	APEX TUBES PVT. LTD. (Upto 102mm OD (Thickness Upto 4.00mm)	INDIA
2	DIVINE TUBES PVT. LTD (Upto 4")	INDIA
3	KRYSTAL STEEL MANUFACTURING PVT. LTD (Upto 50.8 OD- (Material upto Gr. SS321))	INDIA
4	MAXIM TUBES COMPANY PVT. LTD (6mm to 114.3mm (0.5mm to 4.5mm	INDIA

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	thk))	
5	MODERN TUBE INDUSTRIES LTD (Upto 50.80 OD( UPTO SS321 Grade))	INDIA
6	PRAKASH STEELAGE LIMITED (114.3mm OD, thickness upto 6mm)	INDIA
7	QUALITY STAINLESS PVT. LTD (Upto 4"OD(upto 4.0mm thk)upto Grade SS316L))	INDIA
8	REMI EDELSTAHL TUBULARS LTD. (RAJENDRA MECHANICAL INDUSTRIES(50.8mm OD))	INDIA
9	SCODA TUBES LTD. (9.52 mm OD to 50.8mm OD)	INDIA
10	SCORODITE STAINLESS (INDIA) PVT. LTD. (19.05 mm OD to 50.80mm OD, thk upto 3mm)	INDIA
11	STEAMLINE INDUSTRIES LTD. (6.00mm OD to 50.8mm OD)	INDIA
12	SUNRISE STAINLESS PVT. LTD (Upto 4" OD Thickness upto 6mm)	INDIA
13	SURAJ LIMITED (SURAJ STAINLESS LIMITED)	INDIA
14	WELSPUN SPECIALITY SOLUTIONS LIMITED (Upto 50.8mm OD)	INDIA
	<b>FITTINGS: CS/AS/SS SEAMLESS &amp; FORGED</b>	
1	AMFORGE INDUSTRIES (Upto 24")	INDIA
2	ANIL METAL CORPORATION	INDIA
3	CHETAN STEELS ( UPTO 6" SCH. 80 )	INDIA
4	COMMERCIAL SUPPLYING AGENCY	INDIA
5	CSA FITTINGS (Forged ½" to 2"-(Upto 9000#) & Seamless: 2" to 8" (upto SCHXXS))	INDIA
6	EBY FASTENERS	INDIA
7	EBY INDUSTRIES	INDIA
8	FIT-TECH INDUSTRIES (Upto 24")	INDIA
9	FLASH FORGE(P) LTD.(Forged upto 4" (upto 9000#) & Seamless up to 42")	INDIA
10	GUJARAT INFRAPIPES PVT. LTD.	INDIA
11	JAY LAKSHMI STEELS & ENGINEERING CO.	INDIA
12	KALPESH TUBE(INDIA),(TRADER) (UPTO A MAX ORDER VALUE RS.25.0 LAKH)	INDIA
13	M.S FITTINGS MANUFACTURING CO. PVT LTD.	INDIA
14	MARDALE PIPES PLUS LTD.	INDIA
15	NAVKAR FORGINGS & FITTINGS PVT. LTD ( Forged 3"(UPTO 6000#) & Seamless(Upto 16" SCH XXS))	INDIA
16	NL HAZRA (upto SCH80)	INDIA
17	P.K TUBES & FITTINGS PVT. LTD. (Forged upto 1 ½" & Seamless upto 24" (SCH160))	INDIA
18	P.K FORGE & FITTING INDUSTRIES	INDIA

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19	PARAS FITTINGS PVT. LTD. (Forged: CS ½" to 2" & CS Seamless: 2" to 8"(upto SCHXXS))	INDIA
20	PARMAR TECHNO FORGE (Elbow- ½" to 12"; Tee- ½" to 8"; Reducer (conc & eccn)- ½" to 12" , Cap ½" to 18" (CS&SS))	INDIA
21	PERFECT MARKETTING PVT. LTD.	INDIA
22	PETROCHEM INDUSTRIES (Seamless: Upto 16" (All Fittings) & upto 36" (Only caps) SCH : XXS /80S, Forged: upto 3"-6000#)	INDIA
23	RAJENDRA FORGE INDUSTRIES (CS: UPTO 12" SCH 40 & SS: 6" SCH 40S)	INDIA
24	S & G ENGINEERS (P) LTD.	INDIA
25	SAGAR STEEL CORPORATION (TRADER)	INDIA
26	SANGHVI METALS (TRADER)	INDIA
27	SAWAN ENGINEERS PVT LTD (Upto 36" (SCH160))	INDIA
28	SHIVANANDA PIPE FITTINGS LTD.,	INDIA
29	STEWARTS AND LLOYDS OF INDIA LIMITED	INDIA
30	TEEKAY TUBES PRIVATE LIMITED	INDIA
31	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
32	TOPAZ PIPING INDUSTRIES (2" to 36" (SCH 10 to Sch160))	INDIA
33	TUBE BEND (CALCUTTA) PVT. LTD. (CS FITTINGS ONLY)	INDIA
34	TUBE PRODUCTS INCORPORATE	INDIA
35	ZOLOTO INDUSTRIES (15mm to 150mm (only CS Galv.))	INDIA
36	PETROL RACCORD S.P.A. (Seamless: 1" to 42" (Elbows) & 1" to 56" Tee/Reducer/Caps))	ITALY
37	ETS TROUVAY & CAUVIN	FRANCE
38	PHOCEEENNE	FRANCE
39	VALLOUREC	FRANCE
40	SEIKMANN ANLAGEN-TECHNIK GMBH.	GERMANY
41	TPS-TECHNITUBE ROHRENWERKE GMBH	GERMANY
42	HORST KURVERS GMBH	GERMANY
43	MANNESMANN HANDEL AG	GERMANY
44	DALMINE SPA	ITALY
45	GAM RACCORDI S.P.A	ITALY
46	IBF SEAMLESS PIPES SPA	ITALY
47	IND MECCANICA BASSI LUIGI & C. SPA	ITALY
48	MANTOVANI SPA	ITALY
49	RACCORTUBI SRL	ITALY
58	TECHNO FORGE SPA	ITALY
51	MARUBENI ITOCHU STEEL	JAPAN
52	NIPPON KOKAN	JAPAN



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53	NISHITANI & CO. LTD.	JAPAN
54	NISSHO IWAI CORPORATION	JAPAN
55	OKURA & CO. LTD.	JAPAN
56	SOJITZ CORPORATION	JAPAN
57	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
58	HAITIMA CORPORATION	TAIWAN
59	BRITISH STEEL CORPORATION	U.K.
60	CORUS TUBES LIMITED	U.K.
61	EUROTUBE LIMITED	U.K.
62	VOMAL INTERNATIONAL LIMITED	U.K.
63	BONNEY FORGE	U.S.A.
	<b>FITTINGS: SS UREA GRADE</b>	
1	KEY-TECH ENGINEERING COMPANY (Upto 8")	INDIA
2	PETROL RACCORD S.P.A (Size upto 14")	ITALY
3	BHDT GMBH	AUSTRIA
4	ETS TROUVAY & CAUVIN	FRANCE
5	PHOCEENNE	FRANCE
6	VALLOUREC	FRANCE
7	HORST KURVERS GmbH	GERMANY
8	MANNESMANN HANDEL AG	GERMANY
9	SEIKMANN ANLAGEN-TECHNIK GMPH	GERMANY
10	TPS-TECHNITUBE ROHRENWERKE GMBH	GERMANY
11	DALMINE SPA	ITALY
12	IBF SEAMLESS PIPES Spa	ITALY
13	IND MECCANICA BASSI LUIGI & C.SPA	ITALY
14	RACCORTUBI SRL	ITALY
15	TECHNO FORGE SPA	ITALY
16	MARUBENI ITOCHU STEEL	JAPAN
17	NIPPON KOKAN	JAPAN
18	NISHITANI & CO. LTD	JAPAN
19	NISSHO IWAI CORPORATION	JAPAN
20	OKURA & CO. LTD	JAPAN
21	SOJITZ CORPORATION	JAPAN
22	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
23	AVESTA CANDVITE TUBE AD	SWEDEN
24	HELENS ENERGY	SWEDEN

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25	BRITISH STEEL CORPORATION	U.K
26	CORUS TUBES LTD	U.K
27	EUROTUBE LTD	U.K
28	VOMAL INTERNATIONAL LTD	U.K
	<b>FRP/PVC PIPE AND PIPE FITTINGS</b>	
1	ASTRAL POLYTECHNIK PVT. LTD. (1/2" to 12" Size)	INDIA
2	GANDHI AND ASSOCIATES	INDIA
3	SONAL ENGG. PLASTIC FABRICATOR	INDIA
	<b>CAST IRON FITTINGS &amp; PIPES</b>	
1	CRAWLEY & RAY (F&E) PVT. LTD	INDIA
2	IISCO LTD	INDIA
3	KESORAM SPUN PIPES & FOUNDRIES	INDIA
4	SAYAJI IRON & ENGG. CO (P) LIMITED	INDIA
5	SHAKTI CAST (P) LTD	INDIA
6	SHALIMAR WORKS LTD	INDIA
7	SHIVA ENGINEERING WORKS	INDIA
8	VISVESARAYA IRON & STEEL LTD.	INDIA
	<b>FORGED FLANGES</b>	
1	AJAY FORGING PVT. LTD	INDIA
2	AMFORGE INDUSTRIES(Upto 24"(upto1500#) & Upto 12"(FOR 2500#)	INDIA
3	ANANDMAYEE FORGINGS PVT. LTD.	INDIA
4	C D ENGINEERING	INDIA
5	CHANDAN STEELS LIMITED (ONLY SS Flanges- Upto36"-150#, Upto24"-300#, Upto20"-600#, Upto16"-900#, Upto12"-1500#, Upto8"-2500#)	INDIA
6	CHETAN STEELS (UPTO 6", 150#)	INDIA
7	CHW FORGE PVT. LTD. (FORMELY CHAUDHARY HAMMER WORKS)	INDIA
8	ECHJAY INDUSTRIES LTD	INDIA
9	FERROUS ALLOYS FORGING PVT. LTD	INDIA
10	GOLDEN IRON & STEEL WORKS	INDIA
11	GOOD LUCK ENGINEERING CO. (½"-12" (UPTO 2500#), 14"-16" (UPTO 900#), 18"-32" (UPTO 600#), 34"-48" (UPTO 300#),	INDIA
12	J.K FORGINGS (1/2" to 60" ANSI B 16.5, Class 150 to 2500)	INDIA
13	KUNJ FORGINGS PVT. LTD. (upto 60" (upto 300#) & upto 12" (upto 2500#))	INDIA
14	MAHESH INDUSTRIES (1/2" to 8"NB,Rating-150#,SWRF,SORF & BLRF material: ASTM A105 only; 2"NB to 4"NB, Rating- 150# WNRF FLANGES, Material-A105 only)	INDIA
15	METAL FORGINGS PVT. LTD. (Upto86"-150#; 60"-300# TO 600#; 48"-900#	

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	; 24"-1500#; 12"-2500#)	
16	P.K TUBES & FITTINGS PVT. LTD. (Upto 24"(upto1500#) & Upto 12"(upto2500#) Spectacle Blind and Spacer & Blinds only)	INDIA
17	PARAMOUNT FORGE (CS,AS & SS : ½" TO 42" (UPTO 600#), ½" TO 24" (UPTO 900#), ½" TO 16" ( UPTO 1500#), ½" TO 12" (UPTO 2500#)).	INDIA
18	PERFECT MARKETING (P) LTD.	INDIA
19	PUNJAB STEEL	INDIA
20	R D FORGE (A UNIT OF R D CHEMICALS PVT LTD) (1/2" to 54" (150#), ½" to 40"-300#, ½" to 42"- 600#,1/2" to 20"-900#, 1/2" to 20"-1500#, ½" to 12" -2500# (CS, AS & SS))	INDIA
21	RAJENDRA FORGE INDUSTRIES (CS & SS : UPTO 12", 300#)	INDIA
22	S & G ENGINEERS (P) LTD.	INDIA
23	SANGHVI FORGINGS & ENGINEERING LTD (Upto 42" (upto 300#), 36" (600#), 24" (upto 1500#) & 12" (2500#))	INDIA
24	SANGHVI METALS (TRADER)	INDIA
25	SAWAN ENGINEERS PVT LIMITED	INDIA
26	TECHNO FORGE LTD. (UPTO 42" (UPTO 300#), UPTO 24" (600#), UPTO 20" (900#), UPTO 16" (1500#), upto 12" (2500#))	INDIA
27	TUBE BEND (CALCUTTA) PVT LTD	INDIA
28	ETS TROUVAY & CAUVIN	FRANCE
29	PHOCEENNE	FRANCE
30	HORST KURVERS GMBH	GERMANY
31	I.S. INTERNATIONAL	ITALY
32	MANTOVANI SPA	ITALY
33	OFFICINE NICOLA GALPERTI & FIGLIO S.P.A	ITALY
34	RACCORTUBI SRL	ITALY
35	NICHINAN SANGYO CO. LTD.,	JAPAN
36	NISHITANI & CO. LTD.	JAPAN
37	SOJITZ CORPORATION	JAPAN
38	VOMAL INTERNATIONAL LIMITED	U.K.
	<b>PLATE RING FLANGES</b>	
1	FABWELL ENGINEERS	INDIA
2	MAHESH INDUSTRIES (1/2" TO 16"NB -150# &300# SWRF, SORF & BLRF, Material: MS Plate Flanges of IS 2062 Grade)	INDIA
3	MOD FABRICATORS	INDIA
4	P K TUBES & FITTINGS PVT. LTD (Upto 48"- (Spectacle Blinds and Spacer & Blind only))	INDIA
5	PARAMOUNT FORGE (CS & SS: ½" to 84")	INDIA
6	PERFECT MARKETING (P) LTD	INDIA

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7	R SQUARE ENGINEERS	INDIA
8	SANGHVI METALS (TRADER)	INDIA
	<b>FITTINGS: CS/AS/SS WELDED</b>	
1	PARAS ENGINEERING WORKS (8" to 36" NB- SCH 5 to SCH XXS- (CS&SS))	INDIA
2	CHETAN STEELS (Upto 10" SCH80)	INDIA
3	FIT- TECH INDUSTRIES (Upto 48")	INDIA
4	FLASH FORGE (P) LTD. (Upto 42")	INDIA
5	NAVKAR FORGING & FITTINGS PVT. LTD (Upto24"- (SCH XXS, Material: CS only))	INDIA
6	P K TUBES & FITTINGS PVT. LTD (Upto 48"- (SCH160))	INDIA
7	PETROCHEM INDUSTRIES (6" to 36" (all Fittings) & 6" to 56" (Only Conc/Ecc. Reducers) SCH :XXS/80S)	INDIA
8	RAJENDRA FORGE INDUSTRIES (CS & SS: Upto 12", SCH40)	INDIA
9	SAWAN ENGINEERS PVT. LIMITED (Upto 52" (SCH160))	INDIA
10	TOPAZ PIPING INDUSTRIES (8" to 48" (SCH 10 to SCH160))	INDIA
11	PETROL RACCORD S.P.A (4"-56" (Tees/Reducers/Elbows))	ITALY
12	TK CORPORATION	KOREA
	<b>PIPE COATING</b>	
1	PRATIBHA INDUSTRIES LTD, (External Coating 4" to 24" Pipe OD)	INDIA
2	WELSPUN GUJARAT STAHL ROHREN LIMITED (DAHEJ) (4" to 64" for external coating & 16" to 64" for internal coating)	INDIA
	<b>GATE/ GLOBE/ CHECK VALVES CS/SS/AS &lt; 900 LBS</b>	
1	AV VALVES LTD. (CAST UPTO 42"(150#), 28" (300#), 24" (600#) & FORGE UPTO 2" (800#))	INDIA
2	ADVANCE VALVES (2"-80"(Upto 600#) Dual Plate Check Valves only))	INDIA
3	ASSOCIATED TOOLINGS (I) PVT. LTD. (1/2" to 2", upto 800#)	INDIA
4	AUDCO INDIA LIMITED (L&T VALVES DIVN.)	INDIA
5	AUTOCAP INDUSTRIES (1/2" to 2", 800# (only CS & SS))	INDIA
6	BELL- O-SEAL VALVES LTD. (FOR ZERO LEAKAGE, HAZARDOUS FLUIDS.)	INDIA
7	BHEL ( VALVES DIVISION)	INDIA
8	BRIGHTCH VALVES AND CONTROLS PVT. LTD. (Upto 8" x 300# for CS, AS & SS Material)	INDIA
9	CHEMTECH INDUSTRIAL VALVES PVT. LTD.	INDIA
10	CHEMTROLS SAMIL (INDIA) PVT. LTD (Upto 12"-150# -Dual Plate Check Valve only)	INDIA
11	CRAWLEY & RAY (FOUNDERS & ENGINEERS) PVT. LTD. (<=300#, (only CS))	INDIA
12	DATRE CORPORATION LTD. (Upto 300#, 2"-8" (Gate), 2"- 6" (Globe &	INDIA

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13	DEWRANCE MACNEILL & CO. LTD.	INDIA
14	ECONO VALVES PVT. LTD.	INDIA
15	EXPERT ENGINEERING ENTERPRISES (Forged upto 2"-800#, Gate & Globe Valve: upto12"-150# & 300#, Check Valve upto 32"-150# & 300#)	INDIA
16	FLOCON SYSTEMS PVT. LTD. (CS upto 6" 150#)	INDIA
17	FLOVEL VALVES PVT. LTD.(SINGLE DISC, DUAL PLATE & NOZZLE CHECK VALVES ONLY: UPTO 48"(150#) & 24 (UPTO 600#))	INDIA
18	FLUIDTECH EQUIPMENT PVT. LTD. ( CAST # (CS & SS): 2" to 12" 150# & 2" to 8" 300# AND FORGED (CS AND SS ) ½" TO 2" (800#)	INDIA
19	FORWARD ALLOYS & CASTINGS ( UPTO 14")	INDIA
20	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS only: upto 24"(150#), 20"(300#), 10" (600#) & Forged : upto 2" (800#)	INDIA
21	HAWA ENGINEERS LTD. (Gate Valves: upto 40"(150#), upto 26" (300#), upto 24" (600#), upto 2" (800#); Globe Valves: upto 20"(150#), upto 16" (300#), upto 12" (600#), upto 2" (800#), Check Valves: upto 36"(150#), upto 24" (300#), upto 16" (600#), upto 2" (800#) (Dual Plate: 36" (150#)	INDIA
22	HAWA VALVES INDIA PVT. LTD. (CS upto 6", 150#)	INDIA
23	HI-TECH VALVES PVT. LTD. (CS, <=800#, SIZE ½"-2", <=300# FOR SIZE 2"-6")	INDIA
24	INTERVALVE POONAWALLA LTD. (CAST UPTO 24" (UPTO 300#) & UPTO 12" 600# , FORGED UPTO 2" (800#))	INDIA
25	JC VALVES & CONTROLS INDIA PVT. LTD. (CAST UPTO 48" (150#) & 24"(UPTO 600#) & FORGED UPTO 2" (800#))	INDIA
26	KIRLOSKAR BROTHERS LTD.( CS UPTO 12" size, 300#)	INDIA
27	KSB PUMPS LIMITED (VALVES DIVN)	INDIA
28	LARSEN & TOUBRO LIMITED (1/2" TO 24")	INDIA
29	LEADER VALVES LTD. (Casting<=20" upto 600#, & 30"-150#, Forging<=2" upto 800#)	INDIA
30	M.H. VALVES PVT. LTD. (1/2" to 1 1/2"-800#, 2" to 6"-600#)	INDIA
31	MICON ENGINEERS (HUBLI) [PVT. LTD.(Cast: Upto 12" (150# & 300#), 6" (600#) & Forged: upto 2" (800#))	INDIA
32	MICROFINISH VALVES LTD.	INDIA
33	NEOSEAL ENGINEERING PRIVATE LTD (Upto 24" rating upto 600#)	INDIA
34	NITON VALVES INDUSTRIES PVT. LTD. (Forging upto 800#, <=1.5" size)	INDIA
35	NSSL LTD. (Cast: UPTO 80" (150#), 56" (UPTO 600#) & FORGED UPTO 2" (800 #))	INDIA
36	OSWAL INDUSTRIES LTD. (UPTO 48" (150#), 32" (300#) & 24" (600#)	INDIA
37	S & M INDUSTRIAL VALVES LTD. (CS Gate & Globe Valves 2" – 24" <=300#)	INDIA
38	SHALIMAR VALVES PVT. LTD. (Cast Upto 24" (Upto 600#), Forged: ½" to	INDIA

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	1 ½" (800#)	
39	SHREERAJ INDUSTRIES (CS upto 150#)	INDIA
40	STEEL STRONG VALVES (I) PVT. LTD. (Upto 42")	INDIA
41	VENUS PUMP & ENGINEERING WORKS.	INDIA
42	VIBA FLUID CONTROL	INDIA
43	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Cast UPTO 36" (150#); 24" (300#); 12" (600#) & Forged: Upto 2" (800#))	INDIA
44	ZED VALVES CO. PVT. LTD. (Upto 14" (600#))	INDIA
45	ZOLOTO INDUSTRIES. ( 40 MM TO 200 MM(ONLY CS & SS))	INDIA
46	VELAN INC. ( UPTO 48" , Rating upto 600#)	CANADA
47	BOTELI VALVE GROUP CO. LTD.(Cast Upto 56" (150#), 36" (300#), 24" (600#) & Forged: Upto2" (800#))	CHINA
48	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
49	PEMTO VALVE	GERMANY
50	CESARE BONETTI SPA (Cast Upto 42" (Upto 300#), 24" (600#) Forged: upto 1 ½" (800#))	ITALY
51	FASANI S.P.A.	ITALY
52	FRIULCO SPA (UPTO 48" (150#), 32" (Upto 600#)	ITALY
53	GTC ITALIA, S.R.L.	ITALY
54	MANTOVANI SpA	ITALY
55	OMB S.P.A.	ITALY
56	PETROL VALVES S.R.L.	ITALY
57	MATSURA H. P MACHINE WORKS CO.LTD.	JAPAN
58	NISHITANI & CO. LTD.	JAPAN
59	SOJITZ CORPORATION	JAPAN
60	REDPOINT ALLOYS BV	NETHERLAND
61	BABCOCK BORSIG ESPANA , S.A	SPAIN
62	POYAM VALVES (AMPO S.CCP.) (Size upto 60" (Rating upto 800#)	SPAIN
63	WALTHAN & WEIR	SPAIN
64	SUFA LIMITED	U.A.E.
65	BEL VALVES	U.K.
	<b>GATE/ GLOBE/ CHECK VALVES CS/SS/AS &gt;=900 LBS</b>	
1	A V VALVES LIMITED (Cast Upto 24" (900# & 1500#), 8" (2500#) Forged: Upto 2" (2500#))	INDIA
2	ADVANCE VALVES (2"-36" (900#) 2"-24" (1500#), 2"-12(2500#) DUAL PLATE CHECK VALVES ONLY)	INDIA
3	ASSOCIATED TOOLINGS (I) PVT. LTD. (½" TO 2" (RATING :900# & 1500#))	INDIA

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4	AUDCO INDIA LIMITED (L&T VALVES DIVN.)	INDIA
5	BHEL (VALVES DIVISION)	INDIA
6	FLOVEL VALVES PVT. LTD. (Dual Plate Check Valves only: Upto 24" (900#))	INDIA
7	HAWA ENGINEERS LTD. (Gate Valves: upto 20"(900#), upto 10" (1500# & 2500#); Globe Valves: upto 8"( 900# & 1500#), upto 1" (2500#); Check Valves: upto 10"(900#), upto 6" (1500#), upto 1" (2500#)	INDIA
8	INTERVALVE POONAWALLA LTD.(Forged: Upto 2" (1500#))	INDIA
9	JC VALVES & CONTROLS INDIA PVT. LTD. (CAST UPTO 12" (1500#),10" (2500#) & FORGED UPTO 2" (2500#))	INDIA
10	KSB PUMPS LIMITED (VALVES DIVN)	INDIA
11	LARSEN & TOUBRO LIMITED (1/2" TO 2")	INDIA
12	LEADER VALVES LIMITED (Casting<=12" upto2500#, Forging <=2" upto 2500#)	INDIA
13	METROPOLITAN INDUSTRIES (SIZE=200mm, rating=2500 lb)	INDIA
14	MICON ENGINEERS (HUBLI) PVT. LTD. (FORGED: UPTO 2" (1500#))	INDIA
15	NEOSEAL ENGINEERING PVT. LTD. (Upto24"- rating upto 2500#)	INDIA
16	NSSL LIMITED. (CAST: Upto 36"(900#), 24" (upto 2500#) & FORGED: Upto 2" (Upto 2500#))	INDIA
17	OSWAL INDUSTRIES LTD. (Upto 12" (900# & 1500#))	INDIA
18	SHALIMAR VALVES PVT.LTD.(CAST: UPTO 20"(900#), FORGED: ½" TO 1 ½" (1500#))	INDIA
19	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Cast UPTO 12" (upto 2500#) & Forged: Upto 2" (1500#), 1" (2500#))	INDIA
20	VELAN INC. ( UPTO 24" (Rating upto 2500#))	CANADA
21	BOTELI VALVE GROUP CO. LTD.(Cast Upto 16" (Upto 1500#), 12" (2500#) & Forged: Upto 2" (1500# & 2500#))	CHINA
22	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
23	BFE BONNEY FORGE VALVE LICENSEE	ITALY
24	CESARE BONETTI SPA (Upto 24" (Upto 2500#)	ITALY
25	FASANI S.P.A.	ITALY
26	FRIULCO SPA (UPTO 32" (900#); 24" (1500#); 14" (2500#))	ITALY
27	GTC ITALIA S.R.L.	ITALY
28	OMB S.P.A.	ITALY
29	PETROL VALVES S.R.L.	ITALY
30	VALVITALIA SPA	ITALY
31	MATSURA H. P MACHINE WORKS CO.LTD.	JAPAN
32	NISHITANI & CO. LTD.	JAPAN
33	BABCOCK BORSIG ESPANA, S.A.	SPAIN

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34	POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))	SPAIN
35	SUFA LIMITED	U.A.E.
36	BEL VALVES	U.K.
	<b>BALL VALVES (SOFT SEATED)</b>	
1	A V VALVES LIMITED (Upto 12" (Upto 600#))	INDIA
2	AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),	INDIA
3	AQUA VALVES PVT. LTD.	INDIA
4	BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)	INDIA
5	CHEMTECH INDUSTRIAL VALVES PVT. LTD.	INDIA
6	CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)	INDIA
7	DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))	INDIA
8	FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)	INDIA
9	FLOW CONTROL	INDIA
10	FLOWCHEM INDUSTRIES ( UPTO 300# and upto 10")	INDIA
11	FLUIDTECH EQUIPMENT PVT. LTD( UPTO 4" (300#))	INDIA
12	FORWARD ALLOYS AND CASTINGS (Upto 900#)	INDIA
13	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS only: Upto 12" (Upto 300#), 4" (Upto 900#) & Forged: Upto 2" (800#))	INDIA
14	HAWA ENGINEERS LTD. (Upto 16" (150# & 300#), Upto 12" (600# & 900#))	INDIA
15	INTERVALVE POONAWALLA LTD. (Forged: Upto 2" (800#), Cast: Upto 12" (Upto 300#))	INDIA
16	JC VALVES & CONTROLS INDIA PVT. LTD. (CAST UPTO 28" (upto 600#),12" (900#, 1500#) & 10"(2500#))	INDIA
17	KSB PUMPS LTD. (VALVES DIVN.) (CS upto 100DN, 20 bar)	INDIA
18	LEADER VALVES LTD. (Casting <=6" upto 600# & forging <=2" upto 800#)	INDIA
19	MEVADA ENGINEERING WORKS PVT. LTD., MUMBAI (Upto 2"(800#), (Forged), UPTO 14"(300#), Material: CS/AS/SS	INDIA
20	MICON ENGINEERS (HUBLI) PVT. LTD. (Cast: Upto 6" (150# & 300#) & Forged: Upto 2" (800#)	INDIA
21	MICROFINISH VALVES (P) LTD.	INDIA
22	NEOSEAL ENGINEERING PVT. LTD (Upto 12" rating upto 600# and Upto 8" upto 2500#)	INDIA
23	NSSL LTD. (Upto 12" (150# & 300#))	INDIA
24	OSWAL INDUSTRIES LTD. (Upto 24" (150#, 300# & 600#))	INDIA
25	SHALIMAR VALVES PVT. LTD. (Upto 18" (600#) Material: CS/AS/SS)	INDIA
26	VIBA FLUID CONTROL (Upto 300#)	INDIA



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27	VIRGO ENGINEERS LTD. (Upto 16" (upto 600#))	INDIA
28	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Cast: Upto 30" (150# & 300#), 20" (600#), 16" (900#), 12" (1500#) & Forged: Upto 2" (800#))	INDIA
29	XOMOX SANMAR LTD.( FISHER XOMOX)	INDIA
30	BHDT GMBH	AUSTRIA
31	BOTELI VALVE GROUP CO. LTD. (Upto 32" (150# & 300#), 30" (600#), 24" (900#)	CHINA
32	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
33	VELAN INC.( UPTO 16", 600#)	CANADA
34	ETS TROUVAY & CAUVIN	FRANCE
35	PERRIN GMBH (SIZE UPTO 24", RATING UPTO 2500#)	GERMANY
36	CESARE BONETTI SPA (Cast: Upto 4" (150#) & Forged: Upto 1" (800#) Floating only)	ITALY
37	FRIULCO SPA (UPTO 48" (150# & 300#); 20" (upto 1500#); 12" (2500#))	ITALY
38	GTC ITALIA S.R.L	ITALY
39	MANTOVANUI SPA	ITALY
40	PETROL VALVES S.R.L	ITALY
41	PIBIVESSE SRL (UPTO 48" , 600#)	ITALY
42	METSO AUTOMATION	SINGAPORE
43	POYAM VALVES (AMPO S. COOP.) (Size upto 42" (Rating upto 2500#))	SPAIN
44	HATIMA CORPORATION	TAIWAN
<b>BALL VALVES (METAL SEATED)</b>		
1	AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),	INDIA
2	BRIGHTCH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)	INDIA
3	DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))	INDIA
4	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS only: Upto 12" (Upto 300#), 4" (Upto 900#) & Forged: Upto 2" (800#))	INDIA
5	HAWA ENGINEERS LTD. (Upto 16" (150# & 300#), Upto 12" (600# & 900#))	INDIA
6	INTERVALVE POONAWALLA LTD.(UPTO 12" , 150#).	INDIA
7	JC VALVES & CONTROLS INDIA PVT. LTD. (UPTO 28" (upto 600#),12" (upto 1500#), 10" (2500#))	INDIA
8	MICON ENGINEERS (HUBLI) PVT. LTD. (Cast: Upto 6" (150# & 300#) & Forged: Upto 2" (800#)	INDIA
9	MICROFINISH VALVES PVT LTD.	INDIA
10	NEOSEAL ENGINEERING PVT. LTD (Upto 12" rating upto 600#)	
11	NSSL LIMITED (Upto 12" NB, (150# & 300#))	INDIA

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12	OSWAL INDUSTRIES LTD. (UPTO 24" (150#, 300#, & 600#))	INDIA
13	VIRGO ENGINEERS LTD. (UPTO16" (UPTO 600#))	INDIA
14	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Cast: Upto 30" (150# & 300#); 20" (600#), 16" (900#), 12" (1500#) & Forged: Upto 2" (800#)	INDIA
15	VELAN INC. (SIZE UPTO 16" (Rating Upto 600#))	CANADA
16	BOTELI VALVE GROUP CO. LTD. (Upto 32" (150# & 300#), 30" (600#), 24" (900#)	CHINA
17	PERRIN GMBH (SIZE UPTO 24" (RATING UPTO 2500#))	GERMANY
18	ALFA VALVOLE SRL	ITALY
19	CESARE BONETTI SPA (UPTO 24" (150#) & 4" (UPTO 1500#) TRUNNION MOUNTED ONLY)	ITALY
20	FRIULCO SPA (UPTO 48" (150# & 300#); 20" (UPTO 1500#); 12" (2500#))	ITALY
21	GE POWER (NUOVO PIGNONE SPA)	ITALY
22	GTC ITALIA, S.R.L.	ITALY
23	PETROL VALVES S.R.L	ITALY
24	PIBIVIESSE SRL(UPTO 48", 600#)	ITALY
25	VALVITALIA SPA	ITALY
26	RED POINT ALLOYS BV	NETHERLAND
27	METSO AUTOMATION	SINGAPORE
28	ORBIT VALVES PLC	SINGAPORE
29	POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 42" (RATING UPTO 2500#))	SPAIN
	<b>BUTTERFLY VALVES</b>	
1	A V VALVES LIMITED (UPTO 48" (150#))	INDIA
2	ADVANCE VALVES (2"-120"(UPTO150#), 2"-80"(UPTO 900#))	INDIA
3	AIRA EURO AUTOMATION PVT. LTD. (Upto 48", Rating: upto 300#)	INDIA
4	AUDCO INDIA LIMITED (L&T VALVES DIVN.)	INDIA
5	BDK PROCESS CONTROL PVT LTD. (UPTO 1600MM)	INDIA
6	CHEMTECH INDUSTRIAL VALVES PVT LTD	INDIA
7	CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (40mm-1000mm)	INDIA
8	DELVAL FLOW CONTROLS PVT. LTD. (Upto 24" (Upto 300#))	INDIA
9	FLOCON SYSTEMS PVT. LTD. (CS upto 12", 150#)	INDIA
10	FLUIDTECH EQUIPMENT PVT. LTD. (CS upto 12" (300#))	INDIA
11	FOURESS ENGINEERING (I) LTD.	INDIA
12	HAWA ENGINEERS LTD. (2" to 48"(PN10/PN16/150#/300#))	INDIA
13	HAWA VALVES INDIA PVT. LTD. (CS UPTO 6", 150#)	INDIA
14	HI-TECH BUTTERFLY VALVES INDIA PVT. LTD	INDIA

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	(<300#,<30"(TEFLON/RUBBER) ,<72"(METAL))	
15	INSTRUMENTATION LTD. (PALAKKAD)	INDIA
16	INTERVALVE POONAWALLA LTD. (Upto 72" (150#) & Upto 16" (300#))	INDIA
17	JC VALVES & CONTROLS INDIA PVT. LTD. (Upto 20" (150#) & 10" (300#))	INDIA
18	L&T LTD (1/2" TO 24")	INDIA
19	LEADER VALVES LTD.( upto 16"- 150#)	INDIA
20	MATHER & PLATT (INDIA) LTD. A SUBSIDIARY OF WILO SE GERMAN (UPTO DN1600,PN10, Double flange type)	INDIA
21	METROPOLITAN INDUSTRIES (SIZE=2000mm)	INDIA
22	MICON ENGINEERS (HUBLI) PVT. LTD.(Upto 24" (PN10 & PN16))	INDIA
23	VENUS PUMP & ENGINEERING WORKS (upto 600NB, 150#)	INDIA
24	VIRGO ENGINEERS LTD. ((Triple offset only): 3" to 24", Upto 600# (CS/SS))	INDIA
25	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Upto 56" (Upto 150#), 24" (300#))	INDIA
26	XOMOX SANMAR LIMITED (FISHER XOMOX)	INDIA
27	TOMOE VALVE CO. LTD. (Upto 48"(150# & 300#), Upto 24"(600#, 900# & 1500#))	JAPAN
28	BHDT GMBH	AUSTRIA
29	VELAN INC. (Size upto 48"(Rating upto 600#)	CANADA
30	BOTELI VALVE GROUP CO. LTD. (Upto 36" (150# & 300#)	CHINA
31	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
32	GRISS SAPAG INDUSTRIAL VALVES	FRANCE
33	ADAMS ARMATUREN	GERMANY
34	GTC ITALIA, S.R.L.	ITALY
35	HAITIMA CORPORATION	TAIWAN
36	LEEDS VALVE LTD	U.K
37	WEIR VALVES & CONTROLS DIVISION.	U.K
38	CURTIS WRIGHT FLOW CONTROL CORPOARATION	U.S.A.
39	EMERSON PROCESS MGT	U.S.A.
40	LEAR SIEGLER MEAS. CTRLS. CORP	U.S.A.
41	SPX VALVES & CONTROLS (COPES-VULCAN LTD)	U.S.A.
42	TYCO INTERNATIONAL INC.,U.S.A.	U.S.A.
43	XOMOS (CRANE CO.)	U.S.A.
	<b>BLOWDOWN VALVES</b>	
1	VELAN INC.(SIZE UPTO 2"(RATING UPTO 1500#)	CANADA
2	GESTRA AG	GERMANY
3	CEASRE BONETTI SPA(UPTO 3"(UPTO 2500#))	ITALY

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4	TYCO INTERNATIONAL INC, U.S.A.	U.S.A.
	<b>SAMPLING VALVES/ NEEDLE VALVES</b>	
1	ASSOCIATED TOOLINGS (I) PVT. LTD. (1/2" to 11/2", Rating: 800#)	INDIA
2	CHEMTECH INDUSTRIAL VALVES PVT LTD	INDIA
3	EXCELSIOR ENGG WORKS	INDIA
4	EXPERT ENGINEERING ENTERPRISES(UPTO 12"-150# & 300#)	INDIA
5	LEADER VALVES LIMITED(SIZE<=1 1/2"-800#)	INDIA
6	TECNOMATIC (INDIA) PVT LTD.	INDIA
7	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (UPTO 50MM SIZE (upto 2500#))	INDIA
	<b>PLUG VALVES (NON LUBRICATED)</b>	
1	A V VALVES LIMITED (UPTO 20"(150#)(CS&SS))	INDIA
2	AUDCO INDIA LTD (L&T VALVES DIVN.)	INDIA
3	AZ ARMATUREN GMBH (1/2" TO 20"(150#, 300# & 600#), Matl. CS, AS &SS)	INDIA
4	BDK PROCESS CONTROL PVT LTD.	INDIA
5	CHEMTECH INDUSTRIAL VALVES PVT LTD	INDIA
6	CHEMTROLS SAMIL (INDIA) PVT LTD (Upto 12"-150# & 300#))	INDIA
7	CRAWLEY & RAY (FOUNDERS & ENGINEERS) PVT. LTD (DN 200)	INDIA
8	FLUIDTECH EQUIPMENT PVT. LTD. (Upto 4" (300#))	INDIA
9	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS only: Upto 12" (Upto 300#), Upto 4" (Upto 900#)) & Forged: Upto 2" (800#)	INDIA
10	HAWA ENGINEERS LTD. (1/2" TO 8" (150#))	INDIA
11	JC VALVES & CONTROLS INDIA PVT. LTD. (Upto 12" (Upto 300#))	INDIA
12	LARSON & TOUBRO LTD ( 1/2" TO 24")	INDIA
13	LEADER VALVES LIMITED (Upto 6" (Upto 300#))	INDIA
14	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (UPTO 16"(150#), 12" (300#), 3" (600#))	INDIA
15	XOMOX SANMAR LIMITED (FISHER XOMOX)	INDIA
16	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
17	O.M.S. SALERI DI SALERI P & FIGLI S.M.C.	ITALY
18	POYAM VALVES, (AMPO S. COOP.) (UPTO 30" (UPTO 900#) FOR LIFT PLUG VALVES ONLY.)	SPAIN
	<b>PLUG VALVES (LUBRICATED)</b>	
1	A V VALVES LIMITED (Upto 20"-150# CS & SS)	INDIA
2	AUDCO INDIA LTD (L&T VALVES DIVISION)	INDIA
3	BDK PROCESS CONTROLS PVT. LTD	INDIA
4	ECONO VALVES PVT. LTD (<=8" (150 - 300#), <= 1 1/2" (<=800#))	INDIA

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5	FLUIDTECH EQUIPMENT PVT. LTD (Upto 4"-300#)	INDIA
6	GURU INDUSTRIAL VALVES PVT. LTD (Cast CS only: Upto 12"-300#, 4" Upto 900# & Forged: upto 2"-800#)	INDIA
7	HAWA ENGINEERS LTD. (1/2" TO 8" -150#)	INDIA
8	JC VALVES & CONTROLS INDIAN PVT. LTD (Upto 12"-300#)	INDIA
9	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT.LTD)Upto 8"-125#	INDIA
10	ZHEJIANG JIEHUA VALVES CO. LTD	CHINA
11	DELTA VALVES EUROPE	ITALY
12	O.M.S SALERI DI SALERI P & FIGLI S.M.C	ITALY
13	BABCOCK BORSIG ESPANA, S.A	SPAIN
	<b>DIAPHRAGM VALVES/RUBBER LINED CHECK VALVES</b>	
1	A V VALVES LIMITED (Upto 12"-125#)	INDIA
2	AKAY INDUSTRIES PVT LTD	INDIA
3	BDK PROCESS CONTROLS PVT. LTD. (Upto 150#, 6 mm to 350mm)	INDIA
4	CHEMTECH INDUSTRIAL VALVES PVT. LTD	INDIA
5	CRAWLEY & RAY (FOUNDERS & ENGINEERS) PVT. LTD (25NB to 200NB)	INDIA
6	HAWA ENGINEERS LTD (1/2" to 8" -PN10)	INDIA
7	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT LTD)(UPTO 14"(PN16))	INDIA
	<b>CAST IRON VALVES</b>	
1	A V VALVES LTD. (Upto 48" (125#))	INDIA
2	CRAWLEY & RAY (F&E) PVT. LTD. (BUTTERFLY)	INDIA
3	FLUIDTECH EQUIPMENT PVT. LTD. (Upto 24" (PN 1.0 & PN 1.6))	INDIA
4	GEETA ENGINEERING WORKS	INDIA
5	KIRLOSKAR BROTHERS LIMITED ( Sluice, gate, butterfly valves PN1.0 & PN1.6)	INDIA
6	LEADER VALVES LTD. (size<=24" upto PN16 rating)	INDIA
7	S & M INDUSTRIAL VALVES LIMITED (ONLY GATE & GLOBE VALVES, 50mm-600mm, 125#)	INDIA
8	VENUS PUMPS & ENGINEERING WORKS (sluice<900mm, Diaphragm<300mm, stop<500mm)	INDIA
9	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Upto 12" (PN6))	INDIA
	<b>PVC/CPVC VALVES</b>	
1	ASTRAL POLYTECHNIK PVT. LTD (Size 1/2"-6", BUTTERFLY VALVE Upto 24")	INDIA
2	S & M INDUSTRIAL VALVES LTD. (32mm-80mm)	INDIA
	<b>FLAT GASKETS/ RUBBER GASKET</b>	
1	FERROLITE JOININGS (P) LTD.	INDIA

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2	GASKETS (INDIA) PVT. LTD	INDIA
3	GOODRICH GASKET PVT. LTD. (UPTO 24")	INDIA
4	HINDUSTAN ASBESTOS & ALLIED PRODUCTS	INDIA
5	HINDUSTAN COMPOSITE LTD.	INDIA
6	HINDUSTAN FERREDO LTD.	INDIA
7	IGP ENGINEERS LIMITED	INDIA
8	MADRAS INDUSTRIAL PRODUCTS(UPTO 48")	INDIA
9	MECHANICAL PACKING INDUSTRIES LTD.	INDIA
10	NEOSEAL ENGINEERING PVT. LTD (Upto 80" 150#- Only rubber gasket)	INDIA
11	PACKING & JOINTINGS (P) LTD.	INDIA
12	PERFECT MARKETING (P) LTD,	INDIA
13	PRASHANT ENGG STORES	INDIA
14	REINZ TALBROS PVT. LTD.	INDIA
15	SPIRALSEAL GASKETS PVT. LTD. (CAF & Teflon)	INDIA
16	STARFLEX SEALING INDIA PVT. LTD.	INDIA
17	THE BENGAL MILL STORES SUPPLY CO. (TRADER)	INDIA
18	UNIQUE INDUSTRIAL PACKINGS PVT. LTD.	INDIA
	<b>SPIRALLY WOUND GASKETS</b>	
1	GASKETS (INDIA) PVT. LTD	INDIA
2	GOODRICH GASKET PVT. LTD. (upto 24")	INDIA
3	IGP ENGINEERS LIMITED(10 TO 3550MM, 150#-2500# FOR EXCH GSKT)	INDIA
4	MADRAS INDUSTRIAL PRODUCTS(UPTO 52")	INDIA
5	NEOSEAL ENGINEERING PVT. LTD (Upto 84" 150#- AND 30" UPTO600#)	INDIA
6	PACKINGS & JOINTINGS PVT. LTD	INDIA
7	PERFECT MARKETING (P) LTD,	INDIA
8	PRASHANT ENGG STORES	INDIA
9	SPIRASEAL GASKETS PVT. LTD.(SS UPTO 12" & 150#)	INDIA
10	STARFLEX SEALING INDIA PVT. LTD.	INDIA
11	THE BENGAL MILL STORES SUPPLY CO. (TRADER)	INDIA
12	UNIQUE INDUSTRIAL PACKINGS PVT.LTD. (UPTO 42"(600#) & UPTO 24" (2500#))	INDIA
13	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
	<b>LENS GASKETS &amp; RING JOINT (METALLIC)</b>	
1	GASKETS (INDIA) PVT. LTD	INDIA
2	GOODRICH GASKET PVT. LTD. (0.5" to 24")	INDIA
3	IGP ENGINEERS LTD. (150# to 2500#)	INDIA

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4	MADRAS INDUSTRIAL PRODUCT	INDIA
5	METROPOLITAN INDUSTRIES (3mm thk, 300#)	INDIA
6	NEOSEAL ENGINEERING PVT. LTD. (Upto 30", Upto 900# AND Upto 20"- upto 2500#)	INDIA
7	PACKINGS & JOINTINGS PVT. LTD.	INDIA
8	PRASHANT ENGG STORES	INDIA
9	SPIRASEAL GASKET PVT. LTD	INDIA
10	STARFLEX SEALING INDIA PVT. LTD	INDIA
11	UNIQUE INDUSTRIAL PACKINGS PVT. LTD (Ring Joint Gasket only, Upto 16"- 1500#)	INDIA
12	BHDT GMBH	AUSTRIA
13	MANTOVANI SPA	ITALY
	<b>EXPANSION JOINTS &amp; BELLOWS</b>	
1	CORI ENGINEERS PVT. LTD. (For Rubber)	INDIA
2	D.WREN & CO. (For Rubber & Fabric)	INDIA
3	FLEXATHERM EXPANLLOW PVT. LTD. (Circular: Upto 240", Rectangular No bar for size, (Upto 600#))	INDIA
4	FLEXICAN BELLOWS & HOSES PVT. LTD	INDIA
5	FLUIDYNE ENGINEERS (I) PVT. LTD(METALLIC BELLOWS UPTO 800mm DIA)	INDIA
6	KELD ELLENTOFT INDIA PVT. LTD (For Fabric)	INDIA
7	LONESTAR INDUSTRIES	INDIA
8	MB METALLIC BELLOWS PVT. LTD	INDIA
9	PRASHANT ENGG. STORES	INDIA
10	STANDARD PRECISION BELLOWS	INDIA
11	TUBOFLEX	GERMANY
12	FLEXIDER S.P.A.	ITALY
	<b>STRAINERS (PERMANENT INCLUDING Y-TYPE)</b>	
1	CHEMTECH INDUSTRIAL VALVES PVT. LTD	INDIA
2	FLAIR STRAINERS & FILTERS (SIZE UPTO 42" (RATING UPTO 1500#))	INDIA
3	GRAND PRIX ENGINEERING PVT. LTD. (UPTO 60" PIPELINE, UPTO ANSI 1500#)	INDIA
4	GREAVES LIMITED	INDIA
5	GUJARAT OTOFILT	INDIA
6	HAWA ENGINEERS LTD. (1/2" to 24"(150# / 300# / PN10 / PN40))	INDIA
7	KWIKFLO FILTERS PVT. LTD.	INDIA
8	LEADER VALVES LTD. (upto 300# & upto 12" size)	INDIA
9	MOD FABRICATORS	INDIA

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10	MULTITEX FILTRATION ENGINEERS LTD	INDIA
11	ZOLOTO INDUSTRIES (15MM TO 100MM)	INDIA
12	BOTELI VALVE GROUP CO. LTD. (Y - TYPE ONLY: 14" (150#) & 3" (300# & 600#))	CHINA
<b>STEAM TRAPS</b>		
1	GREAVES LTD.	INDIA
2	MOD FABRICATORS (for Drip Rings)	INDIA
3	PENNANT ENGINEERING PVT. LTD.	INDIA
4	VIRGO ENGINEERS LTD. (1/2" to 4" (upto 600#) (CS/SS))	INDIA
5	YARWAY CORPORATION	INDIA
6	ZOLOTO INDUSTRIES (15 mm to 25 mm)	INDIA
7	GESTRA AG	GERMANY
8	ARMSTRONG INTERNATIONAL INC.	U.S.A
9	OGONTZ CORPORATION	U.S.A
10	TYCO INTERNATIONAL INC.,U.S.A.	U.S.A
<b>SPRING SUPPORTS</b>		
1	PIPE SUPPORTS CO. (Upto 14MT)	
2	MYRICS PIPING SYSTEM PVT.LTD.	INDIA
3	PIPE SUPPORTS INDIA PVT. LTD.	INDIA
4	PIPING & ENERGY PRODUCTS (P) LTD.	INDIA
5	SARATHI ENGG. ENTERPRISES PVT. LTD.	INDIA
6	SPRING SUPPORTS MFG. CO.	INDIA
7	FLEXIDER S.P.A.	ITALY
<b>FLAME ARRESTORS</b>		
1	AIROIL FLAREGAS (INDIA) PVT. LIMITED	INDIA
2	EMFA INDUSTRIES	INDIA
3	M.H. VALVES PVT. LTD (1/2"-1.5" :800#, 2"-6" :600#)	INDIA
4	NIRMAL INDUSTRIAL CONTROLS PVT. LTD (1/2" TO 8", RATING:150#)	INDIA
5	PETROL SERVICE INDIA PVT. LTD.	INDIA
6	L & J TECHNOLOGIES	U.S.A.
<b>SPRAY NOZZLE ASSEMBLY</b>		
1	CHEMTROLS SAMIL (INDIA) PVT. LTD.	INDIA
<b>FASTENERS</b>		
1	AEP COMPANY	INDIA
2	CAPITAL INDUSTRIES	INDIA
3	CONSOLE ENGG. & FASTNERS INDUSTRIES	INDIA
4	EBY FASTNERS	INDIA




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5	FIT TIGHT NUTS & BOLTS LTD.	INDIA
6	FIX FIT FASTENERS MFG. PVT. LTD.	INDIA
7	HEM INDUSTRIES (Upto 4")	
8	INDUSTRIAL ENGINEERING CORPORATION (SIZE UPTO 4" (M100))	INDIA
9	MEGA ENGINEERING PRIVATE LIMITED (1/2" TO 3" MATERIAL: CS/AS/SS)	INDIA
10	METRO MECHANICAL PVT.LTD.	INDIA
11	NAGBHUSHANAM INDUSTRIES	INDIA
12	NIREKA ENGG. CO. PVT. LTD.	INDIA
13	PACIFIC FORGING & FASTENERS PVT. LTD. (M 10 TO M125)	INDIA
14	PERFECT MARKETING (P) LTD,	INDIA
15	PIONEER NUTS & BOLTS PVT. LTD. (1/4" TO 4" DIA)	INDIA
16	PRECISION AUTO ENGINEERS	INDIA
17	PRECISION ENGINEERING INDUSTRIES	INDIA
18	PTD FASTNERS PVT. LTD.	INDIA
19	SANGHVI METALS (TRADER)	INDIA
20	SUNDARAM FASTENERS LIMITED	INDIA
21	UDHERA FASTENERS	INDIA
	<b>FIRE FIGHTING SYSTEM</b>	
1	AGNICE FIRE PROTECTION LTD.	INDIA
2	BHARTIYA CACCIALANZA FIRE SYSTEMS LTD	INDIA
3	BLUE STAR LTD.	INDIA
4	DE'S TECHNICO	INDIA
5	DE'S TECHNICO PVT. LTD.	INDIA
6	FUTECH CONSULTANTS PVT. LTD.	INDIA
7	GENERAL MECHANICAL WORKS	INDIA
8	HD FIRE PROTECTION COMPANY	INDIA
9	LAL ENTERPRISES	INDIA
10	MATHER & PLATT (INDIA) LTD. (A Subsidiary of WILO SE German)	INDIA
11	MX SYSTEMS INTERNATIONAL PVT. LTD.	INDIA
12	NEWFIRE ENGINEERS SERVICES	INDIA
13	PRAGATI ENGG. (PVT.) LTD.	INDIA
14	PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
15	RADIANT FIRE PROTECTION ENGINEERS	INDIA
16	STEELAGE INDUSTRIES LTD.	INDIA
17	TECHNOFAB ENGG.	INDIA
18	TRI-PARULEX FIRE PROTECTION SYSTEMS	INDIA
19	UNITECH MACHINES LTD	INDIA

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20	VIJAY FIRE PROTECTION SYSTEM LTD.	INDIA
<b>HOSE PIPE (METALLIC) &amp; CAM LOCK COUPLING</b>		
1	AEROFLEX INDUSTRIES LIMITED (Size 6mm to 250mm dia. (SS Corrg. Flex. Hose with Braid, Braid & Assembly)	INDIA
2	CHHATARIA RUBBER CHEMICALS INDUSTRIES	INDIA
3	D. WREN & CO.	INDIA
4	FLEXATHERM EXPANLLOW PVT. LTD. (1/2" to 6")	INDIA
5	GAYATRI INDUSTRIES	INDIA
6	GAYATRI INDUSTRIAL CORPORATION (UPTO 6" ID)	INDIA
7	HELIFEX HYDRAULICS & ENGG CO. LTD.	INDIA
8	SENIOR INDIA PVT. LTD.	INDIA
<b>HOSE PIPE (NON-METALLIC) &amp; CAM LOCK COUPLING</b>		
1	CHHATARIA RUBBER CHEMICALS INDUSTRIES	INDIA
2	D. WREN & CO.	INDIA
3	GAYATRI INDUSTRIES	INDIA
4	GAYATRI INDUSTRIAL CORPORATION (UPTO 8" ID)	INDIA
5	HELIFEX HYDRAULICS & ENGG CO. LTD.	INDIA
6	PADMINI INDUSTRIES LIMITED	INDIA
7	PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
8	SENIOR INDIA PVT. LTD.	INDIA
<b>FIRE WATER PUMPS</b>		
1	BEST & CROMPTON ENGG. CO.	INDIA
2	GREAVES COTTON & CO. LTD.	INDIA
3	JAYANT ENGINEERING & MARKETING (P) LTD.	INDIA
4	KIRLOSKAR BROTHERS LIMITED	INDIA
5	MATHER & PLATT INDIA LTD. (A Subsidiary of WILO SE German)	INDIA
<b>PORTABLE FIRE EXTINGUISHERS &amp; FIRE FIGHTING CHEMICALS</b>		
1	CEASEFIRE INDUSTRIES LTD	INDIA
2	PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
3	UNITECH MACHINES LTD.	INDIA
4	ZENITH FIRE SEVICES INDIA PVT. LTD	INDIA
<b>SMOKE / GAS DETECTOR</b>		
1	CEASEFIRE INDUSTRIES LTD	INDIA
2	PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
3	UNITECH MACHINES LTD.	INDIA
4	ZENITH FIRE SEVICES INDIA PVT. LTD	INDIA
<b>FIRE FIGHTING EQUIPMENTS</b>		

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1	DE'S TECHNICO PVT. LTD. (Deluge Valve and Sprinklers only.)	INDIA
2	HD FIRE PROTECT PVT. LTD.	INDIA
3	PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
4	VENUS PUMP & ENGG. WORKS	INDIA
5	WINCO VALVES PVT. LTD. (Equipments for Fire Hydrant System)	INDIA
6	ZENITH FIRE SEVICES INDIA PVT. LTD	INDIA
	<b>MARINE LOADING ARM</b>	
1	LLOYDS STEELS INDUSTRIES LIMITED (8" TO 20")	INDIA
	<b>TRUCK/WAGON LOADING ARM</b>	
1	LLOYDS STEELS INDUSTRIES LIMITED (2" TO 4")	INDIA
2	WOODFIELD SYSTEMS INTERNATIONAL PVT LTD (upto SIZE: CORE-4"/ JACKET-6")	INDIA

**NOTE:**

1. Make of the items not indicated and any other make for the specified item shall be subject to owner's / consultant's approval.
2. Any item for which vendor list is not enclosed; bidder has to furnish a list of their proposed vendors along with their references for supply of similar type of items with their proven track record. Vendor for these items shall be finalized during execution/detail engineering stage.
3. Any addition to vendor list of listed item shall be reviewed and approved by Owner/PMC, subject to submission of proper justification/reason and back-up credentials with proven & reliable record of performance for similar items on case to case basis.
4. In case of trader/stockist, make of items shall be as per approved vendor list.

 <b>पी डी आई एल</b> <b>PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LIMITED</b>	PC183/E/206/S -VI/12.0	0	
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## SECTION VI-12.0

### DRAWINGS AND SOCUMENTS

**PLANT : SUPPLY & CONSTRUCTION OF ASH POND AND ALLIED SERVICES**

**PROJECT : INTEGRATED COAL BASED FERTILISER COMPLEX, AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TFL- TALCHER DRAWINGS AND DOCUMENTS</b>	PC183/E/206/S -VI/12.0	0	
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## MATERIAL HANDLING LIST OF DRAWINGS & DOCUMENTS

### 1.0 DRAWINGS & DOCUMENTS:

This chapter details out various drawings and documents to be generated at various stages during the course of execution of the Project by the Contractor/Bidder for different project activities. Categorization of the documents/ drawings for review/ information/ records of PMC and the review/ approval requirements of the Owner/ PMC along with routing of the documents/ drawings will be conveyed separately as a philosophy.

The efficient handling of drawings and documents to be prepared by the Contractor under the contract is the key to the timely completion of the plants. The Contractor undertakes to ensure that all drawings and documents to be submitted by him to the Owner/ PMC shall be of professional quality and conforming to the contractual requirements. The Contractor also undertakes to institute a formal drawing control system which will be documented and submitted to the Owner/PMC for review or approval.

Compliance of this chapter on drawings and documents is mandatory and is non-negotiable.

The drawings / documents are to be generated by the Contractor at various stages of the project covering different activities. The drawings / documents generated will be in the category of Approval/ Review/ Information. The list of drawings and documents required is enclosed; however, the categorisation for the drawings/ documents will be informed separately. However, this will in no way relieve the Contractor of responsibility to conform to drawings, standards, specification, codes and contractual requirements / obligations.

The Contractor shall prepare the drawing numbering procedure and submit to Owner/ PMC for approval. Each Drawing submitted by the Contractor shall be clearly marked with the name of the Owner, PMC with revision number & date. It should contain the minimum following details:

- a. Size of Drawing.
- b. Discipline of Engineering for which the drawing is issued.
- c. Discipline wise segregation of numbering sequence for example:  
100 Series for Process. 200 Series for Mechanical etc.

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For drafting of Drawings, Computer aided design and drafting, AutoCAD 2015 shall be used. Further, standard, approved and well established P.C. based computer programmes/software packages, available in market shall only be used by the Contractor/his subcontractors/vendors etc. The Contractor shall bring out the list of all such packages in the offer for each discipline for evaluation of bid. Every time a computer aided design is submitted for review/ approval to Owner/PMC, it shall accompany with input/output data on Compact disc (CD) along with the name of the software package and operable on any system along with the requisite No. of Hard Copies (specified elsewhere in the Bidding document).

For drawing, data sheet and all graphic works Auto CAD 2015 and for all texts, MS Word Package 2012 shall be used. Hard Copies (3 nos.) and Soft Copies of all calculations & Drawings (applicable paper size) shall be made available by the Contractor for PMC review. Line List, Data Sheet & spread sheets shall be provided in MS Excel & all text items shall be in MS Word. All other documents like presentations etc. and other data shall be in MS Office; the required operating system for Data Exchange shall be at least Windows.

All documents before forwarding to Owner/PMC will have to be vetted in detail by the Contractor/duly approved engineering sub-contractor appointed by the Contractor. Document received without vetting will be returned.

The review by the PMC/Owner shall not be construed by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

Each drawing submitted by the Contractor shall be clearly marked with the name of the Owner, Unit Designation, Specifications, Title, Specification number and the name of the Project with Revision number and date. If standards, catalogue pages are to be submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawings shall be in English.

All the dimensions should be in metric units. Upon receiving comments on Drawings & Documents by the Contractor, the subsequent submission should give compliance report, separately on each of the comments, document-wise. Comments given by PMC/Owner to be discussed and finalised within agreed schedule.

The schedule of submission of the Drawings & Documents shall be in accordance with project plans only. The detailed list under different category, document-wise, shall be prepared by the Contractor for approval of Owner/PMC. This activity is to be completed within one month of Fax of Intent.

Sequence of submission of drawing is essential for proper review of documents and timely completion of the project is to be adhered. In case sequence is not maintained, the

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documents submitted will not be reviewed by Owner/ PMC and responsibility of timely execution of plant shall be to the Contractor's account.

## 2.0 CATEGORY OF DOCUMENTS:

Category	Description	Action by Owner/ PMC
1	Records/ Information	Contractor can continue to progress with the work. This drawings or documents will be retained with Owner/PMC for information only. Owner/ PMC reserves the right to advise the Contractor of any comments (deviations from the contract) at any time and the contractor is liable to respond to satisfy that the work being done is in accordance with the contract; deviations, if any will be bidder's risk and cost.
2	Review/Approval	<p>Owner/PMC will review and advise the Contractor of any Comments on Contractor's Drawings / documents within specified schedule (ie 2 weeks), from date of receipt in PMC office of Contractor's drawings/documents. The review period is defined as date of receipt of documents by PMC, to date of issue of comments by PMC. This review period shall be valid only if submission of drawings is done by Contractor in accordance with approved drawings / documents schedule as indicated in ITB. In case of any non-conformity to the above by Contractor due to which the period of review extends beyond 2 weeks by the PMC, schedule delay, if any will have to be absorbed by the Contractor.</p> <p>Review of documents / drawings shall be categorized as follows:</p> <ul style="list-style-type: none"> <li>i) Code-3: Not accepted. New Document / Drawing to be submitted</li> <li>ii) Code-2: Accepted with comments as marked</li> <li>iii) Code-1: Final approval</li> </ul>

The documents falling under Review category will be returned with comments within specified time schedules subject to fulfilling other conditions enumerated. The information category document will be retained for information only but however Owner/PMC reserves the right to comment at any stage of the Project, but not later than two weeks of receipt.

Where clearance of Owner/ PMC is required for ordering of equipment materials, enquiry documents and one technically selected offer is to be submitted for review. The unpriced copies of purchase orders detailing both technical and commercial aspects for all items shall be submitted to PMC/ Owner within 15 days of issue of the same.

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Each purchase order forwarded should contain complete technical documents. It is obligatory for the Contractor to obtain acceptance on all the technical documents and accepted copy only to be forwarded to Owner / PMC. Any inaccuracies /omissions/inconsistencies noticed and brought to the notice of the Contractor at any stage of the project will be rectified/ replaced by Contractor without any cost & time implication to the Owner/ PMC.

Detailed manufacturing schedules of fabricated/ manufactured items shall be submitted within one month of ordering, Status report for all the items in detail, will be submitted once in a month.

Documents to Boiler Regulation authorities shall be submitted and getting the documents reviewed by PMC/Owner. To any other agencies, documents shall be submitted under intimation to PMC/Owner.

As built drawings and documents will be generated within one month of completion of activities on respective items of work.

As Built Drawings:

Contractor will furnish reproducible and electronic files of all the drawings under their scope to Owner / PMC, certified as "As-Built Issue" by Third Party Inspection Agency (TPIA) for Vendor Items coming under Third Party Inspection / Contractor for all other drawings.

Upon completion of identifiable units or components of the fabrication, construction and installation phase of the project the Contractor will complete all the related plans to the "as built" stage including all Vendor drawings and furnish Owner/PMC with the following:

- a. One complete set of all original tracings copies.
- b. One complete set of reduced size (A3-297x420 mm) copies of all drawings.
- c. One set of CD for all documents/drawings/data
- d. All the as built drawings duly certified should be scanned and converted into electronic files made on magnetic/discs/optical long storage.
- e. All other project documents such as operating and maintenance manuals, manufacturers' Catalogues etc. shall also be scanned on magnetic/optical discs for safe storage and retrievals by the Owner when needed.
- f. 10 complete sets of full size prints of the drawings and 4 sets of reduced size prints.
- g. 10 complete bound sets of Manufacturer's specifications including design calculations.
- h. 10 complete sets in hard binders of the Manufacturers data book including certified prints and data for all items including test reports. Data Books shall be complete with index as tag numbers associated with Manufacturer's data shown. Equipment data shall include as a minimum requirement the principal and description of operation, drawings and dimensions, spare parts lists and un-priced purchase orders and bill of material.
- i. 10 bound copies each of the Spare Parts data books and the Lubricants inventory Schedule.
- j. 10 complete sets of field records shall be signed by both the Contractor's and Owner's Representative at the site.





**SUPPLY & CONSTRUCTION OF ASH POND  
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- k. Original approvals and related drawings and documents from the statutory authority.
- l. Copies of correspondence with the statutory authorities.

### 3.0 PROCEDURE:

The procedure for compilation of final as-built documents / drawings shall be informed later. However the Procedure for routing the final / as built documents/ drawings to PMC / Owner shall be informed during the execution stage.

### 4.0 LIST OF DRAWINGS & DOCUMENTS:

Sl. No.	Description	With Bid (Y/N)	For Review/ Approval	For Information	Final/ Approved/ As-built
<b>A.</b>	<b>MATERIAL HANDLING</b>				
1.0	Flow Diagram of Material Handling system	Y	Y	-	Y
2.0	Conveyors Layout drg.	Y	Y	-	Y
3.0	Layout of all the Transfer Tower showing outline dimensions of all the equipments	N	Y	-	Y
4.0	Data Sheet/Specification Sheet of all equipments completely filled in as per format	N	Y	-	Y
5.0	Power, capacity and Pulley shaft dia calculations of all the conveyors as per CEMA / IS 11592.	N	Y	-	Y
6.0	Bunker/Hopper capacity calculation	N	Y	-	-
7.0	Civil Scope Drg. with Load data for design of buildings, gantry, foundations etc	N	Y	-	-
8.0	Detail GA drg. of all conveyors gantry, transfer towers, bagging plant including railway platform showing all the equipments & machinery inline with Civil drg.(by others)	N	Y	-	Y
9.0	Catalogue for spare parts	N	-	Y	-
10.0	Design calculations of equipments structural including base plates	N	-	Y	-
11.0	Instruction manual showing installation, operation & maintenance procedure for all mechanical as well as electrical & Instrument items, parts list and bearing lubrication schedule substantiated by sketches and drawings.	N	-	-	-
12.0	Any other drawing required by owner / Consultant.	N	Y	-	Y



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**ELECTRICAL**

S. No	Description	With Bid (Y/N)	For Review/ Approval	For Information	Final/ Approved/ As-built
	<b>ELECTRICAL</b>				
1.0	Load List indicating rated and absorbed power of loads and duty type (Continuous / Standby / Intermittent) at different voltages including emergency loads.	N	-	Y	Y
2.0	Load Data indicating normal, peak, starting and construction power requirement at various voltage levels.	N	-	Y	Y
3.0	Single line distribution diagram (power, lighting, DC supply and UPS supply) including protection and metering details giving rating of each equipment.	N	Y	-	Y
4.0	Specification Sheets and Technical Particulars of Electrical Equipment	N	Y	-	Y
5.0	General arrangement and foundation drawings of all equipment.	N	-	Y	Y
6.0	Equipment layout in Sub Station, MCC room, and plant area showing location of all electrical equipment.	N	Y	-	Y
	Civil scope drawing of Transformers, 415V switch boards, MLDB, Battery & Battery Charger, UPS and other substation equipment.				
7.0	Cable schedule.	N	Y	-	Y
8.0	Cable rack / trench / pipe layout of substation and Plant.	N	Y	-	Y
9.0	Power Layout of Plant and Substation .	N	Y	-	Y
10.0	Schematic diagram for all control panel & switch boards.	N	Y	-	Y
11.0	Feeder Details of all switch boards	N	Y	-	Y
12.0	Interconnection & Terminal connection diagram	N	-	Y	Y
13.0	List of controls, interlocks, indication & metering at various locations for all drives.	N	-	Y	Y
14.0	Characteristic curves for motor/ relays etc.	N	-	Y	Y
15.0	Sizing Calculations for Electrical System and Equipment.	N	Y	-	Y
16.0	Design calculations (for system design and equipment sizing, earthing & Lightning, lighting, cables, bus ducts etc.)	N	Y	-	Y
17.0	Earthing and lightning protection layout of substation and Plant	N	Y	-	Y
18.0	Lighting layout of substation and Plant with Distribution diagram	N	Y	-	Y

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TFL- TALCHER DRAWINGS AND DOCUMENTS</b>	PC183/E/206/S -VI/12.0	0	
		Document No.	Rev	
		Sheet 8 of 15		

19.0	Drawings and documents asked for each equipment as per respective Technical Specifications	N	Y	-	Y
20.0	Control & operation write up/Block logic diagrams.	N	Y	-	Y
21.0	Catalogues for all bought out items	N	-	Y	Y
22.0	Bill of Materials covering all electrical equipment and installation materials	N	-	Y	Y
23.0	Installation operation and maintenance Manual	N	-	-	Y
24.0	Relay Co-ordination and settings	N	-	Y	Y
25.0	Spare Parts list	Y	-	Y	Y
26.0	Test Certificates	N	-	Y	Y
27.0	Guarantee Certificates	N	-	Y	Y
28.0	Quality Assurance Plan & Formats	N	Y	-	Y
29.0	Hazardous area Classification Drawing	Y	Y	-	Y
30.0	Erection Drawings & Details	N	Y	-	Y
31.0	Construction & Commissioning specification and procedure for all equipment.	N	-	Y	Y
32.0	Any other drawings & data as required for satisfactory installation, operation & maintenance.	N	Y	Y	Y

## INSTRUMENTATION

SLNo	Document Description	Document to be submitted		
		With Bid	After order for approval	Final
1	List of Instruments (tag wise) indicating type of Instrument, make, model no., quantity etc.		Yes	Yes
2	Instrument mounting and connection details		Yes	Yes
3	Instrument layout drawings		Yes	Yes
4	Catalogue of Instruments & System		Yes	Yes
5	List of spares (item wise and quantity) for Commissioning and 2 years of operation		Yes	Yes
6	Specification of Instruments		Yes	Yes
7	Detail wiring/ interconnection diagram		Yes	Yes
8	P and I Diagram		Yes	Yes
9	I/O list		Yes	Yes
10	Loop Diagram		Yes	Yes
11	Logic Diagram for interlock & safety (if any)		Yes	Yes

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TFL- TALCHER DRAWINGS AND DOCUMENTS</b>	PC183/E/206/S -VI/12.0	0	
		Document No.	Rev	
		Sheet 9 of 15		

12	J.B. termination drawings		Yes	Yes
13	Instrumentation, operating, maintenance manuals		Yes	Yes
14	Instrument Test Certificate			Yes
15	Vendor to indicate power requirement (if any) for the control system		Yes	Yes
16	Other documents necessary to have a clear understanding of the system		Yes	Yes
17	List of alarms		Yes	Yes
18	Schematic drawings for controls		Yes	Yes
19	Control room layout/System Architecture		Yes	Yes
20	Field Operator Room layout		Yes	Yes
21	System Architecture	Yes	Yes	Yes
22	Control Philosophy	Yes		
23	Instrument Air Consumption Requirement		Yes	Yes
24	UPS power & Heat Load Requirement		Yes	Yes
25	Bill of Material		Yes	Yes

#### ROTATING EQUIPMENTS



**SUPPLY & CONSTRUCTION OF ASH POND  
AND ALLIED SERVICES  
TFL- TALCHER  
DRAWINGS AND DOCUMENTS**

PC183/E/206/S -VI/12.0

0

Document No.

Rev

Sheet 10 of 15



A.	PUMPS				
1.0	List of drawings / documents including drawing number, revision number, description and approval status	N	Y	-	Y
2.0	Detailed manufacturing programme (Time bar chart )	N	Y	-	Y
3.0	Certified dimensional outline drawing	N	Y	-	Y
4.0	Cross sectional drawing and bill of material	N	Y	-	Y
5.0	Shaft seal drawing and bill of material	N	Y	-	Y
6.0	Shaft coupling assembly drawing and bill of materials including allowable misalignment clearances, shaft bores & key ways dimensions with tolerances and the style of coupling guard	N	Y	-	Y
7.0	Primary & auxiliary sealing schematic and bill of materials including seal fluid, fluid flows, pressure pipe and valve sizes, instrumentation, orifice sizes, and piping arrangement drawings	N	Y	-	Y
8.0	Cooling or heating schematic and bill of materials including cooling & heating media, fluid flows, pressure, pipe and valve sizes, instrumentation, orifice sizes and piping arrangement drawings	N	Y	-	Y
9.0	Lube oil schematic and bill of materials	N	Y	-	Y
10.0	Lube oil system arrangement drawing including sizes, rating and location of all customer connections	N	Y	-	Y
11.0	Lube oil component drawings data	N	Y	-	Y
12.0	Electrical and instrumentation schematics, wiring diagrams and bill of materials	N	Y	-	Y



**SUPPLY & CONSTRUCTION OF ASH POND  
AND ALLIED SERVICES  
TFL- TALCHER  
DRAWINGS AND DOCUMENTS**

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Rev

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13.0	Electrical and instrumentation arrangement drawing and list of components	N	Y	-	Y
14.0	Performance curves	N	Y	-	Y
15.0	Pump specification sheet with complete details in Performa enclosed with enquiry / order	N	Y	-	Y
16.0	Certified foundation assembly drawing of pump with driver & all accessories mounted on base plate with load diagram for foundation design (In case of motor being procured by purchaser, motor frame details will be supplied to vendor within 4 weeks.)	N	Y	-	Y
17.0	Engineering flow diagram showing: - Lubrication & sealing lines - Flushing / washing lines - Cooling / steam lines	N	Y	-	Y
18.0	Reference list for pumps supplied in past for similar duty conditions. Reference list shall contain complete address of user, user's purchase order number, brief specifications and date of commissioning	N	-	-	Y
19.0	Lube oil schedule	N	-	-	Y
20.0	Automatic recirculation valve assembly drawing, sectional drawing with bill of material	N	Y	-	Y
21.0	Quality Assurance Plan.	N	Y	-	-
22.0	Material test certificates and Inspection & performance test report along with dispatch clearance certificates from inspector	N	-	-	Y
23.0	Instruction manuals describing installation, operation and maintenance procedures	N	-	-	Y
24.0	Spare parts recommendations and price list	N	-	-	Y

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TFL- TALCHER DRAWINGS AND DOCUMENTS</b>	PC183/E/206/S -VI/12.0	0	
		Document No.	Rev	
		Sheet 12 of 15		

25.0	Parts catalogue complete with reference drawing nos. and sketches etc.	N	-	-	Y
------	--	---	---	---	---

	<b>SUPPLY &amp; CONSTRUCTION OF ASH POND AND ALLIED SERVICES TFL- TALCHER DRAWINGS AND DOCUMENTS</b>	PC183/E/206/S -VI/12.0	0	
		Document No.	Rev	
		Sheet 13 of 15		

<b>B.</b>	<b>FANS &amp; BLOWERS</b>				
1.0	Specification sheets completely filled.	N	Y	-	Y
2.0	Characteristic Curves - Performance curves, showing discharge pressure, capacity, and brake horse power at the inlet specified conditions (Pressure, capacity, temperature, molecular weight).	N	Y	-	Y
3.0	Spare parts list	N	-	-	Y
4.0	Details of Lubrication and sealing system	N	-	-	Y
5.0	Data for selection of motor :	N	Y	-	Y
	a) Type				
	b) HP absorbed at duty point				
	c) RPM				
	d) Recommended HP				
	e) Max. starting torque as % NRT				
	f) $GD^2$ figure for rotating mass of the Fan / Blower				
	g) Speed vs. Torque for the Fan / Blower				
6.0	General Arrangement Drawing with all main dimensions, size and location of connections for ducting with all horizontal & vertical clearance necessary for installation and disassembly.	N	Y	-	Y
7.0	Cross sectional drawing of fan with parts list	N	Y	-	Y





**SUPPLY & CONSTRUCTION OF ASH POND  
AND ALLIED SERVICES  
TFL- TALCHER  
DRAWINGS AND DOCUMENTS**

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Rev

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8.0	Instruction manual for erection, installation operation and maintenance of fan and its accessories (Important clearances to be maintained should be clearly specified).	N	-	-	Y
9.0	Q.A.P and Test procedure	N	Y	-	Y
10.0	Lubrication schedule	N	-	-	Y
11.0	Reference list indicating duty condition, location, year of installation, name of client etc.	N	-	-	-
12.0	GA drawing with all details & dims. Including fan, drive, motor	N	Y	-	Y
13.0	Description of capacity control with details	N	-	-	Y
<b>C.</b>	<b>AGITATORS</b>				
1.0	Specification sheets completely filled.	N	Y		Y
2.0	General Arrangement Drawing with all main dimensions, size and location of connections for installation and disassembly.	N	Y		Y
3.0	Spare parts list	N	Y		Y
4.0	Details of Lubrication and sealing system	N	-	-	Y
5.0	Instruction manual for erection, installation operation and maintenance of fan and its accessories (Important clearances to be maintained should be clearly specified).	N	-	-	Y
6.0	Reference list indicating duty condition, location, year of installation, name of client etc.	N	Y	-	Y



**SUPPLY & CONSTRUCTION OF ASH POND  
AND ALLIED SERVICES  
TFL- TALCHER  
DRAWINGS AND DOCUMENTS**

PC183/E/206/S -VI/12.0

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Document No.

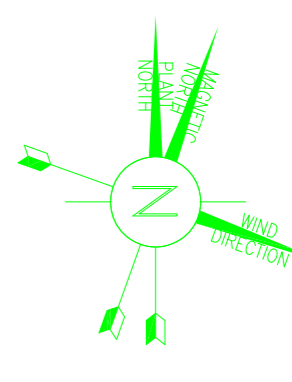
Rev

Sheet 15 of 15




**PIPING :**

Sl. No.	Description	With Bid (Y/N)	For Review/ Approval	For Information	Final/ Approved/ As-built
	<b>PIPING</b>				
1.0	Equipment layout drawing	Y	Y	-	Y
2.0	Piping Layout drawing	N	Y	Y	Y
3.0	Design data:				
3.1	Design basis	N	Y	-	Y
3.2	Piping material specification	N	Y	-	Y
3.3	Valve material specification(Valve Data Sheet)	N	Y	-	Y
4.0	Material Take-offs (Linewise & consolidated BOQ)	N	-	Y	Y
5.0	Material Requisitions schedule	N	-	Y	Y
6.0	Quality control plan/Inspection test plan	N	-	Y	Y
7.0	Vendor Drawings(Valves, Strainers, Traps etc)	N	Y	Y	Y
8.0	Issued for construction (IFC) Drawing				
8.1	Piping GA drawings	N	-	Y	Y
8.2	Isometrics	N	-	Y	Y
8.3	Piping supports, operating platforms drg.	N	-	Y	Y
9.0	Design calculation / Documents.	N	-	Y	Y
10.0	Flexibility Analysis of Piping	N	Y	-	Y
11.0	Support and load data	N	-	Y	Y
12.0	All inspection, testing & NDT Records.	N	-	Y	Y
13.0	As Built Drgs/Docs/MTCs	N	-	-	Y
14.0	3D model	N	Y	Y	Y



LAYOUT PLAN FOR BALANCE LAND DEVELOPMENT  
(SCALE : NTS)

S.NO.	REFERENCE DRG.	DRAWING NO.
1.	PLOT PLAN OF PROPOSED INTEGRATED COAL BASED FERTILIZER AND CHEMICALS COMPLEX	PC183-0000-0001

**LEGEND:-**

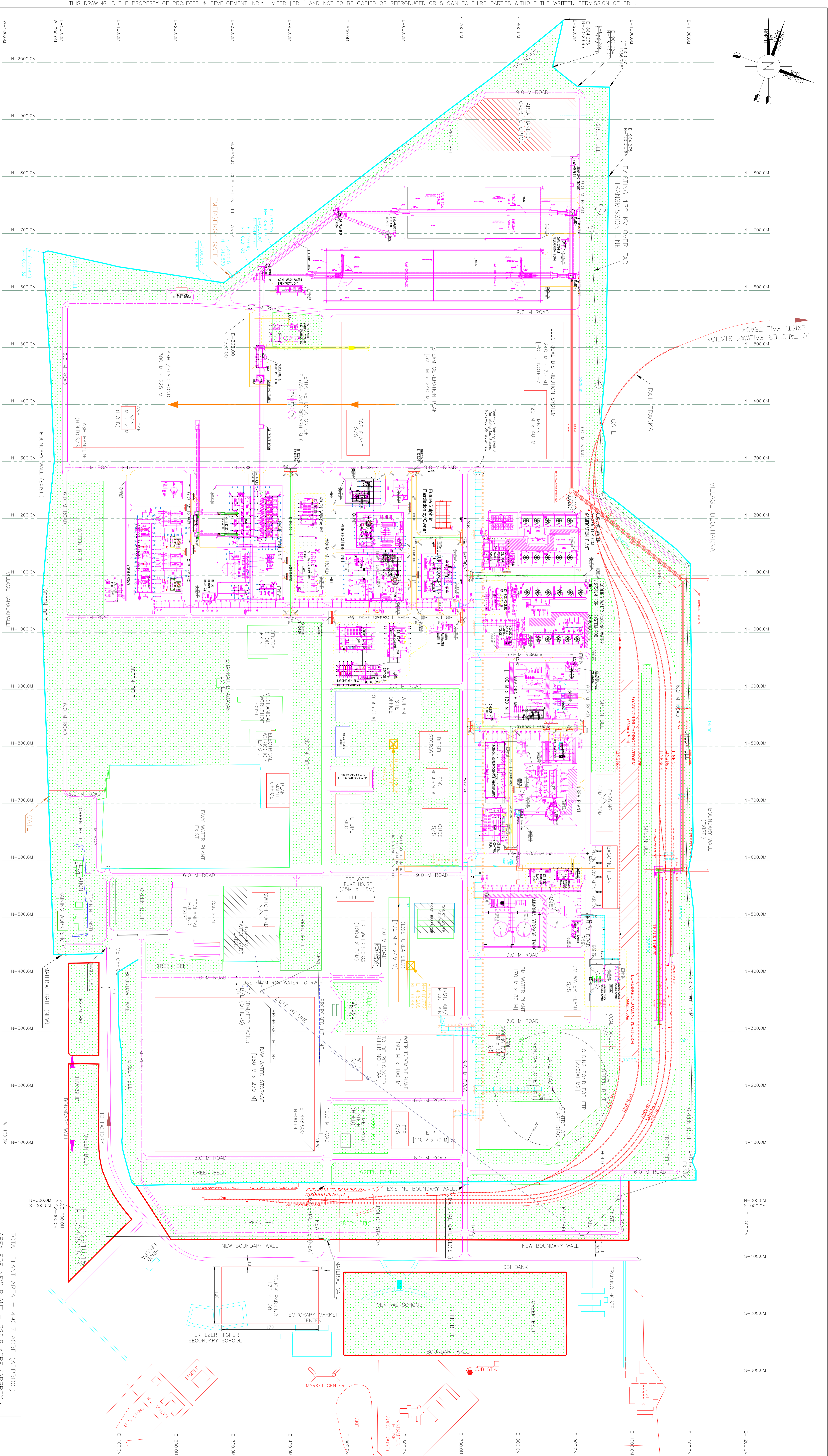
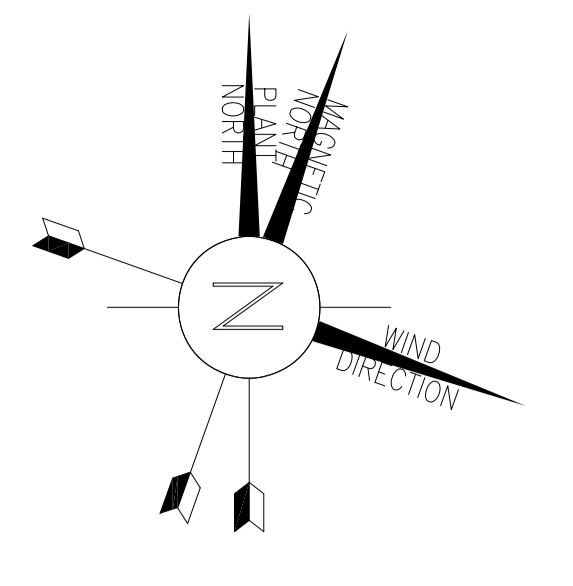
	EL. 106.000M LVL.
	EL. 98.000M LVL.
	EL. 97.000M LVL.
	EL. 94.500M LVL.
	EL. 92.000M LVL.
	EL. 91.000M LVL.
	EL. 88.000M LVL. (REF. NOTE-7)
	EL. 85.500M LVL.
	EL. 89.500M LVL.
	EL. 89.000M LVL.



- GENERAL NOTES:-**
1. ALL DIMENSIONS ARE IN MM AND LEVELS IN M. UNLESS NOTED OTHERWISE.
  2. THE DRAWING SHOULD NOT BE SCALED, ONLY FIGURE DIMENSION ARE TO BE FOLLOWED.
  3. THE RESPECTIVE R/S. SHALL BE RECKONED FROM THE PERMANENT BENCH MARK.
  4. MINIMUM SLOPE OF 1 VERTICAL AND 2 HORIZONTAL SHALL BE PROVIDED ON BOTH SIDE OF ROADS IF REQUIRED.
  5. CONSIDERING ELEVATION DIFFERENCE, PROPER SLOPE IS TO BE PROVIDED BETWEEN BAGGING BUILDING ZONE AND WUHAN BATTERY LIMIT, AS DECIDED BY EIC.
  6. AS PER DPR PRODUCED BY RITES - THE DIFFERENCE IN LEVEL BETWEEN TIL BENCH MARK AND RAILWAYS MOTHER BENCH MARK IS 921MM. RAILWAY MOTHER BENCH MARK IS HIGHER. SITE TEAM TO VERIFY AND TAKE CARE ACCORDINGLY.
  7. LAND GRADING WORKS IN RAILWAY SIDING AREA (TOWARDS SOUTH SIDE) SHALL CONSIST OF CLEANING AND REMOVAL OF TREE/BUSHES/VEGETATION ALONG WITH REMOVAL OF ASH/DIBENS ETC. THEN CONTRACTOR SHALL INFORM PWD/TFL FOR GETTING FURTHER ORDERS REGARDING CUTTING OR FILLING WORKS.
  8. CONTRACTOR TO PROVIDE SUITABLE SLOPE WITH PROPER COMPACTION TO PLANT DRAINS WHILE PERFORMING LAND GRADING ACTIVITIES IN ALL AREAS SPECIALLY IN W/P/EP/SIP AREA AS PER DIRECTION OF TFL/PDL ETC.
  9. CONTRACTOR TO PROVIDE HORTICULTURE AS SUITED SITE AS PER DIRECTION OF TFL/PDL ETC.

REV.	DATE	DESCRIPTION	BY	CHKD	APPD.
2	23.05.22	REVISED AS MARKED	JPR	SS	RNS
1	16.03.22	ISSUED FOR CONSTRUCTION	JPR	SS	RNS
0	16.02.22	ISSUED FOR CONSTRUCTION	JPR	SS	RNS

NO.	DATE	DESCRIPTION	BY	CHKD	APPD.
1	16.02.22	ISSUED FOR CONSTRUCTION	JPR	SS	RNS
2	23.05.22	REVISED AS MARKED	JPR	SS	RNS



TOTAL PLANT AREA = 490.7 ACRE (APPROX.)  
 AREA FOR N/W PLANT = 326.8 ACRE (APPROX.)  
 TOTAL GREENBELT AREA = 163.9 ACRE (APPROX.)

TABLE-1. LIST FACILITIES/UNITS OF GASIFICATION PLANT

S.NO	NAME DESCRIPTION	SIZE IN METRE	REMARKS
1	ASB STORAGE UNIT	202 M X 101 M	
2	ASB STORAGE UNIT	202 M X 101 M	
3	ASB STORAGE UNIT	202 M X 101 M	
4	ASB STORAGE UNIT	202 M X 101 M	
5	ASB STORAGE UNIT	202 M X 101 M	
6	ASB STORAGE UNIT	202 M X 101 M	
7	ASB STORAGE UNIT	202 M X 101 M	
8	ASB STORAGE UNIT	202 M X 101 M	
9	ASB STORAGE UNIT	202 M X 101 M	
10	ASB STORAGE UNIT	202 M X 101 M	
11	ASB STORAGE UNIT	202 M X 101 M	
12	ASB STORAGE UNIT	202 M X 101 M	
13	ASB STORAGE UNIT	202 M X 101 M	
14	ASB STORAGE UNIT	202 M X 101 M	
15	ASB STORAGE UNIT	202 M X 101 M	
16	ASB STORAGE UNIT	202 M X 101 M	
17	ASB STORAGE UNIT	202 M X 101 M	
18	ASB STORAGE UNIT	202 M X 101 M	
19	ASB STORAGE UNIT	202 M X 101 M	
20	ASB STORAGE UNIT	202 M X 101 M	

TABLE-2. LIST FACILITIES/UNITS OF AMMONIA/UREA PLANT

S.NO	NAME DESCRIPTION	SIZE IN METRE	REMARKS
1	AMMONIA UNIT	202 M X 101 M	
2	AMMONIA UNIT	202 M X 101 M	
3	AMMONIA UNIT	202 M X 101 M	
4	AMMONIA UNIT	202 M X 101 M	
5	AMMONIA UNIT	202 M X 101 M	
6	AMMONIA UNIT	202 M X 101 M	
7	AMMONIA UNIT	202 M X 101 M	
8	AMMONIA UNIT	202 M X 101 M	
9	AMMONIA UNIT	202 M X 101 M	
10	AMMONIA UNIT	202 M X 101 M	
11	AMMONIA UNIT	202 M X 101 M	
12	AMMONIA UNIT	202 M X 101 M	
13	AMMONIA UNIT	202 M X 101 M	
14	AMMONIA UNIT	202 M X 101 M	
15	AMMONIA UNIT	202 M X 101 M	
16	AMMONIA UNIT	202 M X 101 M	
17	AMMONIA UNIT	202 M X 101 M	
18	AMMONIA UNIT	202 M X 101 M	
19	AMMONIA UNIT	202 M X 101 M	
20	AMMONIA UNIT	202 M X 101 M	

TABLE-3. UREA, GYL/TH/LD FACILITIES/UNITS

S.NO	NAME DESCRIPTION	SIZE IN METRE	REMARKS
1	UREA UNIT	202 M X 101 M	
2	UREA UNIT	202 M X 101 M	
3	UREA UNIT	202 M X 101 M	
4	UREA UNIT	202 M X 101 M	
5	UREA UNIT	202 M X 101 M	
6	UREA UNIT	202 M X 101 M	
7	UREA UNIT	202 M X 101 M	
8	UREA UNIT	202 M X 101 M	
9	UREA UNIT	202 M X 101 M	
10	UREA UNIT	202 M X 101 M	
11	UREA UNIT	202 M X 101 M	
12	UREA UNIT	202 M X 101 M	
13	UREA UNIT	202 M X 101 M	
14	UREA UNIT	202 M X 101 M	
15	UREA UNIT	202 M X 101 M	
16	UREA UNIT	202 M X 101 M	
17	UREA UNIT	202 M X 101 M	
18	UREA UNIT	202 M X 101 M	
19	UREA UNIT	202 M X 101 M	
20	UREA UNIT	202 M X 101 M	

TABLE-4. UREA, GYL/TH/LD FACILITIES/UNITS

S.NO	NAME DESCRIPTION	SIZE IN METRE	REMARKS
1	UREA UNIT	202 M X 101 M	
2	UREA UNIT	202 M X 101 M	
3	UREA UNIT	202 M X 101 M	
4	UREA UNIT	202 M X 101 M	
5	UREA UNIT	202 M X 101 M	
6	UREA UNIT	202 M X 101 M	
7	UREA UNIT	202 M X 101 M	
8	UREA UNIT	202 M X 101 M	
9	UREA UNIT	202 M X 101 M	
10	UREA UNIT	202 M X 101 M	
11	UREA UNIT	202 M X 101 M	
12	UREA UNIT	202 M X 101 M	
13	UREA UNIT	202 M X 101 M	
14	UREA UNIT	202 M X 101 M	
15	UREA UNIT	202 M X 101 M	
16	UREA UNIT	202 M X 101 M	
17	UREA UNIT	202 M X 101 M	
18	UREA UNIT	202 M X 101 M	
19	UREA UNIT	202 M X 101 M	
20	UREA UNIT	202 M X 101 M	

- NOTES:-
- ALL DIMENSIONS AND COORDINATES ARE IN METERS UNLESS OTHERWISE SPECIFIED.
  - REFERENCE BENCH MARK (BM) POINTS IS WRT GLOBAL CO-ORDINATES HAVING N-2329201.51 & E-386690.83 GRID COORDINATES N=000.00, E=000.00
  - BLOCK SIZE OF FACILITIES ARE TO BE FINALIZED AFTER GETTING VENDORS JMD
  - CENTER LINE OF EXISTING ROAD & PERIPHERAL ROAD TO BE MAINTAINED WITH MINOR ADJUSTMENT & SAME SHALL BE ALIGNED WITH EXISTING BOUNDARY WALL.
  - IT IS ASSUMED THAT 220 KV EXTERNAL POWER SUPPLY TIE-IN SHALL BE AT SYSTEM BLOCK
  - \* INDICATES HOLD

LEGEND :-

SYMBOL	DESCRIPTION
(Red line)	PLANT BOUNDARY
(Blue line)	PROPOSED FACILITIES (PHL/TH)
(Green line)	PROPOSED FACILITIES (K/HAH)
(Yellow line)	EXISTING FACILITIES
(Pink line)	RAILWAY LINE
(Orange line)	PROPOSED ROAD
(Light Green area)	PROPOSED GREEN BELT
(Light Blue area)	PIPE ROCK

REVISIONS

S.NO	DATE	DESCRIPTION	BY	CHKD
01	19.01.21	PRELIMINARY ISSUE	AM	DO/NS
02	19.01.21	PRELIMINARY ISSUE	AM	DO/NS
03	19.01.21	PRELIMINARY ISSUE	AM	DO/NS
04	19.01.21	PRELIMINARY ISSUE	AM	DO/NS
05	19.01.21	PRELIMINARY ISSUE	AM	DO/NS

**PROJECTS & DEVELOPMENT INDIA LTD.**  
 NOIDA

**CLIENT:** M/s. TALCHER FERTILIZER LIMITED  
 TALCHER, ANGUL DISTRICT, ODISHA(INDIA)

**PROJECT:** COAL BASED FERTILIZER INTEGRATED  
 MASTER PLAN FOR TALCHER UNIT  
 INDEX PLAN (FOR TALCHER UNIT)  
 PLANT LAYOUT (FOR TALCHER UNIT)

**DATE:** 15.02.2022

**SCALE:** 1 : 2200

**DRG. NO.:** P018-000-0001

**FILE NO.:** P018-000-0001

**DATE:** 19.01.21

**BY:** AM

**CHKD:** DO/NS

**APPD:** DO/NS

**REV:** 0

**SHEET:** 1 OF 1

**ISSUED FOR COMMENT**

**PRELIMINARY ISSUE**

**DATE:** 19.01.21

**DESIGNER:** D E S C H I P T O N

**SCALE:** 1 : 2200

**DRG. NO.:** P018-000-0001

**FILE NO.:** P018-000-0001

**DATE:** 19.01.21

**BY:** AM

**CHKD:** DO/NS

**APPD:** DO/NS

**REV:** 0

**SHEET:** 1 OF 1

**ISSUED FOR COMMENT**

**PRELIMINARY ISSUE**

**DATE:** 19.01.21

**DESIGNER:** D E S C H I P T O N

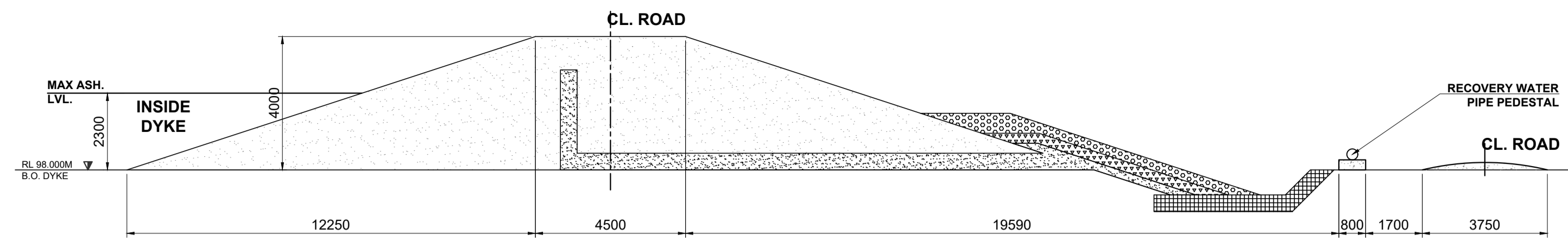


S.NO.	REFERENCE DRG.	DRAWING NO.

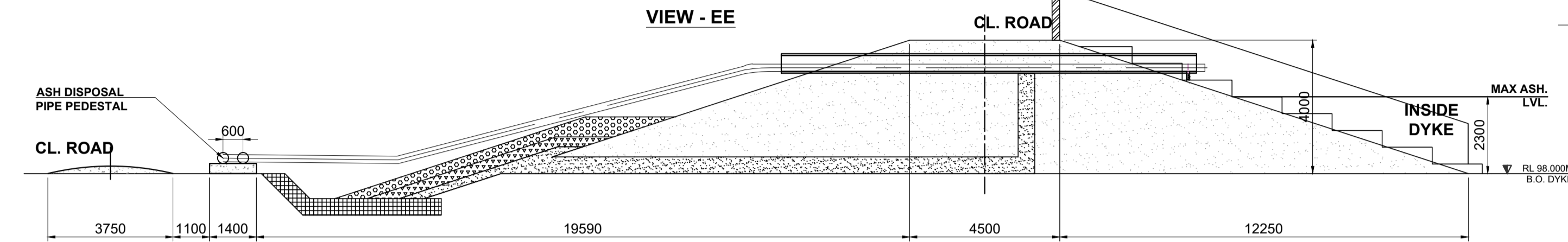
- GENERAL NOTES:-**
1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.
  2. ALL LEVELS ARE IN M UNLESS NOTED OTHERWISE.
  3. THIS DRAWING IS ONLY FOR BID PURPOSE.
  4. EL (+) 0.000M LVL. BELONGS TO RL 98.500M

- LEGEND**
- FGL - FINISHED GROUND LEVEL
  - FFL - FINISHED FLOOR LEVEL
  - HPL - HIGHEST PAVED LEVEL
  - TOG - TOP OF GROUT

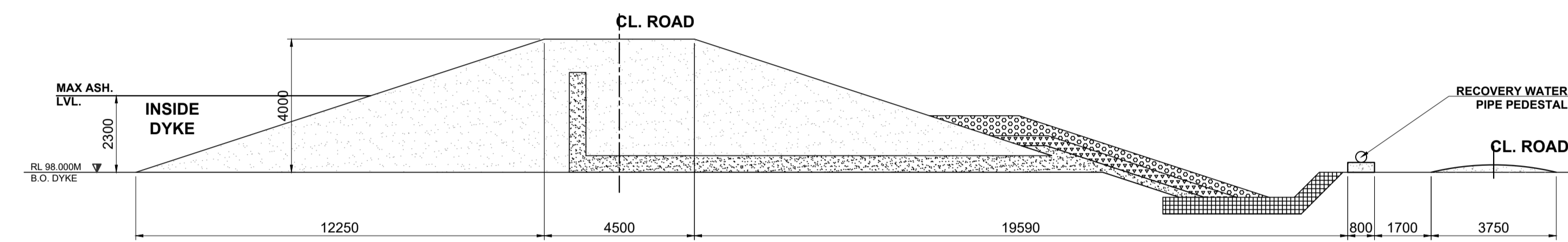
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REV	DATE	DESCRIPTION	BY	CHKD	APPD.
		M/S TALCHER FERTILIZER LIMITED	REV.		
<b>LOCATION</b>	TALCHER, ANGUL DISTRICT, ODISHA(INDIA)			SCALE:- NTS	
<b>TITLE</b>	LAYOUT - ASH & SLAG DYKE			DRG. NO.- PC183-PNCV-AP-0201 FILE.- PC183-PNCV-AP-0201_P	
<b>PROJECTS &amp; DEVELOPMENT INDIA LIMITED NOIDA</b>					



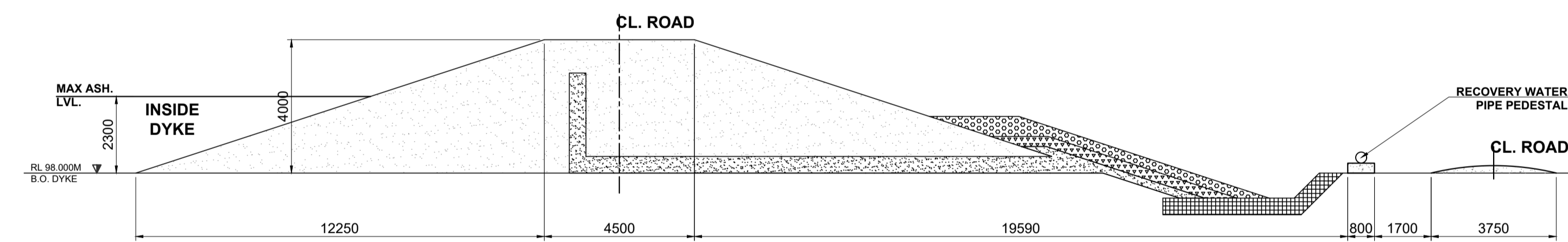
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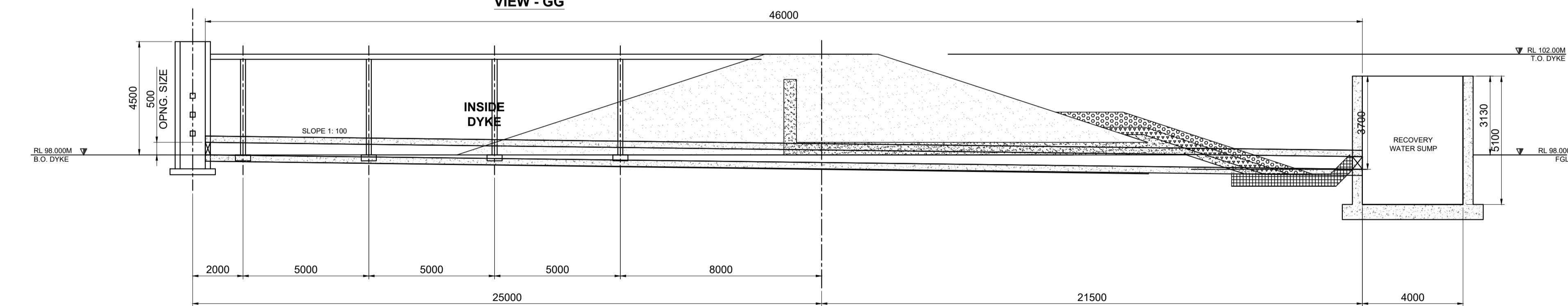
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(TYP. PIPE RAISING OVER DYKE)



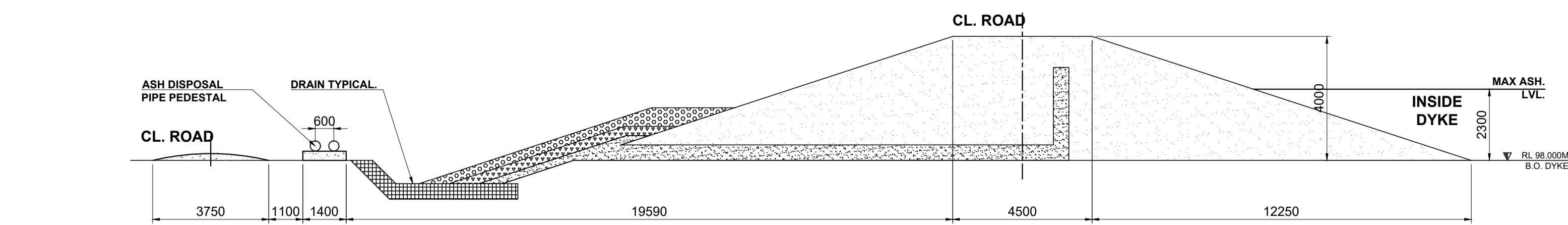
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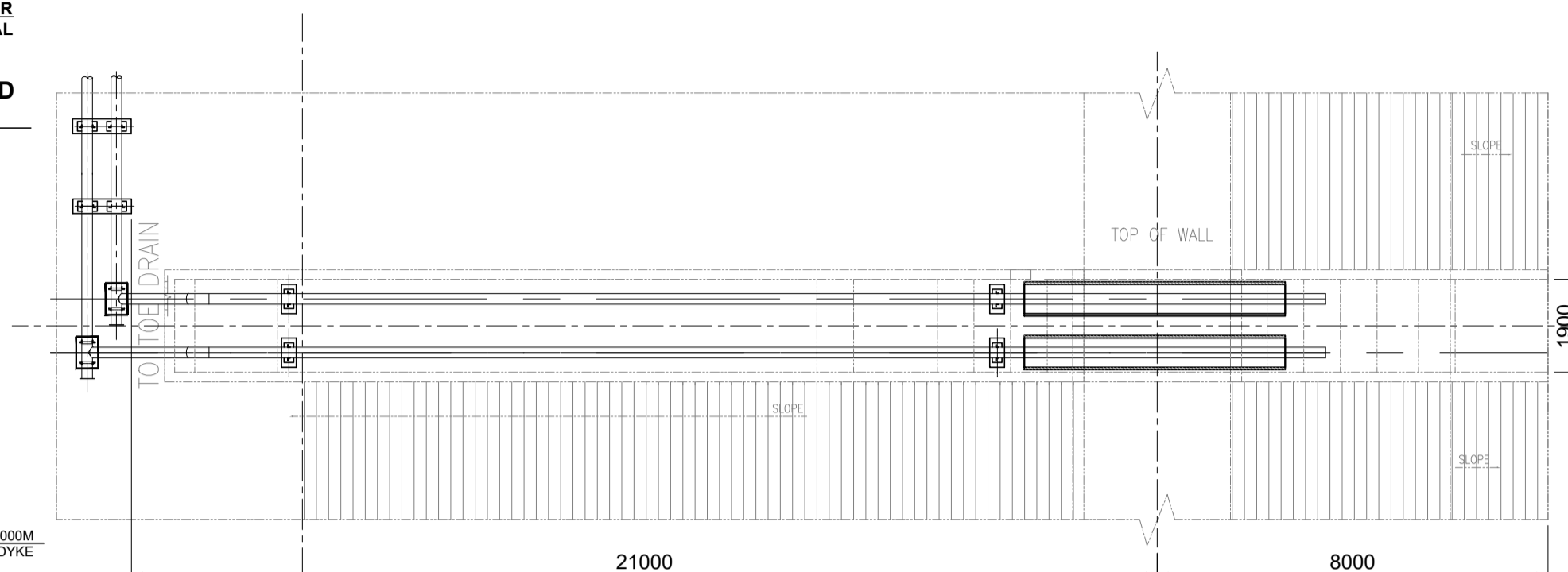
VIEW - GG



VIEW - DD  
(PIPING FROM DECANTING WELL  
TO RECOVERY WATER SUMP)



VIEW - AA



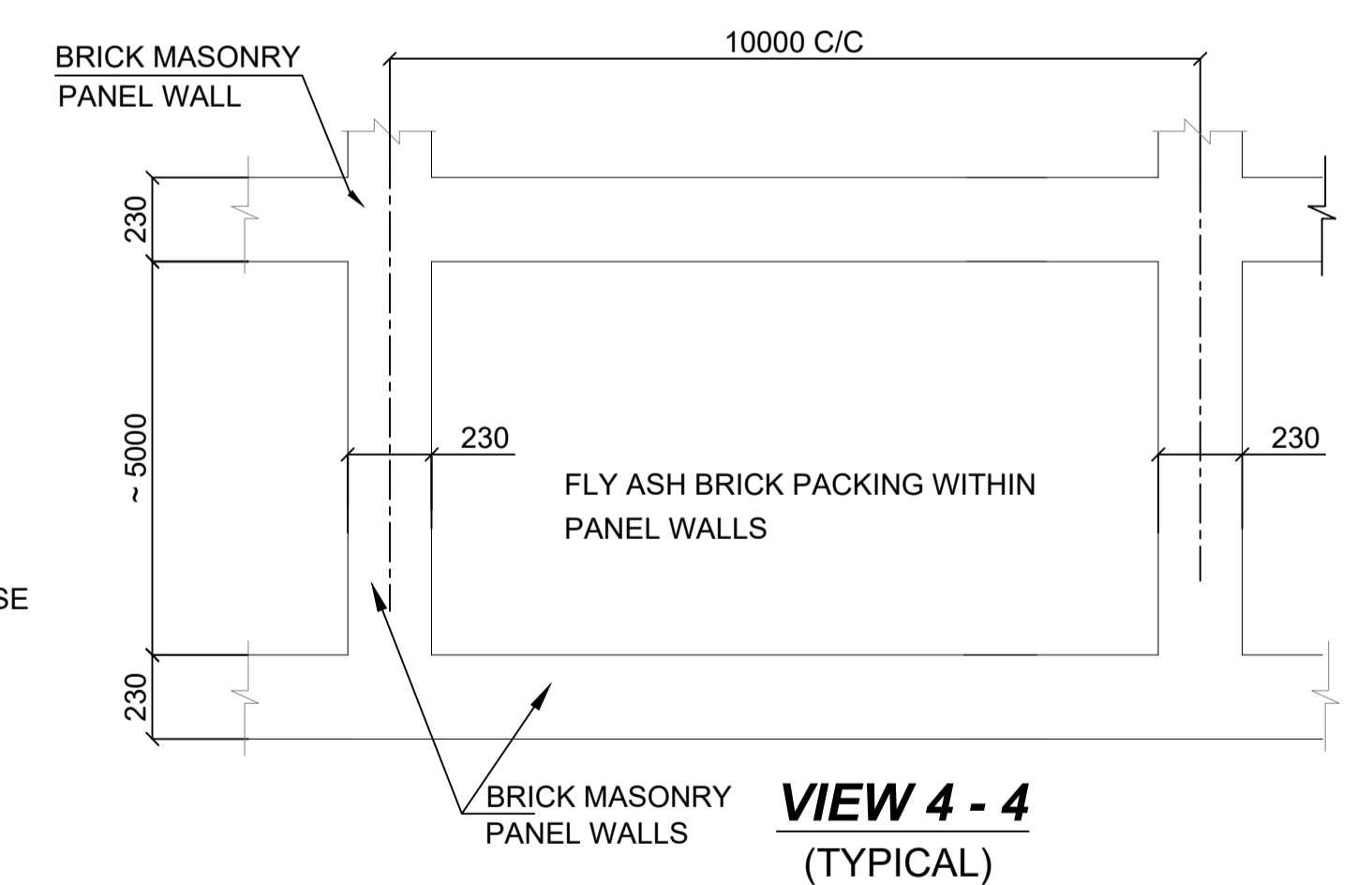
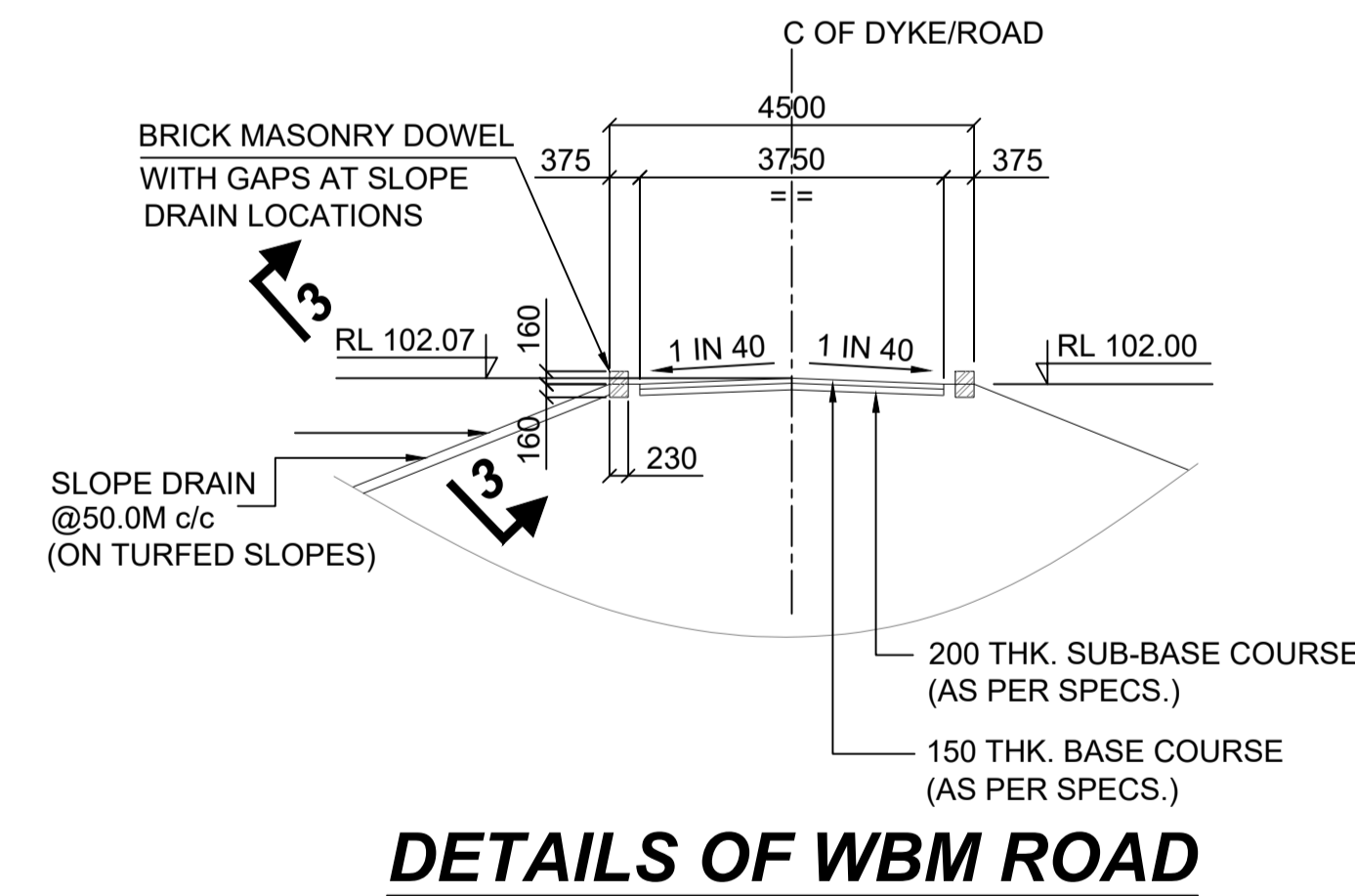
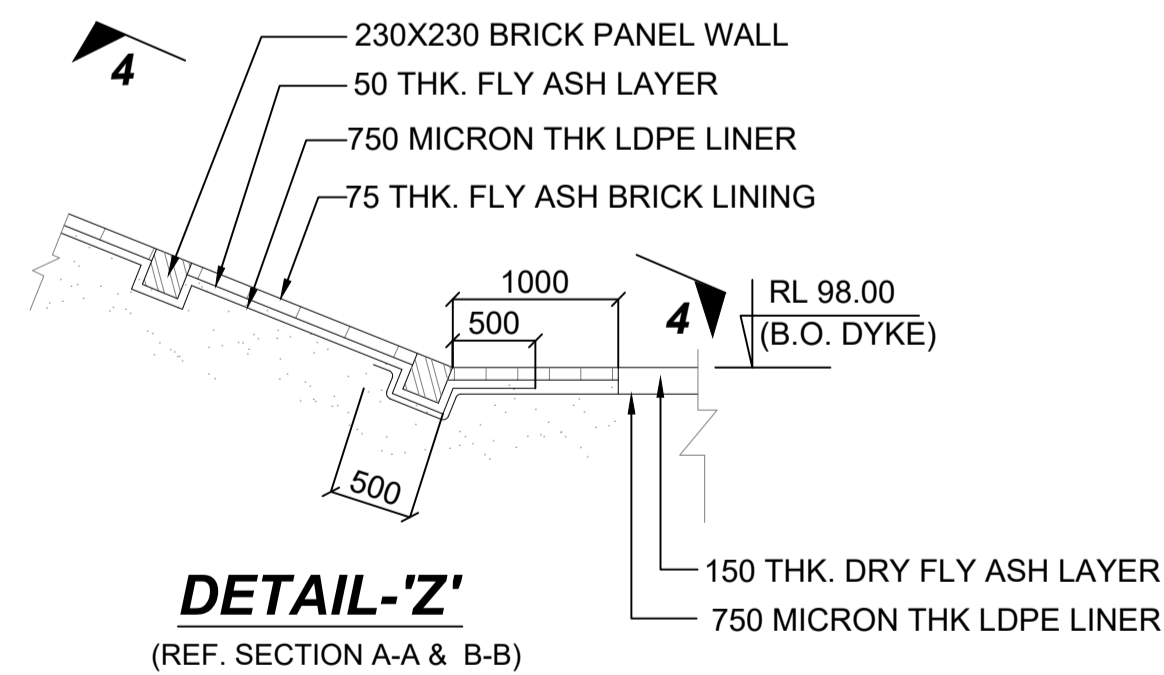
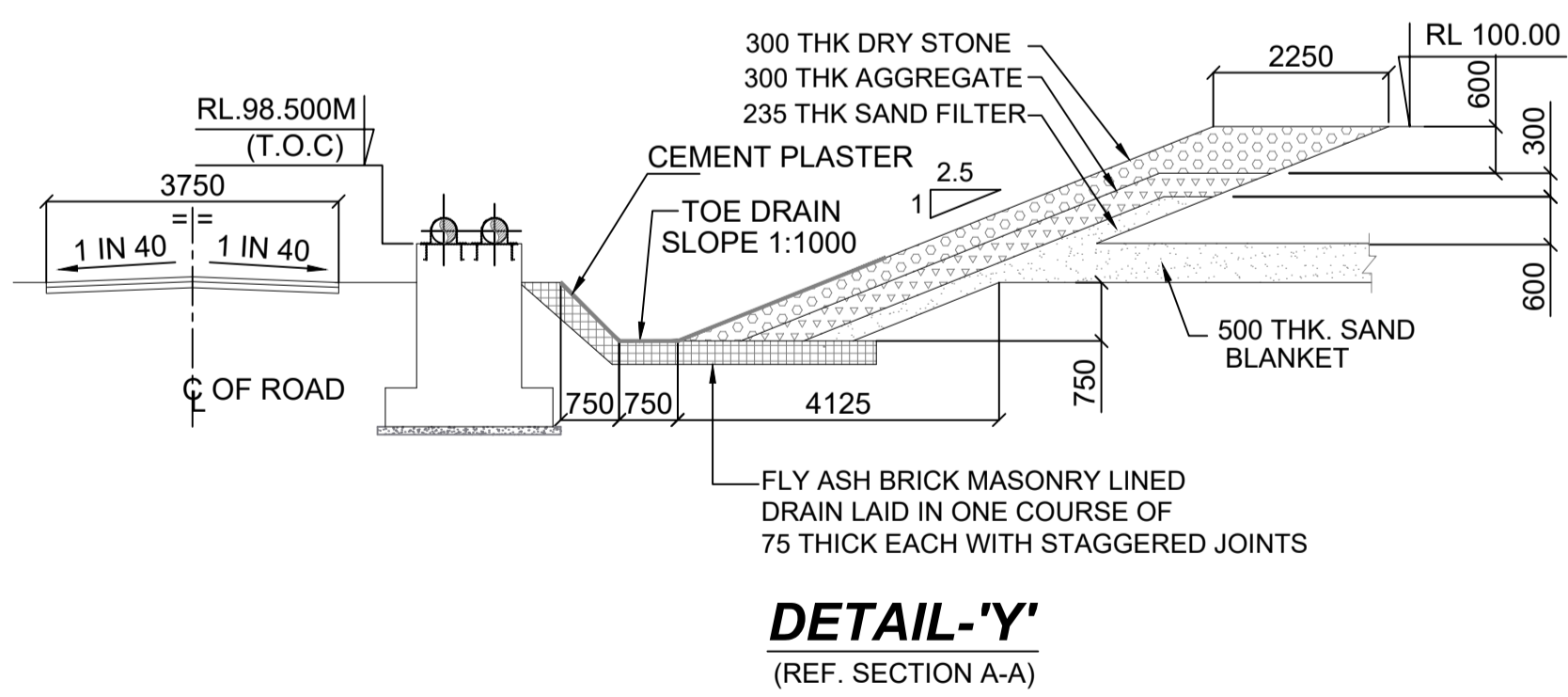
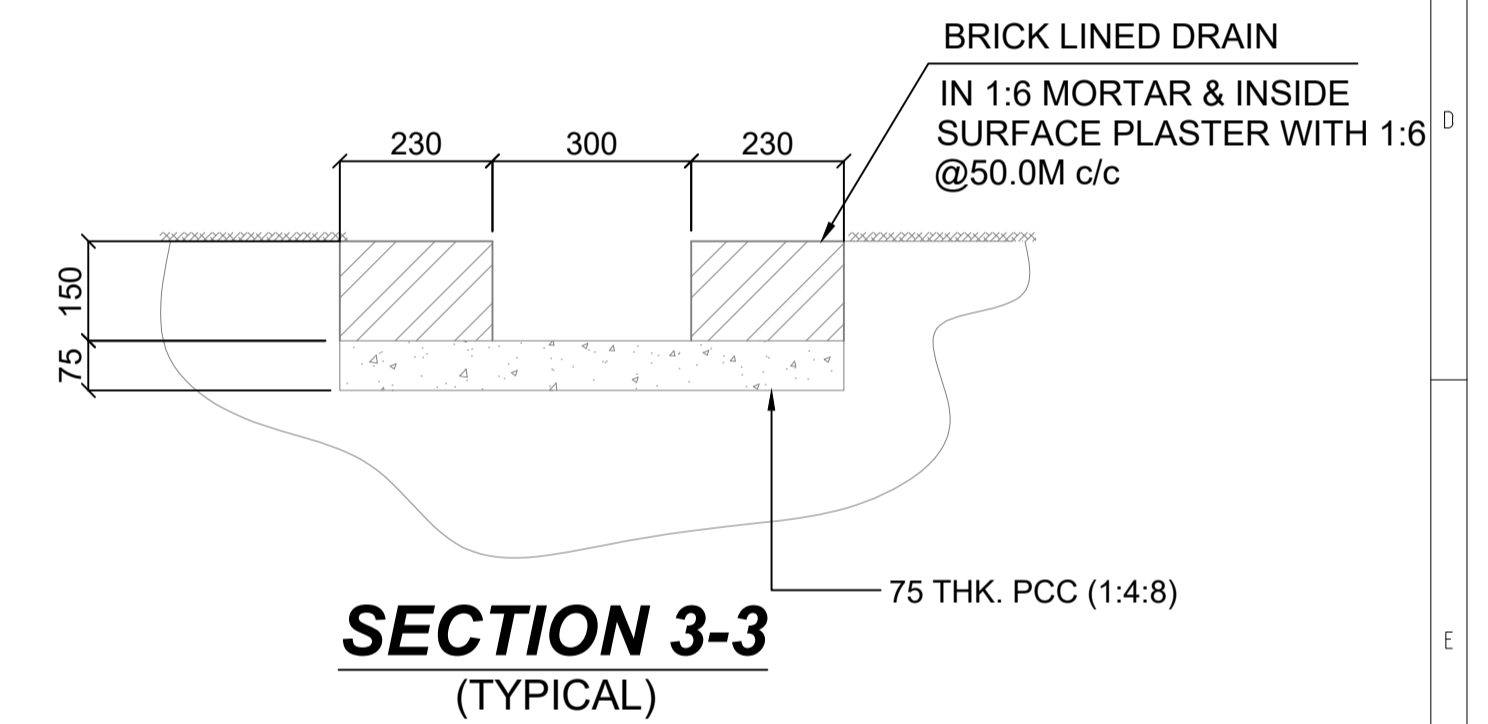
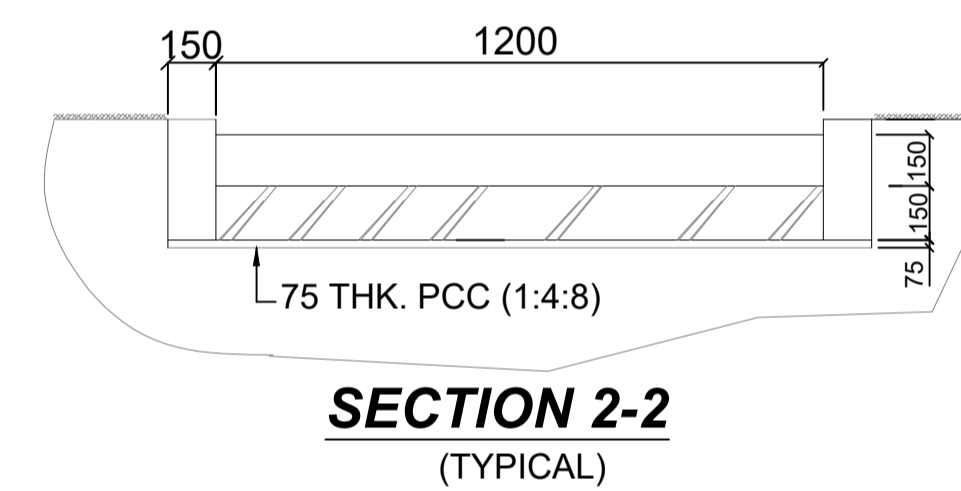
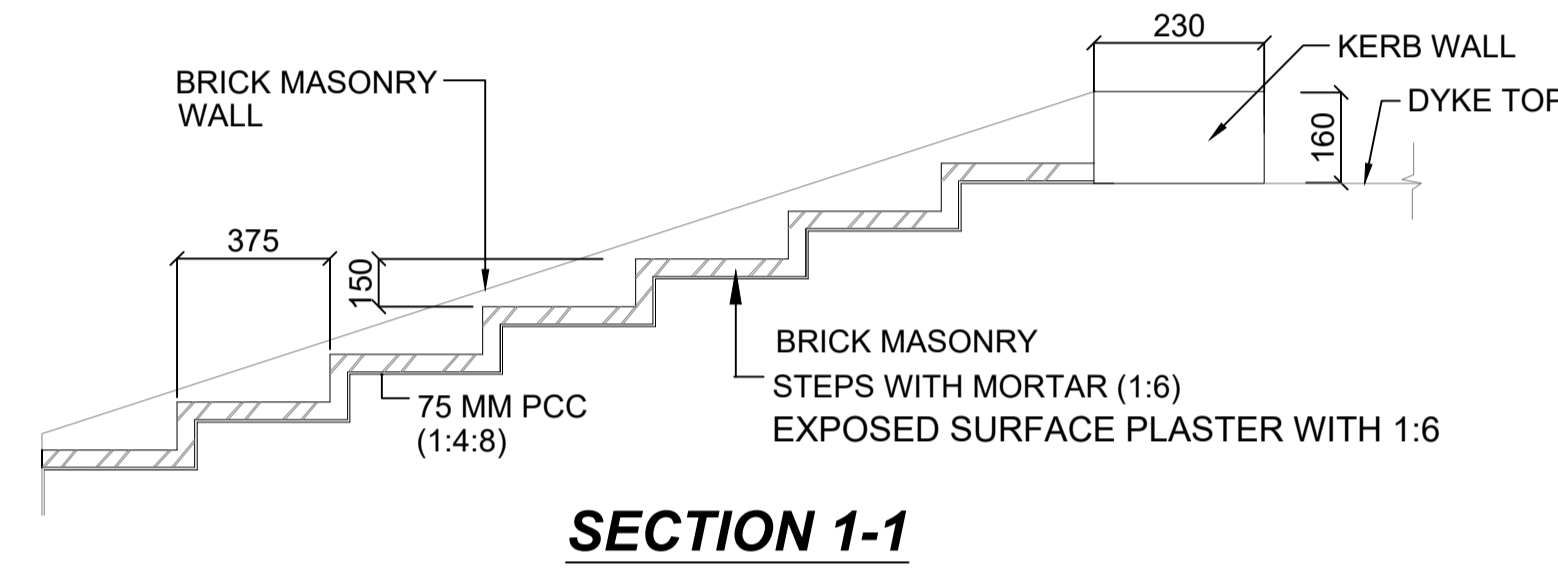
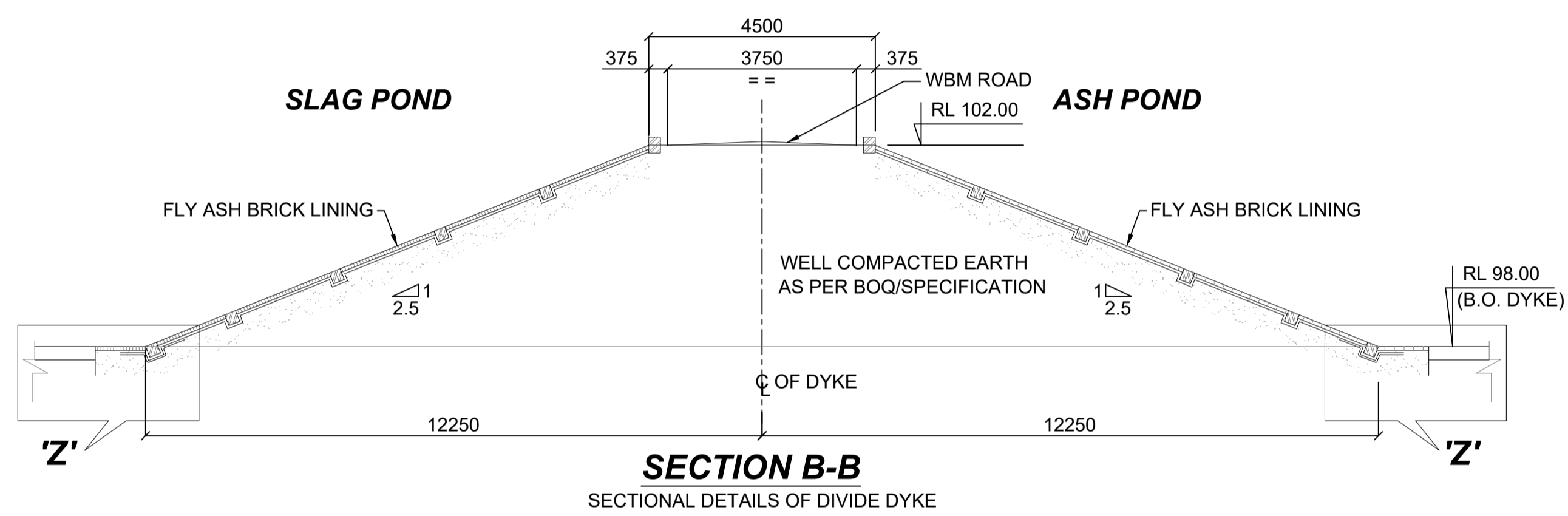
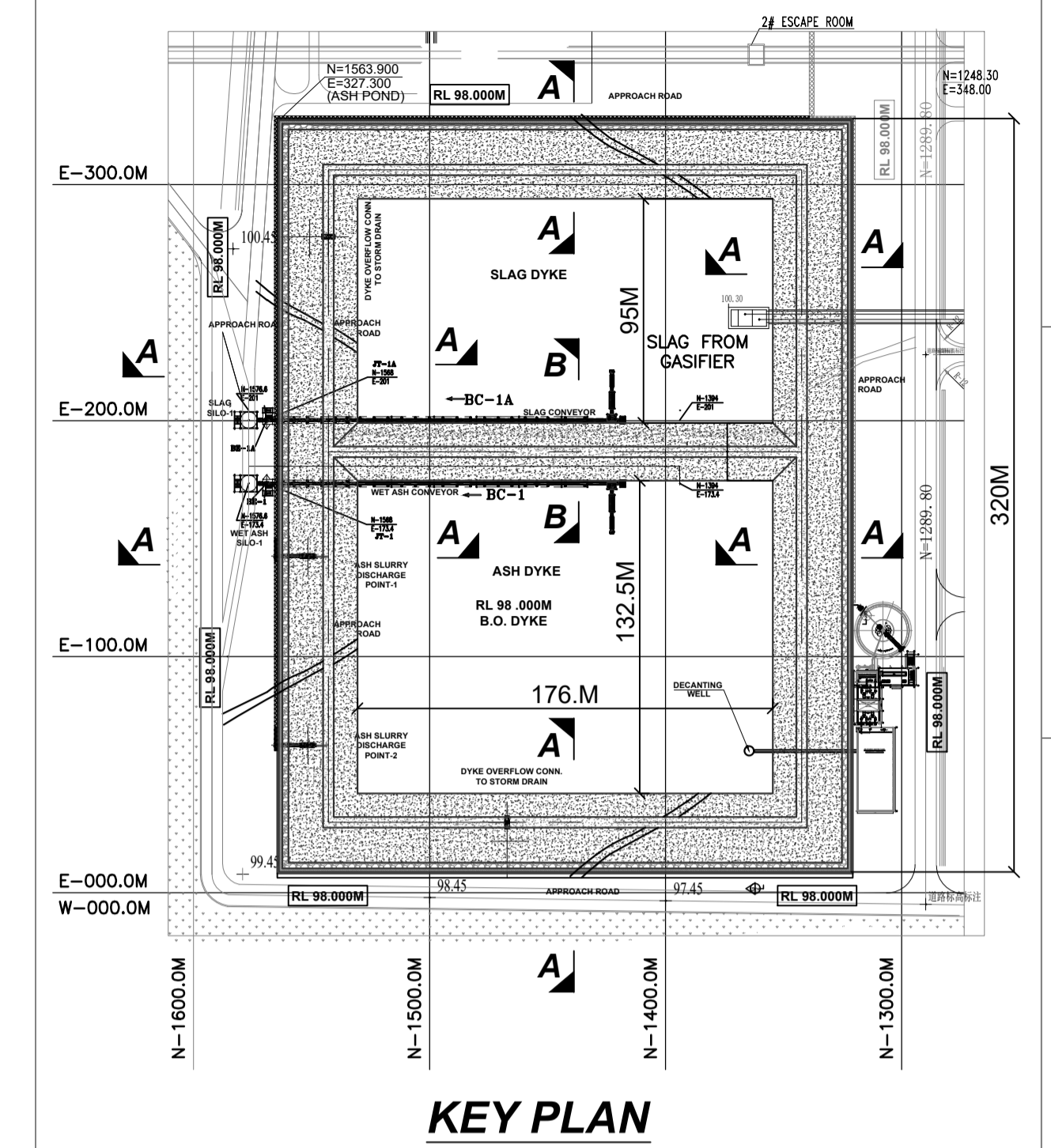
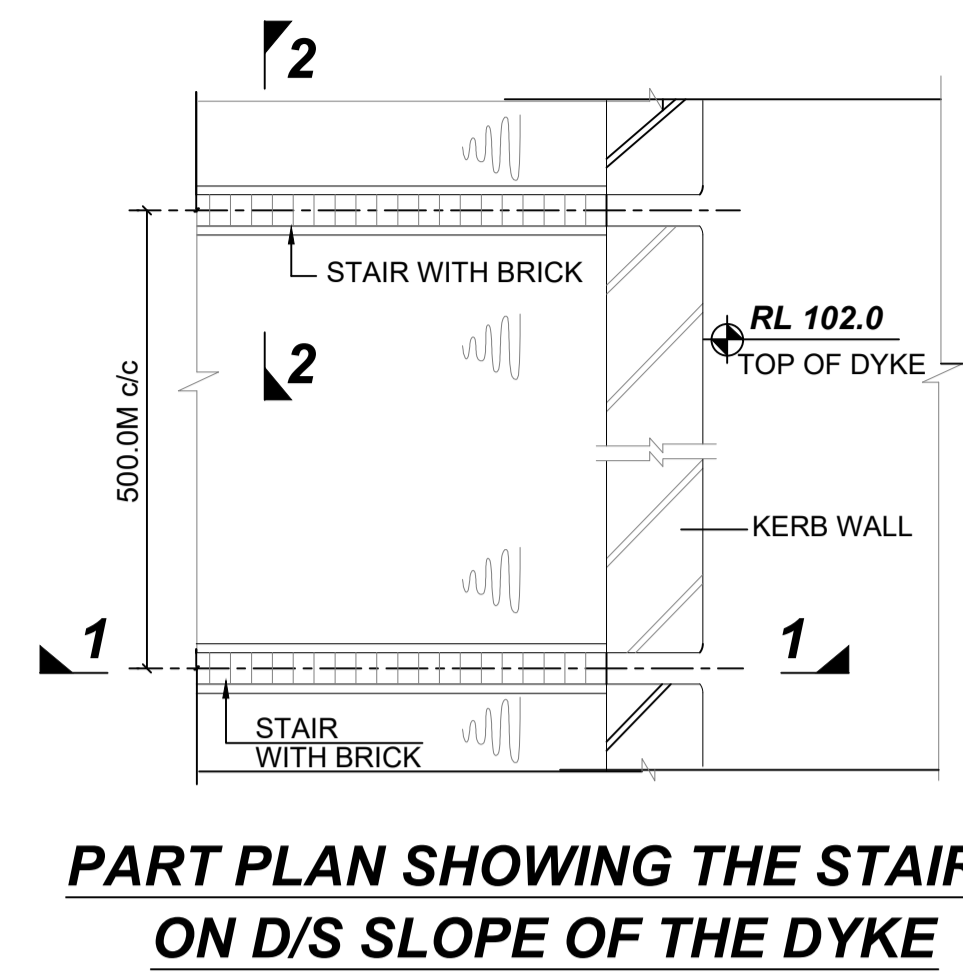
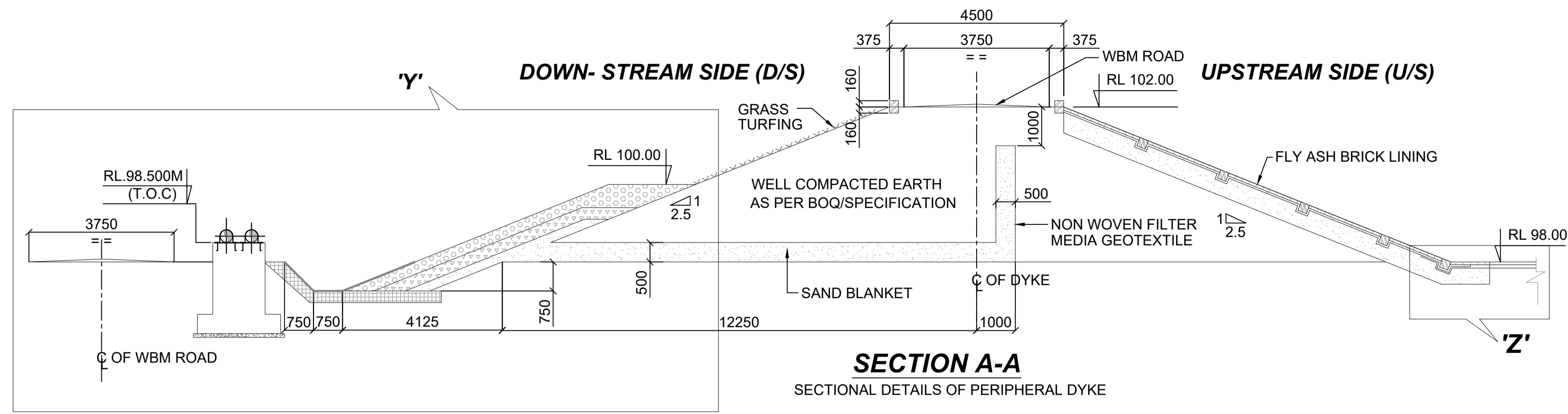
VIEW - CC

GENERAL NOTES:-  
 1. ALL DIMENSIONS ARE IN MM UNLESS NOTED OTHERWISE.  
 2. ALL LEVELS ARE IN M UNLESS NOTED OTHERWISE.  
 3. THIS DRAWING IS ONLY FOR BID PURPOSE.

LEGEND  
 FGL - FINISHED GROUND LEVEL  
 FFL - FINISHED FLOOR LEVEL  
 HPL - HIGHEST PAVED LEVEL  
 TOG - TOP OF GROUT

FOR TENDER PURPOSE ONLY

P	22.12.21	ISSUED FOR TENDER			
REV	DATE	DESCRIPTION	BY	CHKD	APPD.
		M/S TALCHER FERTILIZER LIMITED	REV.		
			SHEET 2 OF 2		
LOCATION	TALCHER, ANGUL DISTRICT, ODISHA(INDIA)		SCALE:- NTS		
TITLE	LAYOUT - ASH DYKE		DRG. NO.- PC183-PNCV-AP-0201 FILE.- PC183-PNCV-AP-0201_P		



FOR TENDER PURPOSE ONLY

**LEGEND**

- FGL - FINISHED GROUND LEVEL
- FFL - FINISHED FLOOR LEVEL
- HPL - HIGHEST PAVED LEVEL
- TOG - TOP OF GROUT

**GENERAL NOTES:-**

1. ALL DIMENSIONS ARE IN MM AND LEVELS IN M. UNLESS NOTED OTHERWISE.
2. EL (+)0.000M BELONGS TO RL 98.000M

SL.	DRG.NO.	DESCRIPTION
REFERENCE DRAWING		

REV	DATE	ISSUED FOR TENDER	DESCRIPTION	BY	CHKD	APPD.	
P	23.12.21						
			M/S TALCHER FERTILIZER LIMITED	REV.	P		
LOCATION						TALCHER, ANGUL DISTRICT, ODISHA(INDIA)	SCALE:- NTS
TITLE						SECTION AND ALLIED DETAILS OF ASH DYKE	DRG. NO. - PC183-PNCV-AP-0215 FILE. - PC183-PNCV-AP-0215_P
						PROJECTS & DEVELOPMENT INDIA LIMITED NOIDA	

**SCHEDULE OF RATES**

**SECTION VII**

**ATTENTION**

**THIS IS AN ELECTRONIC TENDER BIDDER TO QUOTE AS PER  
PROVIDED BOQ (.XLS) IN CPP PORTAL ONLY**



**Item Rate BoQ**

Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Name of the Bidder/ Bidding Firm / Company :	
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**SCHEDULE OF RATE** (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
<b>1</b>	<b>CIVIL AND STRUCTURAL WORK (PART- I)</b>							
<b>2.0</b>	<b>EARTHWORK AND DISPOSAL</b>							
2.01	<b>Foundation stripping for Ash Dyke</b> - Stripping and grading for foundation of dyke, road works in all types of soil including clearing jungle, uprooting of rank vegetation, grass, bushes, wood, numbering of trees, cutting, removal of slush, organic materials and removal of trees and saplings of girth up to 30 cms including cutting of trunks and branches, removal of roots/stumps/spreads including removal of stumps and roots of trees already cut, sorting out serviceable/ unserviceable wood/materials, filling of root hollows, dewatering (if required) etc. wherever applicable with suitable earth as per specification loading, transporting, unloading, disposal of unserviceable wood / materials and all rubbish at a place or different places as per the instructions of the Engineer In-Charge.	14000.00	CuM		0.00	0.00	0.00	INR Zero Only
2.02	<b>Foundation preparation of Ash Dyke</b> - Preparation of foundation on earth/rock bed including compaction of foundation with minimum 6 passes of Vibratory Rollers of min. 10 tonne capacity including cost of labour, equipment, material etc. and all other specified activities complete as per specification, drawings and as directed by the Engineer.	35000.00	CuM		0.00	0.00	0.00	INR Zero Only

## Item Rate BoQ

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NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
2.03	Earthwork in excavation in foundations of dyke , cut-off-trench, water escape structure, decantation well, sumps, spillways, rock toe, toe drain, panel walls, kerb walls, slope drains, trench for pipe laying, nallah diversion, roads, earthen trench, cross drainage works, buildings, footings, columns, plinth beams, walls, machine/ equipment foundations, isolated pits, pavements, trenches for pipelines /cables, pipe sleepers etc., to the required levels and grades in both dry and wet conditions, including dressing of sides and ramming of bottoms, getting out excavated earth with lift upto 1.5 M and disposal of surplus excavated materials within plant battery limit including stacking, levelling and dressing etc., complete as per direction of Engineer-in-Charge(E.I.C.) in all kinds of soils as defined in IS: 1200 including providing temporary supports to all service lines such as overhead and underground water, sewage and drain pipes, cables etc. and shoring and strutting wherever necessary, complete in all respects as per direction of Engineer-in-Charge.	20800.00	CuM		0.00	0.00	0.00	INR Zero Only
2.04	Same as Item No. A-01, but lift from 1.5 M to 3.0 M.	3000.00	CuM		0.00	0.00	0.00	INR Zero Only
2.05	Same as Item No. A-01, but lift from 3.0 M to 4.5 M	1750.00	CuM		0.00	0.00	0.00	INR Zero Only
2.06	Same as Item No. A-01, but lift from 4.5 M to 6.0 M	250.00	CuM		0.00	0.00	0.00	INR Zero Only

**Item Rate BoQ**

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Name of the Bidder/ Bidding Firm / Company :								
<b>SCHEDULE OF RATE</b> (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )								
NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
2.07	<b>Cut off trench for Dyke</b> - Supplying and forming / filling in layers using approved quality of impervious clayey soil (permeability not more than 1X10-6 cm per second) naturally available or prepared by blending the soil, with minimum 4 percent bentonite (by volume) to achieve a permeability not more than 1X10-6 cm per second, using soil obtained from within the ash pond area or from borrow area arranged by the contractor, including all preparatory works in borrow area, excavation, loading, transporting, unloading, mixing with bentonite, laying in layers not exceeding 30 cm compacted thickness all leads & lifts breaking clods, watering, compaction to achieve a dry density of not less than 98 percent of maximum dry density (Standard Proctor) with specified rollers or any other approved mechanical means etc, with all incidental charges, cost of labour equipment, materials, etc. complete as per specification ,drawings and as directed by the Engineer-In-Charge: (a) With bentonite blended soil (with soil obtained from excavation of cut off trench)	4000.00	CuM		0.00	0.00	0.00	INR Zero Only

## Item Rate BoQ

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NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
2.08	<b>Formation of Dyke</b> - Formation of dyke, road embankment using approved materials including the preparation of borrow area, stripping, watering of borrow area, excavation of approved quality of material from borrow area, using poclains or any other mechanical means, loading, unloading, transporting by dumpers, trucks etc., surface watering and dewatering, including construction of cofferdams wherever required, depositing the fill material on the dyke, spreading by dozers or grader in layers not exceeding 30 cm in compacted thickness for forming the embankment with all leads, lifts, breaking clods, watering, compaction with min. 10 tonne capacity vibratory rollers to achieve a dry density not less than 95% of maximum dry density (Standard Proctor) forming extra width on edges, trimming of slopes and slope compaction with dozers or slope compactors to obtain the section as per construction drawings, with all incidental charges, cost of labour, equipment, materials etc. complete as per specifications, drawings and as directed by the Engineer. i) With earth supplied from borrow areas arranged by the Contractor.	1500.00	CuM		0.00	0.00	0.00	INR Zero Only
2.09	<b>Formation of Dyke</b> - Formation of dyke-roads using approved materials from stock piling, loading, unloading, transporting by dumpers, trucks etc. surface watering and dewatering as per requirement , depositing the fill material on the dyke, spreading in layers not exceeding 30 cm in compacted thickness for forming the embankment with all leads, lifts, breaking clods, watering, compaction with min 10 tonne capacity vibratory rollers or pneumatic rubber tyred rollers to achieve a dry density not less than 95% of maximum dry density (Standard Proctor) forming extra width on edges, trimming of slopes and slope compaction with dozers or slope compactors to obtain the section as per construction drawings, with all incidental charges, cost of labour, equipment, materials, etc. complete as per specification, drawings and as directed by the Engineer-In-Charge: i) With useful earth available	50000.00	CuM		0.00	0.00	0.00	INR Zero Only

## Item Rate BoQ

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
2.10	<b>Sand Works-</b> Providing and laying graded coarse sand satisfying filter criteria, for sand blanket, sand chimney, sand filter around rock toe and rip rap including cost and conveyance of materials from the approved sources, laying it in position in layers not exceeding 30 cm in compacted thickness, watering, compaction etc. with all labour, materials, equipment, with all leads and lifts etc., complete as per specifications & drawings and as directed by the Engineer.	15500.00	CuM		0.00	0.00	0.00	INR Zero Only
2.11	<b>Aggregate filter-</b> Providing and forming graded aggregate filters of specified quality rock and size ranging from 10 mm to 75 mm, satisfying the filter criteria with sand filter around the rock toe and rip rap including cost and conveyance of materials from quarries, placing filter in position, cost of all labour, equipment, all leads and lifts etc. complete as per specifications, drawings and as directed by the Engineer.	3500.00	CuM		0.00	0.00	0.00	INR Zero Only
2.12	Filling with available excavated good earth (excluding rocks / boulders), as approved and directed by Engineer-in-Charge, in trenches, plinth, under floors, sides of foundation, pits of water escape structures, spillways, drains, discharge Channels & culverts etc., at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering with lead upto 500 metres, complete in all respects (compaction under floor with mechanical vibrater / road roller including watering).	8600.00	CuM		0.00	0.00	0.00	INR Zero Only
2.13	<b>Supplying and filling with selected good earth</b> brought from source approved by the Engineer-in-Charge intranches, plinth, under floors, sides of foundation etc., at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering (Rate shall include Royalty,Taxes, Octoroi, etc., levied by the local authorities, all transportation, loading and unloading, etc., and nothing extra will be paid on this account including compaction under floor with mechanical vibrater / road roller including watering).	250.00	CuM		0.00	0.00	0.00	INR Zero Only

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Contract No: PNPM/PC-183/E/206/NCB

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2.14	<b>Disposal of excavated earth</b> /building rubbish /malba/ coal ash/ disposal of stripped material and similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to municipal approved dumping ground or as approved by Engineer-in-charge, beyond 500 m initial lead, <b>for lead distance upto 5 Km including all lifts involved.</b>	18000.00	CuM		0.00	0.00	0.00	INR Zero Only
2.15	<b>Same as item no.1.14</b> but for lead distance upto <b>5-10 Km</b>	150.00	CuM		0.00	0.00	0.00	INR Zero Only
2.16	<b>Same as item no.1.14</b> but for lead distance upto <b>10-20 Km</b>	100.00	CuM		0.00	0.00	0.00	INR Zero Only
2.17	<b>Slope protection works: Rock / Stone Pitching-</b> Providing and forming toe drain, 300mm thick rock toe, rip rap & pitching wherever required with broken rock of specified quality and ranging in size from 100 MM to 300 MM including cost and conveyance of materials from quarries, hand packing it in position over coarse graded aggregate, clearing and disposal of bush, roots and other perishable materials from rock fill, with all leads, lifts, labour, material, equipment etc. complete as per specification, drawings and as directed by the Engineer.	1700.00	CuM		0.00	0.00	0.00	INR Zero Only
2.18	Filling the pipe trench with the soil having permeability not more than 1X10-6 cm per second using clayey soil or soil prepared by blending with minimum 4% bentonite so as to achieve the permeability not more than 1X10-6 cm per second, including cost of labour, transport, mixing, lacing in layers, watering, compacting the soil in layers to achieve dry density not less than 100% of maximum dry density (standard proctor) including all leads and lifts complete as per specification, drawings and as directed by the Engineer-In-Charge. a) With bentonite blended soil ( with soil obtained from outside pond area)	1200.00	CuM		0.00	0.00	0.00	INR Zero Only
<b>3.0</b>	<b>PLAIN CEMENT CONCRETE</b>							
3.01	Providing and laying plain cement concrete, machine mixed and mechanically vibrated in foundations, plinth, under floors, etc., excluding all necessary cost of centring and shuttering : <b>1:4:8 (1 cement:4 coarsesand: 8 graded stone aggregate 40 mm nominal size).</b>	200.00	CuM		0.00	0.00	0.00	INR Zero Only

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3.02	Providing and laying plain cement concrete, machine mixed and mechanically vibrated in foundations, plinth, underfloors, etc., excluding all necessary cost of centring and shuttering: <b>1:3:6 (1 cement: 3 coarsesand: 6 graded stone aggregate 20mm and below).</b>	355.00	CuM		0.00	0.00	0.00	INR Zero Only
3.03	Providing and laying plain cement concrete, machine mixed and mechanically vibrated in foundations, plinth, under floors, etc., excluding all necessary cost of centring and shuttering : <b>1:2:4 (1 cement :2 coarse sand :4 graded stone aggregate 20 mm and below).</b>	35.00	CuM		0.00	0.00	0.00	INR Zero Only
3.04	Providing and laying plain cement concrete, machine mixed and mechanically vibrated in foundations, plinth, under floors, etc., excluding all necessary cost of centring and shuttering : <b>1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone aggregate 20mm and below).</b>	25.00	CuM		0.00	0.00	0.00	INR Zero Only
3.05	Providing and laying 50 mm thick <b>damp-proof course</b> with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) including the cost of centring and shuttering complete as directed. (Waterproofing compound to be used shall be paid separately).	60.00	SqM		0.00	0.00	0.00	INR Zero Only
3.06	Providing and mixing <b>Waterproofing compound</b> conforming to IS:2645 in plain cement concrete works, cement plaster, R.C.C. works, etc., in proportion to the weight of cement used as recommended by manufacturers, complete as per direction of Engineering-in-Charge.	60.00	Quintal		0.00	0.00	0.00	INR Zero Only
<b>4.0</b>	<b>REINFORCED CEMENT CONCRETE</b>							

## Item Rate BoQ

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
<b>SCHEDULE OF RATE</b> (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )								
4.01	<b>IN FOUNDATION AND PLINTH :</b> Providing and laying reinforced cement concrete of grade <b>M-30</b> (using 20mm. nominal gauge graded stone aggregate) machine mixed and mechanically vibrated and finished to a fair face but excluding the cost of centring, shuttering and reinforcement in foundation and plinth, for rafts, footings, bases of columns/pedestals/beams, walls, machine and equipment foundations, pile caps, box sections, pipe supports, underground or above ground( chemical storage/ clarifier tanks etc)., complete in all respects as per direction of Engineer-in-Charge.	1935.00	CuM		0.00	0.00	0.00	INR Zero Only
4.02	<b>IN FOUNDATION AND PLINTH: Same as Item No.3.01</b> , but with concrete of grade <b>M-25</b> .	820.00	CuM		0.00	0.00	0.00	INR Zero Only
4.03	<b>IN SUPERSTRUCTURE:</b> Providing and laying reinforced cement concrete of grade <b>M-25</b> (using 20 mm. nominal gauge graded stone aggregate), machine mixed, mechanically vibrated and finished to a fair face but excluding the cost of centring, shuttering and reinforcement in superstructure at all heights for columns, pillars, posts, attached pillasters, portals, struts, inclined posts, pedestals for equipments and similar vertical members, etc.,complete in all respects as perdirection of Engineer-in-Charge.	1325.00	CuM		0.00	0.00	0.00	INR Zero Only
4.04	<b>IN SUPERSTRUCTURE:</b> Same as Item No.3.03, but in <b>walls of any thickness</b> , shape or size including attached buttresses, pilasters and their caps and bases.	265.00	CuM		0.00	0.00	0.00	INR Zero Only
4.05	<b>IN SUPERSTRUCTURE: Same as Item No. 3.03</b> , but in lintels, beams, portal beams, brackets, girders, cantilevers, suspended floors, roofs, staircase roofs and their supports, balconies, staircase waist and landing slabs and steps including preparation of top surface and finishing, nosing,etc.	40.00	CuM		0.00	0.00	0.00	INR Zero Only
4.06	<b>INSUPERSTRUCTURE: Same as Item No.3.03</b> , but in chajja, fins, roof gutters, drop wall not exceeding 15 Cm. in thickness, railing, parapet wall, window sills, etc.	15.00	CuM		0.00	0.00	0.00	INR Zero Only



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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNPM/PC-183/E/206/NCB

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4.07	<b>IN SUPERSTRUCTURE:</b> Providing, hoisting and fixing <b>precast reinforced cement concrete</b> work including the cost of required centering, shuttering but, excluding cost of reinforcement, with 1:1.5:3 (1 cement :1.5 coarse sand (zone-III) : 3 graded stone aggregate 20 mm nominal size). : <b>Trench / draincovers, in foundation, plinth and above.</b>	170.00	CuM		0.00	0.00	0.00	INR Zero Only
<b>5.0</b>	<b>REINFORCEMENT AND EMBEDMENTS:</b>							
5.01	Supplying, cutting, cleaning, straightening, bending, hoisting and placing in position and binding with 18 SWG annealed wire, <b>reinforcement bar of high yield strength Corrosion Resistance Steel</b> with Fe500D properties conforming to IS:1786 with minimum yield strength of 500N/sq, mm for all	435.00	Ton		0.00	0.00	0.00	INR Zero Only
5.02	Supplying, fabricating and fixing in position <b>M.S. anchor plates, hooks, insert plates</b> , M.S.flats, M.S. angle inserts and the like including welding M.S. lugs, etc., and embedding in cement concrete / R.C.C. works as per approved drawings complete in all respects and as per direction of Engineer-in-Charge.	5180.00	Kg		0.00	0.00	0.00	INR Zero Only
5.03	Supplying, fabricating and fixing in position <b>M.S. holding down bolts assembly consisting of bolts, heads, nuts, washers</b> etc., and the like including embedding in cement concrete / R.C.C.works as per approved drawings complete in all respects including one coat of approved quality anti-corrosive paint over a coat of approved quality primer. (All materials supply are incontractor's scope.)	1795.00	Kg		0.00	0.00	0.00	INR Zero Only
<b>6.0</b>	<b>SHUTTERING</b>							

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Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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6.01	Providing, fabricating, erecting and fixing in position with bolts and nuts, nails and ties, etc., centring and shuttering materials true to line and level, including strutting, propping, staging etc. with necessary bracing in all axes to give a stable assembly including chamfering the corners of columns and beams etc., wherever required including making joints in the shuttering fully leak-proof, i/c. Striking, dismantling and removing the afore said assembly after concreting is over, including all labour and materials complete in all respects and as per direction of Engineer-in-Charge. <b>FOUNDATION AND PLINTH</b> : Foundation and plinth in rafts, footings, columns, pedestals, beams, walls, slabs, machine and equipment foundations, pile caps and pipe support foundations, etc.	7185.00	SqM		0.00	0.00	0.00	INR Zero Only
6.02	<b>IN SUPERSTRUCTURE:</b> Columns, pillars, posts, struts, inclined posts, attached anufactu, portals and similar vertical members.	3890.00	SqM		0.00	0.00	0.00	INR Zero Only
6.03	<b>INSUPERSTRUCTURE:</b> Walls of any thickness, height and shape including attached buttresses, anufactu, and their caps and bases, etc.	4680.00	SqM		0.00	0.00	0.00	INR Zero Only
6.04	<b>INSUPERSTRUCTURE:</b> Lintels, beams, portal beams, brackets, girders, cantilever beams, suspended floors, roofs, staircase roofs and their supports, balconies, staircase waist and landing slabs and steps, etc.	850.00	SqM		0.00	0.00	0.00	INR Zero Only
6.05	<b>INSUPERSTRUCTURE:</b> Chajja, vertical and horizontal fins, roof gutters, drop walls, railing, parapet wall, window sills, etc.	345.00	SqM		0.00	0.00	0.00	INR Zero Only
6.06	Providing, fabricating, erecting and fixing in position with bolts and nuts, nails and ties, etc., centring and shuttering materials true to line and level, including strutting, propping, staging etc. with necessary bracing in all axes to give a stable assembly including chamfering the corners of columns and beams etc., wherever required including making joints in the shuttering fully leak-proof, i/c. Striking, dismantling and removing the afore said assembly after concreting is over, including all labour and materials complete in all respects and as per direction of Engineer-in-Charge. <b>FOUNDATION AND PLINTH (FOR CIRCULAR WORK)</b> : Foundation and plinth in rafts, footings, columns, pedestals, beams, walls, slabs, machine and equipment foundations, pile caps and pipe support foundations, etc.	250.00	SqM		0.00	0.00	0.00	INR Zero Only

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6.07	<b>IN SUPERSTRUCTURE (FOR CIRCULAR WORK):</b> Columns, pillars, posts, struts, inclined posts, attached anufactu, portals and similar vertical members.	250.00	SqM		0.00	0.00	0.00	INR Zero Only
6.08	<b>INSUPERSTRUCTURE (FOR CIRCULAR WORK):</b> Walls of any thickness, height and shape including attached buttresses, anufactu, and their caps and bases, etc.	250.00	SqM		0.00	0.00	0.00	INR Zero Only
6.09	<b>INSUPERSTRUCTURE (FOR CIRCULAR WORK):</b> Lintels, beams, portal beams, brackets, girders, cantilever beams, suspended floors, roofs, staircase roofs and their supports, balconies, staircase waist and landing slabs and steps,etc.	250.00	SqM		0.00	0.00	0.00	INR Zero Only
6.10	<b>INSUPERSTRUCTURE (FOR CIRCULAR WORK):</b> Chajja, vertical and horizontal fins, roof gutters, drop walls, railing, parapet wall, window sills, etc.	250.00	SqM		0.00	0.00	0.00	INR Zero Only
<b>7.0</b>	<b>BRICKWORK</b>							
7.01	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 10 in foundation and plinth in: with Cement mortar 1:6 (1 cement : 6 coarse sand)	440.00	CuM		0.00	0.00	0.00	INR Zero Only
7.02	Providing and constructing Brickwork with <b>non modular fly ash bricks</b> conforming to IS:12894, class designation 10 average compressive strength in cement mortar 1 : 6 ( 1 cement : 6 coarse sand ) in walls, etc. at all depths, places and positions including raking out joints, curing, scaffolding etc. complete excluding plastering and painting. <b>Superstructure at all heights.</b>	525.00	CuM		0.00	0.00	0.00	INR Zero Only
7.03	Half brick masonry with non modular fly ash bricks of class designation 7.5 in foundations and plinth in cement mortar 1:4.	110.00	SqM		0.00	0.00	0.00	INR Zero Only
7.04	<b>Brick masonry for Ash Dyke-</b> Providing, laying in position brick masonry for brick masonry panel walls on the slopes of ash dyke, toe drains, slope drains, dowel bank etc. in 1:6 ( 1 Cement : 6 coarse sand) cement sand mortar including all lifts, cost of labour, materials, equipment, mixing, laying, raking joints, curing including transportation and preparation of surface etc. complete as per specifications, drawings and as directed by the Engineer. a) With Burnt Clay bricks (designated class 10 conforming to IS 1077)	415.00	CuM		0.00	0.00	0.00	INR Zero Only

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7.05	<b>Dry brick packing-</b> Providing and packing bricks laid flat, moistening with water wherever required, for protection of inside dyke slopes with brick packing within the panel walls ( cost of panel walls shall be paid under relevant items) including the cost of labour, materials, transportation all leads and lifts, equipment, etc. complete as per drawings and as directed by the Engineer. a) With Burnt Clay bricks (designated class 10 conforming to IS 1077)	1450.00	CuM		0.00	0.00	0.00	INR Zero Only
7.06	Providing, supplying and laying in position 230mm thk. Fly Ash brick work (cement bonded) to be used if approved by Engineer in charge as per specifications. Fly ash conforming to IS 3812 as part replacement of OPC only as approved by the Engineer, in a specified cement mortar 1:5 for Upstream Side Embankment, road side drains, including the cost of all materials, scaffolding, curing, with provision of pipe sleeves, fixing of edge protection angle or groove for drain cover etc as per specification and the direction of Engineer-in-charge.	4350.00	CuM		0.00	0.00	0.00	INR Zero Only
<b>8.00</b>	<b>STRUCTURAL STEEL</b>							
8.01	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position with necessary welding and/or bolting with MS bolts conforming to property class 8.8 of IS:1367 at all heights as per approved fabrication drawings of all types of structural steel work in columns, portals, girders, lattice girders, beams, crane girders, M.S rails, monorails, bracings, trusses, purlins, rafters, side runners, sag rods, hand railings, staircase stringers and steps, walkway, toe plates, floor grids, sag rods with M.S. rounds, side walling, conveyor gantries, trestle for pipe and cable racks, gusset plates, etc., either made of rolled steel joists, channels, angles, tees, flats, plates, universal sections or builtup from plates and/or rolled steel sections including necessary site and shop fasteners, complete in all respects as per approved fabrication drawings, standards and direction of Engineer-in-Charge : <b>With providing and applying primer coat, intermediate coats and finish coat after the preparation of surfaces on structural steel work complete in all respects as per technical specifications and direction of Engineer-in-Charge.</b>	650.00	Ton		0.00	0.00	0.00	INR Zero Only

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8.02	Supplying, transporting, de-rusting, fabricating, erecting, hoisting and fixing in position structural steel work in cat ladders and cages at all heights including brackets, cleats, plates, rungs, chain, pins, hinges, etc., framed, bolted and/or welded together and fixed in position including necessary plugs and plugging and painting complete in all respects and as per direction of Engineer-in-Charge : <b>With providing and applying primer coat, intermediate coats and finish coat after the preparation of surfaces on structural steel work complete in all respects as per technical specifications and direction of Engineer-in-Charge.</b>	10.00	Ton		0.00	0.00	0.00	INR Zero Only
8.03	Supplying of bolts (from 12 mm. to 52 mm. dia.),nuts, plainand tapper washers for fixing equipments, as per drawings and direction of Engineer-in-Charge : <b>Bolts conforming to property class 4.6 of IS:1367.</b>	15.00	kg		0.00	0.00	0.00	INR Zero Only
8.04	Supplying of bolts (from 12 mm. to 52 mm. dia.), nuts, plainand tapper washers for fixing equipments, as per drawings and direction of Engineer-in-Charge : <b>Bolts conforming to property class 8.8 of IS:1367.</b>	35.00	kg		0.00	0.00	0.00	INR Zero Only
8.05	<b>Supplying, transporting, fabricating as per approved fabrication drawings 25 mm. to 35 mm. thick M.S. grating</b> made out of M.S flats as main members and Tor Steel bars as secondary members, all welded together to form a perfect mesh including getting those grating planks inspected and approved by Client/ Consultant, transporting to site, erecting and fixing in position the segrating planks at all heights with necessary G.I.clips/ G.I.clamps tack welded for making floors, platforms, stair steps, etc., as required at site, providing and applying painting as per drawings and direction of Engineer-in-Charge (Therates shall includecost of G.I. clips/ clamps. The Contractor may procure gratings from grating manufacturer approved by Engineer-in-Charge. The rates shall also include all charges incurred during inspection and testing) : <b>With 86 microns thick hot dip galvanizing coat.</b>	120.00	Ton		0.00	0.00	0.00	INR Zero Only

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8.06	Supplying, transporting, de-rusting, cutting and fixing in position at all heights steel work in <b>M.S. chequered plates</b> in floors, steps, landing, covers over trenches, etc., with necessary bolts, nuts, washers, drilling holes, welding, etc., wherever necessary as per drawing including painting complete in all respects and as directed by Engineer-in Charge : <b>Two coats of chlorinated rubber based paint at dry film thickness of 50 microns per coat over two coats of high built zinc phosphate primer compatible to chlorinated rubber based paint at dry film thickness of 50 microns percoat.</b>	35.00	Ton		0.00	0.00	0.00	INR Zero Only
8.07	Providing and fixing <b>M.S pipe handrailing</b> (medium grade) conforming to IS-1239 consisting of top and middle horizontal rails of 40mm dia. and 32 mm dia. nominal bore respectively, 1050 mm high upright members of 40mm dia. nominal bore at 1500mm maximum distance centre to centre of each member including all joints, bends , elbows, and specials as required and upright members welded or bolted to structural steel work/toe plates or welded to M .S. insert plates with M.S. lugs embedded in R.C.C. works, complete in all respects and as per direction of Engineer-in-Charge. <b>Two coats of chlorinated rubber based paint at dry film thickness of 40 microns per coat over two coats of high built zincphosphate primer compatible to chlorinated rubber based paint at dry film thickness of 25 microns per coat.</b>	35.00	Ton		0.00	0.00	0.00	INR Zero Only
<b>9.0</b>	<b>STEEL AND ALUMINIUM DOORS, WINDOWS AND VENTILATORS</b>							
9.01	Providing, erecting and fixing in position at all heights <b>M.S. rolling shutters</b> rolling shutters up to 10 sq.m. in area with push and pull operation, conforming to IS: 6248 made of 80X1.25 mm M.S.laths, interlocked together through their entire length and joined together at the end by end locks mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking, including the cost of providing and fixing necessary 27.5 cm long wire springs grade No- 2, M.S., top cover 1.25 mm. Thick and ball bearing, including providing and applying two coats of synthetic enamel paint of approved quality over two coats of red oxide zinc chromate primer conforming to IS: 2074 complete in all respects as per direction of Engineer-in-Charge: <b>Rolling shutters with Mechanical device chain and crank operation</b>	45.00	SqM		0.00	0.00	0.00	INR Zero Only

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9.02	Providing and fixing <b>aluminium work for doors, windows, ventilators and partitions</b> with extruded built up standard tubular sections/appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing /paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. Powder coated aluminium (minimum thickness of powder coating 50 micron)	60.00	SqM		0.00	0.00	0.00	INR Zero Only
9.03	For shutters of <b>doors, windows &amp; ventilators</b> including providing and fixing hinges/ pivots and making provision for fixing of fittings wherever required including the cost of EPD M rubber /neoprene gasket required including necessary fittings. Powder coated aluminium (minimum thickness of powder coating 50 micron.	15.00	SqM		0.00	0.00	0.00	INR Zero Only
9.04	Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of Engineer-in-charge. (Including aluminium snap beading) <b>:With float glass panes of 4.0 mm thickness</b>	45.00	SqM		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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9.05	24 mm thick factory made <b>PVC door shutters</b> made of styles and rails of a uPVC hollow section of size 59x24 mm and wall thickness 2 mm (± 0.2 mm) with inbuilt edging on both sides. The styles and rails mitred and joint at the corners by means of M.S. galvanised/ plastic brackets of size 75x220 mm having wall thickness 1.0 mm and stainless steel screws. The styles of the shutter reinforced by inserting galvanised M.S. tube of size 20x20mm and 1mm (± 0.1mm) wall thickness. The lock rail made up of 'H' section, a uPVC hollow section of size 100x24 mm and 2mm (± 0.2 mm) wall thickness, fixed to the shutter styles by means of plastic /galvanised M.S. 'U'cleats. The shutter frame filled with a uPVC multi-chambered single panel of size not less than 620mm, having over all thickness of 20 mm and 1 mm (± 0.1 mm) wall thickness. The panels filled vertically and tie bar at two places by inserting horizontally 6 mm galvanised M.S. rod and fastened with nuts and washers, complete as per manufacturer's specification and direction of Engineer-in-charge. (For W.C. and bathroom door shutter).	5.00	SqM		0.00	0.00	0.00	INR Zero Only
<b>10.0</b>	<b>ROOFING</b>							
10.01	Providing and fixing in position at all heights UPVC rain water pipes conforming to BIS :13592 Type A R.C.C. column using plugs and standard holder bat clamps comprising of two semi-circular halves of flatiron and cast iron base screwed on wooden plugs or using clamps welded to structural steel members or M.S. insert plates where pipes are to be fixed on R.C.C. members including all necessary fittings, such as tees, shoes, off-sets, branches, swannecks, elbows, bends, heads, etc. (plate inserts, if any, to be embedded in R.C.C shall be paid separately) :							
10.02	110 mm diameter pipe.	100.00	RM		0.00	0.00	0.00	INR Zero Only
10.03	75 mm diameter pipe.	100.00	RM		0.00	0.00	0.00	INR Zero Only



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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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10.04	Providing & fixing UV stabilised <b>fiber glass reinforced plastic sheet</b> roofing upto any pitch, including fixing with polymer coated 'J' or 'L' hooks, bolts & nuts 8mm dia. G.I plain/bitumen washers complete but excluding the cost of purlins, rafters, trusses etc. The sheets shall be manufactured out of 2400 TEX panel rovigs incorporating minimum 0.3% ultra-violet stabiliser in resin system under approximately 2400 psi and hot cured. They shall be of uniform pigmentation and thickness without air pockets and shall conform to IS 10192 and IS 12866.The sheets shall be opaque or translucent, clear or pigmented, textured or smooth as specified. <b>2mm thick corrugated</b>	10.00	SqM		0.00	0.00	0.00	INR Zero Only
10.05	Providing and fixing pre-coated galvanised steel sheet roofing accessories 0.50 mm (+ 0.05 %) total coated thickness, Zinc coating 120 grams per sqm as per IS: 277, in 240 mpa steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self drilling/ self tapping screws complete (Refer J-02):							
10.06	Ridges plain (500 – 600 mm)	10.00	Meter		0.00	0.00	0.00	INR Zero Only
10.07	Corrugated Aprons. (Upto 600 mm)	10.00	Meter		0.00	0.00	0.00	INR Zero Only
10.08	Barge board (Upto 300 mm).	10.00	Meter		0.00	0.00	0.00	INR Zero Only
10.09	Gutter. (600 mm over all girth).	10.00	Meter		0.00	0.00	0.00	INR Zero Only
<b>11.0</b>	<b>WATER PROOFING</b>							
11.01	<b>Clearing the roof surface wherever required by manual scrapping / chipping</b> to take out loose mortar, laitance etc. to expose the mother R.C.C roof surface. At the junction between the roof and the vertical face of the parapet wall a fillet 75mm (min.) in radius shall be constructed to receive the waterproofing treatment. In case of RCC parapet walls for taking in the waterproofing treatment a horizontal groove shall be left in the vertical face at the time of construction or made by using electrically operated cutter.	390.00	SqM		0.00	0.00	0.00	INR Zero Only



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12.01	Supplying and laying <b>hard core underfloors</b> including watering, ramming, bliding and well consolidating with broken stone aggregates 90 mm to 45 mm in layers of maximum compacted thickness of 150 mm including filling the voids with smaller stone chips and with blinding materials fine river sand, (Payments hall be made for finished thickness of hardcore) Consolidation by road roller.	700.00	CuM		0.00	0.00	0.00	INR Zero Only
12.02	<b>52 mm thick cement concrete flooring with concrete hardener topping</b> , under layer 40 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) and top layer 12 mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix : 2graded stone aggregate 6 mm nominal size) by volume, hardening compound mixed @ 2 litre per 50 kg of cement or as per manufacturer's specifications. This includes cost of cement slurry, but including the cost of nosing of steps etc. complete.	820.00	SqM		0.00	0.00	0.00	INR Zero Only
12.03	Providing and laying reinforced cement concrete of grade M-20 in <b>pavement floors in plant areas</b> (using 20 mm. nominal gauge graded stone aggregate) machine mixed and mechanically vibrated and finished to a fairface but excluding the cost of centring, shuttering and reinforcement in slabs at ground floor level. Floors are to be cast in the panel of 3 metre x 3metre with broom finish and painting side surfaces with two coats of bitumen paint of approved quality, complete in all respects as per direction of Engineer-in-Charge.	240.00	CuM		0.00	0.00	0.00	INR Zero Only
12.04	Providing, laying and <b>fixing the tiles</b> of approved quality and make in cement mortar 1:3 including 20 mm thick mortar bed, filling joints with cement admixed with matching pigments and cleaning etc. Complete as directed- polished vitrified tiles of min size 600mm X600mm mirror polish 8-10mm thk. Tiles should be first quality full body vitrified tiles of Nitco /Johnson/Kajaria make; Colour and design approved by Engineer-in-charge.	280.00	SqM		0.00	0.00	0.00	INR Zero Only
12.05	Providing and laying <b>non-skid Ceramic glazed floor tiles</b> of size 300x300 mm (thickness to bespecified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make (as per Vendor List) in colours such as White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cementmortar 1:4 (1Cement : 4 Coarse sand), including pointing the joints with white cement and matching pigment etc., complete.	250.00	SqM		0.00	0.00	0.00	INR Zero Only

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12.06	Providing and laying in position at all heights 25mm thick <b>Kota stone tiles</b> in flooring and trades over 20 mm (Average) thick base of cementmortar 1:4 (1 cement: 4 coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing complete.	30.00	SqM		0.00	0.00	0.00	INR Zero Only
12.07	Providing and fixing in position at all heights <b>Kota stone tiles</b> 25 mm thick in risers of steps for skirting/dado laid on12 mm (Average) thick cement mortar 1:3 (1 cement :3 coarse sand) and jointed with grey cement slurry mixed with pigmentto match the shade of the tiles including rubbing, polishing, etc., complete in all respects.	220.00	SqM		0.00	0.00	0.00	INR Zero Only
<b>13.0</b>	<b>FINISHING</b>							
13.01	Providing at all heights <b>12 mm thick</b> cement plaster on brickwork, exposed surfaces of RCC lintels, beams, etc., complete in all respects and as directed with cement plaster mix : 1:4 (1 cement: 4 coarse sand)	1245.00	SqM		0.00	0.00	0.00	INR Zero Only
13.02	Providing and laying 12 mm thick plaster in 1:6 ( 1 Cement : 6 fine sand) cement sand mortar on walls, drains, peripheral drain, steps etc. finished to a smooth finish all complete as per specification and directions of the Engineer	5000.00	SqM		0.00	0.00	0.00	INR Zero Only
13.03	Providing at all heights <b>15 mm thick</b> cement plaster on roughside of single or half brick walls,etc., complete in all respects and as directed with cement plaster mix :1:4 (1 cement: 4 coarse sand)	1245.00	SqM		0.00	0.00	0.00	INR Zero Only
13.04	Providing at all heights <b>6mm thick</b> cement plaster to ceiling, etc., complete in all respects and as directed with cement plaster mix: 1:3 (1cement :3finesand).	480.00	SqM		0.00	0.00	0.00	INR Zero Only
13.05	Providing and applying <b>Acrylic Smooth exterior paint</b> of required shade of approved brand n makeon exterior walls (two or more coats New work (Two or more coat applied @ 1.67 ltr/10 sqm over and including priming coat of exterior primer applied @2.20kg /10sqm)). The job includes preparation of surface, applying two coat of putty to make good the unevenness of the surfaces including necessary scaffolding etc. complete for all heights. as per and as directed & instructed by engineer-in-charge	915.00	SqM		0.00	0.00	0.00	INR Zero Only

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13.06	Providing and applying distemping with <b>oil bound washable distemper</b> of approved brand and manufacture to give an even shade with good quality acrylic washable distemper (readymade) of approved manufacture's specification. Two or more coats on new work. The job includes preparation of surface, providing and applying manufacture's approved distemperprimer and applying two coat of putty to make good the unevenness of the surfaces including necessary scaffolding etc. complete for all heights. As per and as directed & instructed by engineer-in-charge	1390.00	SqM		0.00	0.00	0.00	INR Zero Only
<b>14.0</b>	<b>SANITARY WORK</b>							
14.01	Providing and fixing oval shape counter top type coloured Vitreous China wash basin of size 630x450 mm of Hindware/cera/parryware/Jaqar, tato or equivalent incl. The following accessories :Providing and fixing pillar cock of Jaquar or equivalent make all other fittings like CP waste coupling, CP brass bottle trap, CP brass stop cock, tap, as required all connecting arrangement etc. including painting of fittings and brackets, cutting and making good the walls wherever required:	5.00	Each		0.00	0.00	0.00	INR Zero Only
14.02	Providing and fixing coloured vitreous European type water closet with 8-10 ltr flushing cistern of Hindware/cera/parryware or equivalent) with seat and lid ;C.P brass hings and rubber buffers with ;overflow arrangement with specials of standard make and mosquito proof coupling of approved design complete including painting of fitting and brackets cutting and making good the walls and floors wherever required.	2.00	Each		0.00	0.00	0.00	INR Zero Only
14.03	Providing and fixing <b>bevelled edge mirror of superior glass</b> (of approved quality) of 5mm thick of size 1000 x 750 mm of Belgium Glass or equivalent, 6mm wooden ply wood, wooden beads with 3M adhesive alround of specified size and Chamfered, fixing with wooden plugs with CP brass crew sand cup washers etc. All complete as per the directions of engineer-In-charge.	5.00	Each		0.00	0.00	0.00	INR Zero Only
14.04	Supplying and fixing <b>white vitreous china flat back large auto flush type gents urinal</b> with concealed censor of Hindware/cera/parryware or equivalent with CP flush valve, CP pipe connections CP wastecoupling CPbrassbottle trap 32mm UPV Cwasteline of required length CP spreader unit and extension pipe all complete as directed.	5.00	Each		0.00	0.00	0.00	INR Zero Only

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14.05	Providing and fixing C.P. brass bibcock (of 15mm nominal bore) of approved quality conforming to IS:8931 : <b>Short body bibcock</b>	2.00	Each		0.00	0.00	0.00	INR Zero Only
14.06	Providing and fixing C.P. Brass <b>stopcock</b> (concealed) of standard design and of approved make conforming to IS:8931.	2.00	Each		0.00	0.00	0.00	INR Zero Only
14.07	Providing and erecting readymade storage tanks of approved manufacturer as per Vendor Listand requiredsize for capacity 2500 Lit including connecting necessary supply lines, delivery lines, wash water line and with manhole cover at top of not less than 450mm clear dia, with locking arrangement complete as per drawing and as directed and instructed by Engineer-In-Charge.	3.00	Each		0.00	0.00	0.00	INR Zero Only
14.08	Making soak pit for 50 users, basic details 2.5 m diameter 3.0 metre deep with 45 x 45 cm dry brick honey comb shaft with bricksand S.W. drain pipe 100 mm diameter, 1.8 m long complete as per standard design. - With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	1.00	Each		0.00	0.00	0.00	INR Zero Only
14.09	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, including all CPVC plain & brass threaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes, fittings & including all fixtures with one step CPVC solvent cement and the cost of cutting chasesand making good the same including testing of joints complete as per direction of Engineer inCharge. Concealed work, including cutting chases and making good the walls etc. <b>15 mm nominal outer dia Pipes</b>	10.00	R.M.		0.00	0.00	0.00	INR Zero Only
14.10	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, including all CPVC plain & brassthreaded fittings, i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes, fittings & including all fixtures with one step CPVC solvent cement and the cost of cutting chasesand making good the same including testing of joints complete as per direction of Engineer inCharge. Concealed work, including cutting chases and making good the walls etc. <b>25 mm nominal outer dia Pipes</b>	200.00	R.M.		0.00	0.00	0.00	INR Zero Only
14.11	Providing and fixing soil/ waste PVC pipes as required connecting properly with pipe and filling all joints as required at any level (including tees, bends, plain junction, stays & clamps and other fixturesas required complete in all respect. <b>100 mm dia.</b>	100.00	R.M.		0.00	0.00	0.00	INR Zero Only

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14.12	Constructing brick masonry road gully chamber 50x45x60 cm with bricks in cement mortar 1:4 (1cement : 4 coarse sand) including 500x450 mm pre-cast R.C.C. horizontal grating with frame complete as per standard design : <b>With common burnt clay F.P.S. (non modular) bricks of class designation7.5</b>	5.00	Each		0.00	0.00	0.00	INR Zero Only
14.13	Providing and fixing toilet paper holder C.P. brass of approved make.	5.00	Each		0.00	0.00	0.00	INR Zero Only
14.14	Providing and fixing P.V.C. wastepipe for sink or washbasin including P.V.C. waste fittings complete. <b>Flexible pipe-32 mm dia.</b>	5.00	Each		0.00	0.00	0.00	INR Zero Only
14.15	Providing and fixing PTMT liquid soap container 109 mm wide, 125 mm high and 112 mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour,weighing not less than 105 gms.	5.00	Each		0.00	0.00	0.00	INR Zero Only
14.16	Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fittings arrangement of approved quality and colour. <b>450mm long towel rail with total length of 495 mm, 78 mm wide and effective height of 88 mm,weighing not less than170 gms</b>	2.00	Each		0.00	0.00	0.00	INR Zero Only
<b>15.0</b>	<b>MISCELLANEOUS:</b>							
15.01	Providing and laying " <b>SHRINKKOMP- 20</b> " anti-shrinkage grouting in pocket sand base plates of light dynamic machines such as small pump sand compressors as per manufacturer's specifications,complete in all respects as per direction of Engineer-in-Charge.	95.00	CuM		0.00	0.00	0.00	INR Zero Only
15.02	Providing and fixing in position 25 mm thick shalitek boardin expansion joints or around machine foundations or in floors with necessary shalitek sealing compound, complete in all respects as per direction of Engineer-in-Charge :	15.00	SqM		0.00	0.00	0.00	INR Zero Only
15.03	Providing and fixing G.I. pipe sleeve including grouting in wall & floor with concrete1:2:4 (1cement: 2 sand: 4 stone chips 20 mm and down), complete in all respects as per direction of Engineer-in-Charge:	10.00	Kg		0.00	0.00	0.00	INR Zero Only

## Item Rate BoQ

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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15.04	Supplying and <b>filling in under floors, etc., with fine sand</b> at all depths in layers not exceeding 20 cms. in thickness including consolidating and dressing each deposited layer by ramming and watering, etc., complete in all respects as per direction of Engineer-in-Charge	290.00	CuM		0.00	0.00	0.00	INR Zero Only
15.05	Providing and <b>cutting concrete</b> ( Rectangle / square ) upto 750mm deep using Hilti D-LP 32/ DS-TS32 wall saws or equivalent having diamond saws and central water cooling system for accurate and vibration free cutting. The system should be operated using digital remote control. Suitable & sufficient scaffoldings shall be provided separately for all work that cannot be done safely from ground or other available means of safe support and the payments for this shall be made against respective items. (Approx 20 pieces at different places of plant.)	45.00	SqM		0.00	0.00	0.00	INR Zero Only
15.06	Providing and fixing <b>16 mm M.S. Fan clamps</b> of standard shape and size in existing R.C.C. slab, including cutting chase, anchoring clamp to reinforcement bar, including cleaning, refilling, making good thechase with matching concrete, plastering and painting the exposed portion of the clamps complete.	5.00	Each		0.00	0.00	0.00	INR Zero Only
15.07	Providing and fixing 10 mm thick <b>acid and/or alkali resistant tiles</b> of approved make and colour using acid and/or alkali resisting mortar bedding, and joints filled with acid and/or alkali resisting cement as per IS : 4457, complete as per the direction of Engineer-in- Charge. : <b>Acid and alkali resistant tile In flooring on a bed of 10 mm thick mortar 1:4 (1 acid proof cement : 4 coarse sand)</b>	77.00	SqM		0.00	0.00	0.00	INR Zero Only
15.08	Providing and fixing 10 mm thick acid and/or alkali resistant tiles of approved make and colour using acid and/or alkali resisting mortar bedding, and joints filled with acid and/or alkali resisting cement as per IS : 4457, complete as per the direction of Engineer-in- Charge. : <b>Acid and alkali resistant tile In dado/skirting on 12 mm thick mortar 1:4 (1 acid proof cement : 4 coarse sand)</b>	10.00	SqM		0.00	0.00	0.00	INR Zero Only



**Item Rate BoQ**

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15.09	Providing and fixing in position <b>12 mm thick bitumen impregnated fibreboard</b> conforming to IS:1838 in expansion joints including sealing the joints at the exposed ends with approved quality sealing compound including application of an approved primer as per manufacturer's specifications and as per direction of the Engineer-in-Charge.	24.00	SqM		0.00	0.00	0.00	INR Zero Only
15.10	Providing and laying factory made chamfered edge <b>Cement Concrete paver blocks</b> in footpath,parks, lawns, drive ways or light traffic parking etc, of required strength, thickness & size/ shape, made by table vibratory method using PU mould, laid in required colour & pattern over 50mm thick compacted bed of sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand. complete all as per direction of Engineer-in-Charge.: <b>60mm thick cement concrete paver block of M-35 grade with approved colour, design &amp; pattern.</b>	300.00	SqM		0.00	0.00	0.00	INR Zero Only
15.11	Providing and fixing <b>G.I. chain link fabric fencing</b> of required width in mesh size 50x50 mm including strengthening with 2 mm dia wire or nuts, bolts and washers as required complete as per the direction of Engineer-in-charge. <b>Made of G.I. wire of dia. 4mm, PVC coated to achieve outer dia not less than 5 mm in required colour and shade</b>	500.00	R.M.		0.00	0.00	0.00	INR Zero Only

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15.12	Providing, fabricating and fixing in position double leaf gates of any height with one wicket door within the main gate, all made out of structural steel sections such as M.S. Angles, Tees, Channels, Plates, Flats, etc., for all horizontal, vertical and diagonal members, M.S. Gusset plates including providing and fixing in position at all heights hard drawn steel wire fabric mesh of size 75 mm x 25 mm and weight not less than 7.75 kg/sq.m. welded with frames, including providing and fixing necessary lock plate, handles, locking arrangement and other fittings, drilling of holes wherever required, welding etc. including providing necessary hinge plateswelded to insert plates embedded in RCC columns, bolts and nuts for hinge etc. including providing and applying painting, complete in all respects and direction of Engineer-in-Charge: <b>With providing and applying two coats of high build zinc phosphate primer of approved brandand manufacture compatible to chlorinated rubber paint at a dry film thickness of 50 micronper coat on structural steel work after preparation of surfaces including providing and applying two coats of chlorinated rubber based paint of approved colour, brand and manufacture at a dry film thickness of 50 microns per coat</b>	10.00	Ton		0.00	0.00	0.00	INR Zero Only
15.13	Supplying chemical emulsion in sealed containers including delivery as specified. Chlorpyriphos/ Lindane emulsifiable concentrate of 20%	150.00	Litre		0.00	0.00	0.00	INR Zero Only
15.14	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) : Along external wall where the apron is not provided using chemical emulsion @ 7.5 litres / sqm of the vertical surface of the substructure to a depth of 300mm including excavation channel along the wall & rodding etc. complete: With Chlorpyriphos/ Lindane E.C.20% with 1% concentration	300.00	R.M.		0.00	0.00	0.00	INR Zero Only
15.15	RELEVANT GEO-TECHNICAL TESTS FOR SOIL INVESTIGATION. Note: Minimum Three Numbers of bore holes up to 20-22 m depths and other relevant soil tests as per design requirement of Ash Dyke, Slurry Pump house.Report shall be submitted to the Owner/PMC for information.	1.00	LS		0.00	0.00	0.00	INR Zero Only

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15.16	<b>Turfing-</b> Slope protection with turf sods including collection, conveyance and providing 50 mm thick grass turf sods, ramming and watering for three months or till the grass establishes itself uniformly whichever is later, with all leads, lifts, watering charges, etc. complete as per specifications, drawings and as directed by the Engineer.	11000.00	SqM		0.00	0.00	0.00	INR Zero Only
15.17	<b>Water Bound Macadam Road (Sub-base course)-</b> Providing and laying of sub-base course (water bound macadam) each layers of 100mm finished thickness with 90-40 mm graded aggregate as per specifications, true to camber and slope, including full compensation for furnishing all materials to be incorporated in the work including all lifts and leads, preparation of sub grade, spreading, rolling, providing and applying screenings (locally available moorum), sprinkling and grouting, application of binding material (locally available moorum), setting and drying, all labour, tools, equipments and incidentals necessary to complete the work as per drawings, specifications and the directions of the Engineer. a) road over embankment top and inspection road along periphery of dyke	1615.00	CuM		0.00	0.00	0.00	INR Zero Only
15.18	<b>Water Bound Macadam Road (Base course)-</b> Providing and laying of base course (water bound macadam) in two layers of 75 mm finished thickness each with 63-40mm and 50-20mm graded stone aggregate, true to camber and slope including full compensation furnishing all materials to be incorporated in the work including all leads and lifts, preparation of sub-base course, spreading, rolling, providing and applying screening (locally available moorum) sprinkling and grouting, application of binding material (locally available moorum) setting, and drying, all labour, tools, equipments and incidentals necessary to complete the work as per drawings, specifications and directions of the Engineer. <b>a) road over embankment top and inspection road along periphery of dyke</b>	1200.00	CuM		0.00	0.00	0.00	INR Zero Only

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15.19	Providing and laying of Premix Bituminous Macadam Base Course, with stone aggregates of quality, size and grading as specified in IRC, laid in layers each of 100 mm compacted finished thickness, true to camber and slope, including tack coat, Bitumen of grad 80/100 @4% by weight of total mix, hot mixing of stone aggregate and bitumen in hot mix plant, handling transportation of mixed material, for all leads and lifts, laying with paver, spreading, rolling with road roller of 8-10 ton capacity to achieve required compaction and density, finishing including all labour, material equipment, all complete, as per specifications, drawing and instructions of the Engineer. a) road over embankment top and inspection road along periphery of dyke	800.00	CuM		0.00	0.00	0.00	INR Zero Only
15.20	Providing and laying of Bituminous Concrete with minimum 100-120 TPH , using stone aggregates of quality, size and grading as specified in IRC, laid in layer of 40 mm compacted finished thickness, true to camber and slope, including tack coat, Bitumen of grad 80/100 @5.5% by weight of total mix and lime filler @ 3% (% by weight of aggregate), hot mixing of stone aggregate and bitumen in hot mix plant, handling transportation of mixed material, for all leads and lifts, laying with paver, spreading, rolling with road roller of 8-10 ton capacity to achieve required compaction and density, finishing including all labour, material equipment, all complete, as per specifications, drawing and instructions of the Engineer. <b>(a) road over embankment top and inspection road along periphery of dyke (for Grading-I) with bitumen 5.5 %</b>	325.00	CuM		0.00	0.00	0.00	INR Zero Only
15.21	Providing and laying 6mm thick seal coat over prepared surface of road with bitumen heated in bitumen boiler fitted with the spray set spraying using 98 kg of bitumen of grade VG - 10 and blinding surface with 0.90 cum of stone aggregate of 6.7 mm size (Passing 11.2 mm sieve and retained on 2.36 mm sieve) per 100 sqm of road surface, including rolling and finishing with power road roller all complete. <b>(a) road over embankment top and inspection road along periphery of dyke</b>	8000.00	SqM		0.00	0.00	0.00	INR Zero Only

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15.22	<b>RCC Hume Pipes-</b> Providing, laying and fixing in position cement concrete pipes, conforming to IS:458 and laying as per IS:783 ( excluding cost of excavation/cutting trench, backfilling the trench with specified material & RCC encasement to be measured & paid separately), placing the pipe in position, jointing materials, cost of jointing pipes, transportation, labour, materials, equipments, all leads and lifts, dewatering etc. complete as per specification, drawing and as directed by the Engineer.							
15.23	a) 1000 mm internal dia NP-4 Hume Pipe	100.00	R.M.		0.00	0.00	0.00	INR Zero Only
15.24	b) 600 mm internal dia NP-3 Hume Pipe	50.00	R.M.		0.00	0.00	0.00	INR Zero Only
15.25	c) 450 mm internal dia NP-3 Hume Pipe	50.00	R.M.		0.00	0.00	0.00	INR Zero Only
15.26	<b>Cut-off collars-</b> Providing cut-off collars around the RCC Hume pipe & MS Pipe with bentonite-soil mix of 1:1 proportion by volume, including the cost of the labour, materials, equipments, transportation, excavating the trenches, disposing/stock piling the excavated materials, mixing the bentonite and soil in dry form, filling and compaction of material in layers of 200 mm thickness, providing temporary protective layers of polyethylene sheets, including all leads and lifts etc. complete as per specifications, drawings and as directed by the Engineer.	30.00	CuM		0.00	0.00	0.00	INR Zero Only
15.27	<b>Diaphragm filters-</b> Providing diaphragm filters around RCC hume pipe & MS pipe with graded coarse sand satisfying filter criteria, including the cost of materials, labour, equipment, transportation, excavating the trenches, disposal of excavated material, laying the fill material in layers, watering, compaction, providing temporary protective layers of polyethylene sheets, including all leads and lifts etc., complete as per specifications, drawings and as directed by the Engineer.	30.00	CuM		0.00	0.00	0.00	INR Zero Only

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15.28	<b>Precast cement concrete-</b> Providing and laying all types of pre-cast cement concrete units (reinforced) of grade M 25, in opening of water escape structure, at any RCC structure etc. at all levels, with graded stone chips (20 / 12.5 / 10 mm nominal size), including all labour, material, equipment, handling, transportation, formwork, batching, mixing, casting, compacting, curing, testing, rendering, exposed surface with cement sand mortar 1:3, handling, storing, trans-orting, for all leads and lifts, erection, setting in position with cement sand mortar 1:3, all complete, as per specifications, drawings and instructions of the Engineer, but excluding reinforcement work.	5.00	CuM		0.00	0.00	0.00	INR Zero Only
15.29	<b>Impervious Liner-</b> Supplying, mixing & spreading of 0.3 m thick compacted to 90% of maximum dry density (standard proctor) with blended soil using soil obtained from within the ash pond area or from borrow area arranged by the contractor and prepared by blending with minimum 4% bentonite (by volume) to achieve a permeability not more than 1X10-6 cm/sec including striping, grading, watering wherever required, subgrade preparation with 2 passes of 8 to 10 tonne capacity roller, transporting unloading, mixing with bentonite all leads & lifts, breaking clods, watering, with all incidental charges, testing of samples in laboratory, cost of labour, equipment, materials etc. complete as per specification, drawings & as directed by the engineer: a) With naturally available Impervious clayey soil ( with available good earth)	5000.00	CuM		0.00	0.00	0.00	INR Zero Only

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15.30	Providing and installing in position porous tube piezometers at specified locations including drilling cased bore holes of 100 mm diameter, cleaning them, assembling porous tube and PVC pipe of about 12M length with couplings, cleaning and driving out air from the pores of porous tube, pouring clean saturated coarse sand around the porous tube, backfilling with cement sand grout (1cement : 4sand) around the PVC pipe, providing removable cover for the PVC pipe and casing, and fabricating and installing protective fence complete with the cost of brass bottom plug, brass adapter, cost of the portion of steel casing pipe to be left in the bore hole, including the cost of all labour, equipment, materials, transportation to site.all leads & lifts etc. complete as per specification, drawings and as directed by the Engineer.	10.00	Each		0.00	0.00	0.00	INR Zero Only
15.31	Providing and installing in position the surface settlement points of 1.0 metre depth at specified locations, including drilling holes and backfilling with 1:2:4 cement concrete and cost of all labour, equipment, materials, transportation to site all leads & lifts etc. complete as per specification drawing and as directed by the Engineer.	5.00	Each		0.00	0.00	0.00	INR Zero Only
15.32	<b>Water Level Sounder-</b> Providing and supplying water level sounder as per technical specification. The instruments shall be accepted by the Engineer only after all the instruments have been demonstrated to be in working condition and initial set of measurements of PIEZOMETERS have been taken, including the cost of all labour, equipment, materials, transportation to site etc. complete as per specification, drawings and as directed by the Engineer.	1.00	Each		0.00	0.00	0.00	INR Zero Only
15.33	Supply of LDPE film 750 micron - Laying spreading, jointing of LDPE film including all testing etc. complete as per specification with 150mm thick Dry Fly Ash layer on top as blanket as per approved specification and direction of Engineer-in-Charge.	58015.00	SqM		0.00	0.00	0.00	INR Zero Only
15.34	Providing, supplying & Placing of 120 gsm Non-woven Filter Material GeoTextile with required water permeability, filtration etc. as per Technical Specification, Drawing and the direction of Engineer-in-Charge including cost of transportation to site, labour, equipment etc..	7000.00	SqM		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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15.35	Providing and laying dry rubble stone soling in layers of 300 mm thick hand set in regular lines, interstices being filled in wit small pieces of stones, thoroughly rammed, consolidated and watered complete as directed and specified & rolling with 10 MT power roller.	100.00	CuM		0.00	0.00	0.00	INR Zero Only
<b>16.00</b>	<b>ELECTRICAL WORKS (SUPPLY &amp; ERECTION) (PART- II)</b>							
<b>17.00</b>	<b>SUPPLY OF ELECTRICAL ITEMS (SUPPLY: PART-A)</b>							
<b>18.00</b>	<b>TRANSFORMERS</b>							
18.01	Supply of Transformers with all accessories, as specified in data sheets, Technical Specification - Electrical, Technical Specification Doc. No. PC183-TS-0802, etc. attached with the NIT.							
18.02	1 MVA, 11/0.433 kV, ONAN, Dyn11, 3 phase, 50 Hz, Oil immersed type transformer with externally operated off circuit tap changer with tapping range of ± 5% in steps of 2.5% and Z=6% (zero negative tolerance) with all applicable fittings and accessories.	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>19.00</b>	<b>DRY TYPE LIGHTING TRANSFORMERS</b>							
19.01	Supply of Dry Type Lighting Transformers with all accessories, as specified in attached Specification Sheet, Technical Specification - Electrical, Technical Specification Doc.No. PC183-TS-0829 attached elsewhere in the tender document.							
19.02	50 kVA, 433/415 V, AN, Dyn11, 3 phase, 50 Hz, Dry type lighting transformer with externally operated off circuit tap changer with tapping range of ± 5% in steps of 2.5% and Z=4% (zero negative tolerance) with all applicable fittings and accessories.	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>20.00</b>	<b>HT SWITCH BOARD</b>							
20.01	Supply of 11 KV, 1250 A, 750MVA for 3 sec., indoor type High Voltage switchboard (refer attached SLD) complete with all accessories, as specified in data sheet, SLD, feeder details, Technical Specification - Electrical, Technical Specification Doc. No. PC183-TS-0806, etc. attached with the NIT.	1	Nos.		0.00	0.00	0.00	INR Zero Only
<b>21.0</b>	<b>415V POWER &amp; MOTOR CONTROL CENTER</b>							



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21.01	Supply, Handling, including transportation from store to site of installation of 415V, 3 Ph & N, 1600 A, 50kA for 1 sec., Draw out type, Double front, indoor type Low Voltage switchboard (Power & Motor Control Centre, PMCC) complete with all accessories as per data sheets, SLD, schematic diagrams and feeder details including APFC Panel along with capacitor banks (bank size in multiple of 50,25 KVAR) and harmonic filter as per Technical Specification - Electrical, Technical specification Doc. No. PC183-TS-0805, etc. attached with the NIT.,	1	Nos.		0.00	0.00	0.00	INR Zero Only
<b>22.00</b>	<b>CABLES (HT &amp; LT)</b>							
22.01	Supply 11KV(UE)/ 1.1 KV Grade, XLPE Insulated, PVC inner sheathed, armoured, FRLS PVC outer sheathed cables including its termination in new & readymade trenches, on pre-fabricated/ site-fabricated cable trays/ racks, on already installed risers, support, hangers, saddles / directly buried up to 700mm depth etc. pulling through pipes on walls/columns, steel structures including transportation of cable drums from storage yard to site, unrolling the drum, including supply & fixing of cable tags, Al clamps with all labour, consumable materials and necessary hardware to make installation complete in all respect as per direction of engineer-in-charge.							
22.02	11KV (UE) grade XLPE insulated, PVC inner sheathed, FRLS PVC (ST2) type outer sheath as per Technical specification enclosed with NIT							
22.03	3Cx240 (Al)	3000	Mtr		0.00	0.00	0.00	INR Zero Only
22.04	1.1KV grade, XLPE insulated, PVC inner sheath, FRLS PVC outer sheath cables as per Technical specification enclosed with NIT							
22.05	3.5C x 400 mm <sup>2</sup> (Al)	400	Mtr		0.00	0.00	0.00	INR Zero Only
22.06	3.5C x 120 mm <sup>2</sup> (Al)	100	Mtr		0.00	0.00	0.00	INR Zero Only
22.07	3.5C x 70 mm <sup>2</sup> (Al)	700	Mtr		0.00	0.00	0.00	INR Zero Only
22.08	3.5C x 50 mm <sup>2</sup> (Al)	200	Mtr		0.00	0.00	0.00	INR Zero Only
22.09	3.5C x 25 mm <sup>2</sup> (Al)	600	Mtr		0.00	0.00	0.00	INR Zero Only
22.10	4C x 4 mm <sup>2</sup> (Cu)	1000	Mtr		0.00	0.00	0.00	INR Zero Only

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22.11	4C x 6 mm <sup>2</sup> (Cu)	400	Mtr		0.00	0.00	0.00	INR Zero Only
22.12	4C x 16 mm <sup>2</sup> (Al)	400	Mtr		0.00	0.00	0.00	INR Zero Only
22.13	3C x 120 mm <sup>2</sup> (Al)	1500	Mtr		0.00	0.00	0.00	INR Zero Only
22.14	3C x 70 mm <sup>2</sup> (Al)	800	Mtr		0.00	0.00	0.00	INR Zero Only
22.15	3C x 25 mm <sup>2</sup> (Al)	1000	Mtr		0.00	0.00	0.00	INR Zero Only
22.16	3C x 6 mm <sup>2</sup> (Cu)	1200	Mtr		0.00	0.00	0.00	INR Zero Only
22.17	3C x 4 mm <sup>2</sup> (Cu)	400	Mtr		0.00	0.00	0.00	INR Zero Only
22.18	3C x 2.5 mm <sup>2</sup> (Cu)	5500	Mtr		0.00	0.00	0.00	INR Zero Only
22.19	5C x 2.5 mm <sup>2</sup> (Cu)	725	Mtr		0.00	0.00	0.00	INR Zero Only
22.20	7C x 2.5 mm <sup>2</sup> (Cu)	6000	Mtr		0.00	0.00	0.00	INR Zero Only
22.21	12C x 2.5 mm <sup>2</sup> (Cu)	1200	Mtr		0.00	0.00	0.00	INR Zero Only
22.22	1Cx185 mm <sup>2</sup> (Al)	100	Mtr		0.00	0.00	0.00	INR Zero Only
22.23	Supply, laying of 6 Fiber multi mode FO Cable suitable for relay to relay distance of approx 2 km for line differential protection with all accessories for termination , this also include splicing, jointing as per requiremnt	3000	Mtr		0.00	0.00	0.00	INR Zero Only
<b>23.00</b>	<b>CABLE TRAYS:</b>							
23.01	Supply of prefabricated ladder GI cable trays and their accessories i.e. supply of all hardware required i.e. J-hooks, GI Nut, Bolt, Washers, coupling plate etc. of width 150 mm, 300 mm, 450 mm & 600 mm as per site requirement for laying of cables with standard rung spacings. Load for support span of 2.5 meter as 30, 60, 75 & 90 (in Kg/Mtr.) respectively with concentric static load as 70 Kg at the centre, with materials, labour, tools and tackles, consumables etc. as per drawings, specification and directions of Site Engineer / Engineer-in-Charge. The rates shall be valid for all mounting heights.							
23.02	<b>Straight Run Cable Trays</b>							
23.03	600 mm wide	1500	Mtrs.		0.00	0.00	0.00	INR Zero Only
23.04	450 mm wide	200	Mtrs.		0.00	0.00	0.00	INR Zero Only
23.05	300 mm wide	1500	Mtrs.		0.00	0.00	0.00	INR Zero Only

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23.06	150 mm wide	200	Mtrs.		0.00	0.00	0.00	INR Zero Only
23.07	<b>Horizontal Bends</b>							
23.08	600 mm wide, 700 mm radius	20	Nos.		0.00	0.00	0.00	INR Zero Only
23.09	450 mm wide, 700 mm radius	15	Nos.		0.00	0.00	0.00	INR Zero Only
23.10	300 mm wide, 700 mm radius	60	Nos.		0.00	0.00	0.00	INR Zero Only
23.11	150 mm wide	20	Nos.		0.00	0.00	0.00	INR Zero Only
23.12	<b>Vertical Inside Bends</b>							
23.13	600mm wide, 1000mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
23.14	450 mm wide, 1000mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
23.15	300 mm wide, 1000mm radius	30	Nos.		0.00	0.00	0.00	INR Zero Only
23.16	150 mm wide	20	Nos.		0.00	0.00	0.00	INR Zero Only
23.17	<b>Vertical Outside Bends</b>							
23.18	600 mm wide, 1000 mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
23.19	450 mm wide, 1000 mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
23.20	300 mm wide, 1000 mm radius	35	Nos.		0.00	0.00	0.00	INR Zero Only
23.21	150 mm wide	20	Nos.		0.00	0.00	0.00	INR Zero Only
23.22	<b>Reducer</b>							
23.23	600 mm / 450 mm wide	10	Mtrs.		0.00	0.00	0.00	INR Zero Only
23.24	450/300mm wide	10	Nos.		0.00	0.00	0.00	INR Zero Only
23.25	300/150mm wide	10	No.		0.00	0.00	0.00	INR Zero Only
23.26	<b>Regular Tees</b>							
23.27	600 mm wide , 700 mm radius	5	Mtrs.		0.00	0.00	0.00	INR Zero Only
23.28	450 mm wide, 700 mm radius	8	Mtrs.		0.00	0.00	0.00	INR Zero Only
23.29	<b>Cross</b>							
23.30	600 mm wide , 700 mm radius	10	Mtrs.		0.00	0.00	0.00	INR Zero Only
23.31	450 mm wide, 700 mm radius	5	Mtrs.		0.00	0.00	0.00	INR Zero Only
<b>24.00</b>	<b>EARTHING AND LIGHTNING PROTECTION</b>							

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24.01	Supply of GI earth strip / Wire conductors of following sizes as per PDS attached with TS enclosed in ready made concrete trenches or in floor slits, on brick / concrete wall under concrete floors, or paved areas, across pipe joints and valves, directly buried under ground at depth of 500 mm, including handling, transportation to erection site, bending, straightening, cutting to size, welding together of earth strips in overlapping manner, chipping in concrete floors / paved areas for laying the earth strips under floors / paved areas and making good by cement plastering concrete after laying of the strips; clamping and supporting of earth strips laid above ground, connecting the strips / wire at both ends to equipment or to earth bus / earth plates or to GI brackets fixed inside earthpit chamber, by bolting etc., Hessian tapes, all necessary GI hardware, GI clamps, civil masonry materials, etc. all work, labour as per specifications, codes and standards and directions of owner / consultant.of Hot Dip Galvanized GI earth strips & GI earth wire (with min. coating 610 gm / sq. m) of following sizes: -							
24.02	Note: The conductors shall be laid at a minimum depth of 500 mm from ground level.The excavation for the GI earth conductors / strips shall not be separately measured and the rates quoted to include the same.							
24.03	75 mm x 10 mm	300	Mtr		0.00	0.00	0.00	INR Zero Only
24.04	50 mm x 6 mm	200	Mtr		0.00	0.00	0.00	INR Zero Only
24.05	1Cx25 sq. mm Al cable Unarmoured	100	Mtr		0.00	0.00	0.00	INR Zero Only
24.06	GI wire Rope (8 SWG)	30	Kg		0.00	0.00	0.00	INR Zero Only
24.07	Supply of 35x6 GI strip on parapet of surface of wall for lightning conductor as required for vertical run including test link etc & horizontal run along wall,column,prapet etc complete with PVC fasteners,screws,Saddles, and welding/revetting and painting of joints etc as required.	200	Mtr		0.00	0.00	0.00	INR Zero Only
<b>25.00</b>	<b>MISCELLANEOUS ITEMS</b>							

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25.01	Supply and Fixing of Caution boards / dangers boards written in ENGLISH & HINDI of the following voltages.							
25.02	11KV	1	Nos		0.00	0.00	0.00	INR Zero Only
25.03	415 V	1	Nos		0.00	0.00	0.00	INR Zero Only
25.04	Supply andFixing of shock treatment chart written in English and Local language duly framed and approved by engineer-in-charge.	1	Nos		0.00	0.00	0.00	INR Zero Only
25.05	Supply andFixing of Do & Don't chart as per Indian Electricity Rules in Aluminum frame with glass	1	Nos.		0.00	0.00	0.00	INR Zero Only
25.06	Supply and Fixing of S/S Single Line Diagram in Aluminum frame with glass.	1	Nos.		0.00	0.00	0.00	INR Zero Only
25.07	Supply and Fixing of CPR (CARDIO PULMONARY RESUSCITATION) Charts.	1	Nos.		0.00	0.00	0.00	INR Zero Only
25.08	Supply andFixing of High Voltage danger signage (Skull & bones).	1	Nos.		0.00	0.00	0.00	INR Zero Only
25.09	Supply and Fixing of Exit Route / Emergency Exit Route Signage.	1	Nos.		0.00	0.00	0.00	INR Zero Only
25.10	Supply and Fixing of First aid boxes.	1	Nos.		0.00	0.00	0.00	INR Zero Only
25.11	Supplying the following Equipment as per directions of Site Engineer / Engineer-in-Charge							
25.12	RUBBER HAND GLOVES : Rubber hand gloves suitable for 11/3.3 KV operation with ISI mark.	2	SET		0.00	0.00	0.00	INR Zero Only
25.13	Supply of 11 KV Discharge Rod	1	SET		0.00	0.00	0.00	INR Zero Only
25.14	<b>INSULATING MATS:</b>							
25.15	Supply & installation of 2000 mm X 1000 mm and of thickness as mentioned below, approved quality insulating Elastomer mats as per specifications.							
25.16	Insulating Elastomer mats conforming to IS 15652:2006 of thickness 2 mm (Class A)	12	EA		0.00	0.00	0.00	INR Zero Only
25.17	Insulating Elastomer mats conforming to IS 15652:2006 of thickness 2.5 mm (Class B)	8	EA		0.00	0.00	0.00	INR Zero Only
25.18	Supply and fixing of of fully charged portable CO2 fire extinguishers as per specifications (4.5 kg capacity as per IS: 2878 latest)	3	Nos.		0.00	0.00	0.00	INR Zero Only
25.19	Supply and fixing of fire sand buckets mounted on stand	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>26.00</b>	<b>Spares</b>							
26.01	Supply of spares of following equipments							

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
<b>27.00</b>	<b>11KV Switchboard</b>							
27.01	1250A VCB, 40KA for 3 sec							
27.02	Shunt trip coil	1	No.		0.00	0.00	0.00	INR Zero Only
27.03	Closing coil	1	No.		0.00	0.00	0.00	INR Zero Only
27.04	Micro Switch for Spring Charging	1	No.		0.00	0.00	0.00	INR Zero Only
27.05	Micro Switch for Service/Test position	1	Set		0.00	0.00	0.00	INR Zero Only
<b>28.00</b>	<b>CONTROL SWITCHES</b>							
28.01	Trip-Neutral-Close Control Switch	1	No.		0.00	0.00	0.00	INR Zero Only
28.02	Local-Remote or Auto-Manual Selector Switch	1	No.		0.00	0.00	0.00	INR Zero Only
28.03	Indication Lamps (1 no. of each colour)	1	set		0.00	0.00	0.00	INR Zero Only
28.04	MINIATURE CIRCUIT BREAKER (OF EACH RATING)	1	Set		0.00	0.00	0.00	INR Zero Only
<b>29.00</b>	<b>RELAYS (OF EACH TYPE)</b>							
29.01	Numerical Relays for line differential	1	No		0.00	0.00	0.00	INR Zero Only
29.02	Numerical Relays for Transformer feeder protection	1	No		0.00	0.00	0.00	INR Zero Only
29.03	Electromechanical Relays-Lockout relay	1	No.		0.00	0.00	0.00	INR Zero Only
29.04	Electromechanical Relays-Trip Circuit supervision	1	No.		0.00	0.00	0.00	INR Zero Only
<b>30.00</b>	<b>METERS</b>							
30.01	Multifunction Meter	1	No.		0.00	0.00	0.00	INR Zero Only
<b>31.00</b>	<b>INSTRUMENT TRANSFORMER</b>							
31.01	PS class CT for line differential protection in incomer	3	Nos.		0.00	0.00	0.00	INR Zero Only
31.02	5P20 & metering class multi core CT for in incomer	3	Nos.		0.00	0.00	0.00	INR Zero Only
<b>32.00</b>	<b>MISCELLANEOUS</b>							
32.01	Surge Suppressor	1	Nos.		0.00	0.00	0.00	INR Zero Only
32.02	Vacuum Bottle (11KV, 1250A)	1	Nos.		0.00	0.00	0.00	INR Zero Only
32.03	Secondary disconnectiong switch	1	Nos.		0.00	0.00	0.00	INR Zero Only
32.04	11KV, 1250A, 40KA for 3 sec VCB complete with all auxiliaries	1	Nos.		0.00	0.00	0.00	INR Zero Only
32.05	11KV, 3 core PT, suitable for 11KV panel	3	Nos.		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

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Contract No: PNP/PC-183/E/206/NCB

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32.06	PT fuse	1	Set		0.00	0.00	0.00	INR Zero Only
32.07	Anti pumping relay	1	No.		0.00	0.00	0.00	INR Zero Only
<b>33.00</b>	<b>POWER &amp; DISTRIBUTION TRANSFORMER (1000 KVA, 11/0.433 kV Transformer)</b>							
33.01	Bushings complete with accessories for all 3 phase & neutral for all voltage grades.	1	Set		0.00	0.00	0.00	INR Zero Only
33.02	Complete set of gaskets	1	No.		0.00	0.00	0.00	INR Zero Only
33.03	Equaliser pipe and Explosion vent diaphragm	1	Set		0.00	0.00	0.00	INR Zero Only
33.04	PRV with alarm and trip	1	Set		0.00	0.00	0.00	INR Zero Only
33.05	Oil Level Gauge	1	No.		0.00	0.00	0.00	INR Zero Only
33.06	Complete charge of Silica gel with breather	1	Set		0.00	0.00	0.00	INR Zero Only
33.07	Gland packing / O-rings for every valve	1	Set		0.00	0.00	0.00	INR Zero Only
33.08	Buchholz Relay	1	No.		0.00	0.00	0.00	INR Zero Only
33.09	Analogue type OTI	1	No.		0.00	0.00	0.00	INR Zero Only
33.10	Analogue type WTI	1	No.		0.00	0.00	0.00	INR Zero Only
33.11	Radiator(one set of each type)	1	Set		0.00	0.00	0.00	INR Zero Only
33.12	Complte set of valve(1 no. of each type)	1	Set		0.00	0.00	0.00	INR Zero Only
33.13	Support insulator( HV Side)	1	Nos.		0.00	0.00	0.00	INR Zero Only
33.14	Support insulator( LV Side)	1	Nos.		0.00	0.00	0.00	INR Zero Only
33.15	Conservator gauge Glass/Sealing	1	No.		0.00	0.00	0.00	INR Zero Only
33.16	Thermister with space heater for M.B	1	No.		0.00	0.00	0.00	INR Zero Only
33.17	3 Pin switch & socket	1	No.		0.00	0.00	0.00	INR Zero Only
33.18	CT for REF	1	No.		0.00	0.00	0.00	INR Zero Only
33.19	CT for SBEF	1	No.		0.00	0.00	0.00	INR Zero Only
<b>34.00</b>	<b>BATTERY CHARGER</b>							
34.01	Power Thyristor/IGBT(each type and rating)	1	Nos.		0.00	0.00	0.00	INR Zero Only
34.02	Power supply Card(each installed card)	1	No.		0.00	0.00	0.00	INR Zero Only
34.03	Control Card(each installed card)	1	No.		0.00	0.00	0.00	INR Zero Only
34.04	Fuses (each type and rating) and fuse link	1	Nos.		0.00	0.00	0.00	INR Zero Only

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Contract No: PNP/PC-183/E/206/NCB

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34.05	Pulse transformer circuit	1	No.		0.00	0.00	0.00	INR Zero Only
34.06	Fuse fail monitor	1	No.		0.00	0.00	0.00	INR Zero Only
34.07	Blocker diodes	1	Nos.		0.00	0.00	0.00	INR Zero Only
34.08	Contactors( Each type and rating)	1	No.		0.00	0.00	0.00	INR Zero Only
34.09	All discrete type components like capacitors, resitors etc.	1	No.		0.00	0.00	0.00	INR Zero Only
34.10	Indicating lamp assembly	1	Set		0.00	0.00	0.00	INR Zero Only
34.11	Toggle switch	1	No.		0.00	0.00	0.00	INR Zero Only
34.12	DC under voltage/over voltage	1	No.		0.00	0.00	0.00	INR Zero Only
34.13	Battery earth fault	1	No.		0.00	0.00	0.00	INR Zero Only
34.14	Annunciator relays	1	No.		0.00	0.00	0.00	INR Zero Only
34.15	Auto float boost changeover	1	No.		0.00	0.00	0.00	INR Zero Only
34.16	Battery isolator	1	No.		0.00	0.00	0.00	INR Zero Only
<b>35.00</b>	<b>BATTERY</b>							
35.01	Rubber Syringe for tapping cells	1	Nos.		0.00	0.00	0.00	INR Zero Only
35.02	Alkali Resistant Funnel	1	Nos.		0.00	0.00	0.00	INR Zero Only
35.03	Alkali Resistant Jug	1	Nos.		0.00	0.00	0.00	INR Zero Only
35.04	Rubber gloves	1	Pair		0.00	0.00	0.00	INR Zero Only
35.05	Rubber apron	1	Nos.		0.00	0.00	0.00	INR Zero Only
35.06	A-type ladder with alkali resistant coating, 2 ft height	1	No.		0.00	0.00	0.00	INR Zero Only
35.07	Complete cells	1	Nos.		0.00	0.00	0.00	INR Zero Only
35.08	Vent plugs	1	Nos.		0.00	0.00	0.00	INR Zero Only
35.09	Inter cell connectors	1	Nos.		0.00	0.00	0.00	INR Zero Only
35.10	Set of nuts, bolts and washers	1	Set		0.00	0.00	0.00	INR Zero Only
<b>36.00</b>	<b>415V LV SWITCHBOARD</b>							
36.01	1600A, 50KA for 1 sec ACB							
36.02	Arc Chute assembly	1	Set		0.00	0.00	0.00	INR Zero Only
36.03	Shunt trip coil.	1	Set		0.00	0.00	0.00	INR Zero Only



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36.04	Closing coil	1	Set		0.00	0.00	0.00	INR Zero Only
36.05	Secondary isolating contact blocks.	1	Set		0.00	0.00	0.00	INR Zero Only
36.06	CONTROL SWITCHES							
36.07	Trip-Neutral-Close Control Switch	1	No.		0.00	0.00	0.00	INR Zero Only
36.08	Control Fuse							
36.09	Fuse Link	1	No.		0.00	0.00	0.00	INR Zero Only
36.10	Fuse Fitting	1	No.		0.00	0.00	0.00	INR Zero Only
36.11	Microprocessor based numerical relay used in incomer ACB feeder	1	No.		0.00	0.00	0.00	INR Zero Only
36.12	Microprocessor based numerical relay used in Motor ACB feeder	1	No.		0.00	0.00	0.00	INR Zero Only
36.13	Restricted earth fault numerical relay for Transformer feeder	1	No.		0.00	0.00	0.00	INR Zero Only
36.14	MCB for control circuit	1	No.		0.00	0.00	0.00	INR Zero Only
36.15	2500A, 50KA for 1 sec ACB complete with all auxiliaries	1	No.		0.00	0.00	0.00	INR Zero Only
<b>37.00</b>	<b>LIGHTING FIXTURE</b>							
37.01	2x18W LED Lighting Fixture with LED lamp	2	Nos.		0.00	0.00	0.00	INR Zero Only
37.02	90W LED street light fixture with LED lamp	2	Nos.		0.00	0.00	0.00	INR Zero Only
37.03	200W LED flood light fixture with LED lamp	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>38.00</b>	<b>AIR PRESSURIZATION SYSTEM</b>							
38.01	Drive belt(motor to fan)	5	Nos.		0.00	0.00	0.00	INR Zero Only
38.02	Set of DE & NDE bearings for all motors	1	Set		0.00	0.00	0.00	INR Zero Only
38.03	Humidity sensor	1	No.		0.00	0.00	0.00	INR Zero Only
38.04	Manometer	1	No.		0.00	0.00	0.00	INR Zero Only
38.05	Damper limit switches	2	Nos.		0.00	0.00	0.00	INR Zero Only
38.06	Power contactors	2	Nos.		0.00	0.00	0.00	INR Zero Only
38.07	Auxilliary contactors	6	Nos.		0.00	0.00	0.00	INR Zero Only
38.08	Overload relays	2	Nos.		0.00	0.00	0.00	INR Zero Only
38.09	Louvers	1	Set		0.00	0.00	0.00	INR Zero Only
38.10	Push button actuator type	4	Nos.		0.00	0.00	0.00	INR Zero Only

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Contract No: PNP/PC-183/E/206/NCB

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38.11	Water level float level	1	No.		0.00	0.00	0.00	INR Zero Only
38.12	Cooling fans for motors	1	No.		0.00	0.00	0.00	INR Zero Only
38.13	Grease, Nipple & Plug	2	Nos.		0.00	0.00	0.00	INR Zero Only
38.14	Fan Cover for Motor	1	No.		0.00	0.00	0.00	INR Zero Only
38.15	Terminal studs/bushing Assembly	1	No.		0.00	0.00	0.00	INR Zero Only
38.16	Set of blower bearings	1	Set		0.00	0.00	0.00	INR Zero Only
38.17	Bellow ( of each type)	1	No.		0.00	0.00	0.00	INR Zero Only
38.18	Motor housing DE/NDE side	1	Set		0.00	0.00	0.00	INR Zero Only
38.19	Pre-filter (50% of installed qty.)	1	Lot.		0.00	0.00	0.00	INR Zero Only
38.20	Fine filter (50% of installed qty.)	1	Lot.		0.00	0.00	0.00	INR Zero Only
38.21	Complete water pump with motor & coupling including Complete coupling sets for V-belt mounting at motor & blower end	1	Set		0.00	0.00	0.00	INR Zero Only
38.22	Strainer in suction	1	Set		0.00	0.00	0.00	INR Zero Only
<b>39.00</b>	<b>Dry type lighting transformer (For each rating)</b>							
39.01	Temperature Scanner	1	No.		0.00	0.00	0.00	INR Zero Only
39.02	Bushing with accessories	1	Set		0.00	0.00	0.00	INR Zero Only
39.03	Complete set of gasket	1	Set		0.00	0.00	0.00	INR Zero Only
<b>40.00</b>	<b>INTERLOCKING SWITCH SOCKET &amp; PLUG</b>							
40.01	Switch of each rating	2	Nos.		0.00	0.00	0.00	INR Zero Only
40.02	Fuse base of each rating	2	Nos.		0.00	0.00	0.00	INR Zero Only
40.03	Fuse of each rating	2	Nos.		0.00	0.00	0.00	INR Zero Only
40.04	Plug Top	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>41.00</b>	<b>ERECTION, TESTING &amp; COMMISSIONING OF ELECTRICAL ITEMS (SERVICES: PART-B)</b>							
<b>42.00</b>	<b>HT SWITCHBOARD (11 KV):</b>							

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42.01	Handling, storage at site, transportation from store to site of installation, erection, installation, testing and commissioning of HT Switchboard of 11KV etc. consisting of VCB's and other accessories free standing, floor mounting, cubicle type, as per the SLD, data sheets & Technical Specification (Doc. No. PC183-TS-0806) attached with the NIT, including transportation from the store to the site of erection, unpacking, inspection, assembly, fabrication and installation on foundation channels, drilling, cutting, welding, aligning, levelling, grouting, assembling and fitting all accessories/instruments/relays, relay coordination, CT, PT, Numerical Relay, interconnection of shipping sections and inter panel wiring as necessary, inter bus bar jointing and earthing of numerical relay, earthing of HT switch board, operational and functional checking, including termination of all LT/control cables, connection of 240V Supply/battery bank 110V DC supply, making all the interconnections/outgoing/incoming LT power & control cable connections including drilling of gland plate for making holes for cable entries as required, materials along with supply & fixing of WP double compression rolled aluminium cable glands, suitable end cable lugs (Al/Cu/Bimetalic), shrouding, plugging/sealing of all unused cable entries and other holes for making the same dust and vermin proof with all labour, tools and tackles, other consumables etc., as per drawings, specification and directions of Site Engineer/Engineer-in-Charge. Note: Commissioning assistance shall be provided by the supplier (OEM) of the HT Switchboard as and when required at site.							
42.02	11 KV, 1250 A, 750MVA for 3 sec., Switchboard (refer attached SLD) as specified at Sl. No. A 1 i) above .	1	Nos.		0.00	0.00	0.00	INR Zero Only
<b>43.00</b>	<b>415V POWER &amp; MOTOR CONTROL CENTER</b>							

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
43.01	<p>Handling, installation including transportation from store to site of installation, erection, testing and commissioning of 415V power-control-centres and bus duct, motor control centres, soft starters, APFC panel etc. assembling as required, unpacking, inspection, fabrication and erection of foundation channel, installation on the foundation channels, welding, aligning, leveling, grouting, assembling, fitting of all accessories / instruments / relays, relay coordination, CT, PT, Numerical Relay, interconnection of shipping sections and inter panel wiring as necessary, inter bus bar jointing, bus bar connection, installation, erection, testing and commissioning of bus duct, as per drawing, specifications and directions of the Site Engineer/ Engineer-in-Charge including cost of all materials, tools labour etc. complete in all respect including supply of WP double compression rolled aluminium cable glands &amp; lugs (Al/Cu/Bimetalic), termination of all power, control cables, installation of thermistor controller, internal wiring, earthing of LT panels &amp; bus duct, making holes for cable entries as required, shrouding, plugging/sealing of all unused cable entries and other holes for making the same dust and vermin proof etc. complete as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.</p> <p>This shall also include assembling as required, unpacking, inspection, fabrication and erection of foundation channel, installation on the foundation channels, welding, aligning, leveling, grouting, assembling, fitting of all accessories / instruments / relays, relay coordination, CT, PT, Numerical Relay, interconnection of shipping sections and inter panel wiring as necessary, inter bus bar jointing, bus bar connection, installation, as per drawing, specifications and directions of the Site Engineer/ Engineer-in-Charge including cost of all materials, tools labour etc. complete in all respect including supply of WP double compression rolled aluminium cable glands &amp; lugs (Al/Cu/Bimetalic), termination of all power, control cables, installation of thermistor controller, internal wiring, earthing of LT panels , making holes for cable entries as required, shrouding, plugging/sealing of all unused cable entries and other holes for making the same dust and vermin proof etc. complete as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.</p>	1	Nos.		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

NAME OF THE BIDDER/ BIDDING FIRM / COMPANY :								
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43.02	415V, 3 Ph & N, 1600 A, 50kA for 1 sec., Draw out type, Double front, indoor type Low Voltage switchboard (Power & Motor Control Centre, PMCC) (refer attached SLD) as specified at Sl. No. A 4 i) above .							
<b>44.00</b>	<b>TRANSFORMER</b>							
44.01	Handling, storage at site, transportation from store to site of installation, erection, installation, testing and commissioning of (outdoor type - ONAN cooled) transformer, erection of transformer over the rail and foundation channels, including transporting, unpacking, rigging, aligning, levelling, grouting, assembling, fitting and fixing all accessories/instruments/relays etc. supplied separately if any, etc., supply of WP double compression rolled aluminium cable glands & suitable lugs (Al/Cu/Bimetalic), making all the interconnections & termination of all power (HT/LT) cables, control cables / busbar etc. as per drawings, including earthing/grounding of transformer neutral as per drawing, equipments needed to completely install and commission the transformer Job complete in all respect including cost of all labour, tools and materials and all services rendered complete, installation of thermistor controller, internal wiring, earthing of LT panel etc. complete as per drawings and directions of the Site Engineer / engineer-in-Charge. Note: Commissioning assistance shall be provided by the supplier of the Transformer as and when required at site.							
44.02	1000 KVA, 11/0.433 kV Transformer (ONAN), 50 Hz, Dyn11with off load tap changer	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>45.00</b>	<b>TRANSFORMER OIL :</b>							
45.01	Centrifuging, filtering and dehydrating of the transformer oil of transformer to improve insulation level to the value recommended as per the relevant ISS and the manufacturer's recommendations and as per specifications and directions of the Site Engineer/Engineer-in-Charge including supply of labour, tools and materials and all services rendered complete.	2500	Ltr		0.00	0.00	0.00	INR Zero Only
<b>46.00</b>	<b>DRY TYPE LIGHTING TRANSFORMERS</b>							

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Contract No: PNP/PC-183/E/206/NCB

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46.01	Handling, Installation, Testing and Commissioning of Dry Type Lighting Transformers (as indicated in Supply Part-A) excluding power and control cable termination but including transportation of lighting transformer and its accessories from owner's stores, placing in position on MS base channel/ flat, assembly of all accessories supplied loose, all labour and material complete as per drawings/ specification and direction of the lighting transformer manufacturer.							
46.02	50 KVA, 433/415 V, Dry Type Lighting Transformers	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>47.00</b>	<b>TESTING &amp; COMMISSIONING of LV MOTORS</b>							
47.01	Testing and commissioning of 3-Phase, 415V, Squirrel Cage, Hoseproof Induction Motors of following ratings excluding cable glanding, cable termination, dehydration of windings but including checking & replenishment/ replacement of bearing grease/ lubricant; checking of IR values between each winding & motor frame & checking of continuity of rotation, if required, by changing supply connections; trial runs on NO LOAD & ON LOAD; supply of approved grease/ lubricant & necessary hardware; all work, labour & materials complete as per specifications, documents, codes & standards & directions of engineer-in-charge. (Contractor to keep proper record of tests on motors for NO LOAD & ON LOAD runs)							
<b>48.00</b>	<b>Hoseproof Motors</b>							
48.01	Rating upto 5.5 KW	15	Nos.		0.00	0.00	0.00	INR Zero Only
48.02	Rating above 5.5 KW but upto 11 KW	6	Nos.		0.00	0.00	0.00	INR Zero Only
48.03	Rating above 11 KW but upto 22 KW	7	Nos.		0.00	0.00	0.00	INR Zero Only
48.04	Rating above 22 KW but upto 45 KW	4	Nos.		0.00	0.00	0.00	INR Zero Only
48.05	Rating above 45 KW but upto 75 KW	2	Nos.		0.00	0.00	0.00	INR Zero Only
48.06	Rating above 75 KW but upto 150 KW	2	Nos.		0.00	0.00	0.00	INR Zero Only
48.07	Dehydration of the following motors to improve the insulation resistance value of the winding to the required level as per direction of the site in-charge.							
48.08	Rating up to 22 KW	1	Nos		0.00	0.00	0.00	INR Zero Only

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<b>49.00</b>	<b>CABLES (HT &amp; LT)</b>							
49.01	Handling, Laying (horizontal & vertical), testing and commissioning of 11KV(UE)/ 1.1 KV Grade, XLPE Insulated, PVC inner sheathed, armoured, FRLS PVC outer sheathed cables including its termination in new & readymade trenches, on pre-fabricated/ site-fabricated cable trays/ racks, on already installed risers, support, hangers,saddles / directly burried up to 700mm depth etc. pulling through pipes on walls/columns, steel structures including transportation of cable drums from storage yard to site, unrolling the drum, including supply & fixing of cable tags, Al clamps with all labour, consumable materials and necessary hardware to make installation complete in all respect as per direction of engineer-in-charge.							
<b>50.00</b>	<b>HT (11KV/3.3 KV) Power cables</b>							
50.01	Power cables HT (11 KV) upto 400 sq. mm	3000	Mtrs.		0.00	0.00	0.00	INR Zero Only
<b>51.00</b>	<b>LT (PVC / XLPE / Armoured / Unarmoured / Power / Control / Signalling) Cables</b>							
51.01	3.5C x 400 mm <sup>2</sup> (Al)	400	Mtr		0.00	0.00	0.00	INR Zero Only
51.02	3.5C x 120 mm <sup>2</sup> (Al)	100	Mtr		0.00	0.00	0.00	INR Zero Only
51.03	3.5C x 70 mm <sup>2</sup> (Al)	700	Mtr		0.00	0.00	0.00	INR Zero Only
51.04	3.5C x 50 mm <sup>2</sup> (Al)	200	Mtr		0.00	0.00	0.00	INR Zero Only
51.05	3.5C x 25 mm <sup>2</sup> (Al)	600	Mtr		0.00	0.00	0.00	INR Zero Only
51.06	4C x 4 mm <sup>2</sup> (Cu)	1000	Mtr		0.00	0.00	0.00	INR Zero Only
51.07	4C x 6 mm <sup>2</sup> (Cu)	400	Mtr		0.00	0.00	0.00	INR Zero Only
51.08	4C x 16 mm <sup>2</sup> (Al)	400	Mtr		0.00	0.00	0.00	INR Zero Only
51.09	3C x 120 mm <sup>2</sup> (Al)	1500	Mtr		0.00	0.00	0.00	INR Zero Only
51.10	3C x 70 mm <sup>2</sup> (Al)	800	Mtr		0.00	0.00	0.00	INR Zero Only
51.11	3C x 25 mm <sup>2</sup> (Al)	1000	Mtr		0.00	0.00	0.00	INR Zero Only
51.12	3C x 6 mm <sup>2</sup> (Cu)	1200	Mtr		0.00	0.00	0.00	INR Zero Only
51.13	3C x 4 mm <sup>2</sup> (Cu)	400	Mtr		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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51.14	3C x 2.5 mm <sup>2</sup> (Cu)	5500	Mtr		0.00	0.00	0.00	INR Zero Only
51.15	5C x 2.5 mm <sup>2</sup> (Cu)	725	Mtr		0.00	0.00	0.00	INR Zero Only
51.16	7C x 2.5 mm <sup>2</sup> (Cu)	6000	Mtr		0.00	0.00	0.00	INR Zero Only
51.17	12C x 2.5 mm <sup>2</sup> (Cu)	1200	Mtr		0.00	0.00	0.00	INR Zero Only
51.18	1Cx185 mm <sup>2</sup> (Al)	100	Mtr		0.00	0.00	0.00	INR Zero Only
51.19	Handling,laying of 6 Fiber multi mode FO Cable suitable for relay to relay distance of approx 2 km for line differential protection with all accessories for termination , this also include splicing, jointing as per requiremnt	3000	Mtr		0.00	0.00	0.00	INR Zero Only
<b>52.0</b>	<b>EARTH STRIP / WIRE / ROPE / CABLE</b>							
52.01	Handling,Installing and testing of earthing strip/wire/rope/cable for completely making the earthing grid system by supplying, laying the GI / Cu strip and making all the necessary welding joints, connecting to the earthing electrodes and existing earthing grid etc., complete as per drawings, specifications and directions of the Site engineer/Engineer-in-charge, including the cost of all labour, tools, materials, etc. complete in all respect.							
52.02	Note: The conductors shall be laid at a minimum depth of 500 mm from ground level.The excavation for the GI earth conductors / strips shall not be separately measured and the rates quoted to include the same.							
52.03	75 mm x 10 mm	300	Mtr		0.00	0.00	0.00	INR Zero Only
52.04	50 mm x 6 mm	200	Mtr		0.00	0.00	0.00	INR Zero Only
52.05	1Cx25 sq. mm Al cable Unarmoured	100	Mtr		0.00	0.00	0.00	INR Zero Only
52.06	GI wire Rope (8 SWG)	30	Mtr		0.00	0.00	0.00	INR Zero Only
52.07	Handling,Installation, Testing and Commissioning of 35x6 GI strip on parapet of surface of wall for lightning conductor as required for vertical run including test link etc & horizontal run along wall,column,prapet etc complete with PVC fasteners,screws,Saddles, and welding/revetting and painting of joints etc as required.	200	Mtr		0.00	0.00	0.00	INR Zero Only
<b>53.0</b>	<b>CABLE TRAYS:</b>							



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53.01	Handling, installation & fixing of prefabricated ladder GI cable trays and their accessories i.e. supply of all hardware required i.e. J-hooks, GI Nut, Bolt, Washers, coupling plate etc. of width 150 mm, 300 mm, 450 mm & 600 mm as per site requirement for laying of cables with standard rung spacings. Load for support span of 2.5 meter as 30, 60, 75 & 90 (in Kg/Mtr.) respectively with concentric static load as 70 Kg at the centre, with materials, labour, tools and tackles, consumables etc. as per drawings, specification and directions of Site Engineer / Engineer-in-Charge. The rates shall be valid for all mounting heights.							
53.02	<b>Straight Run Cable Trays</b>							
53.03	600 mm wide	1500	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.04	450 mm wide	200	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.05	300 mm wide	1500	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.06	150 mm wide	200	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.07	<b>Horizontal Bends</b>							
53.08	600 mm wide, 700 mm radius	20	Nos.		0.00	0.00	0.00	INR Zero Only
53.09	450 mm wide, 700 mm radius	15	Nos.		0.00	0.00	0.00	INR Zero Only
53.10	300 mm wide, 700 mm radius	60	Nos.		0.00	0.00	0.00	INR Zero Only
53.11	150 mm wide	20	Nos.		0.00	0.00	0.00	INR Zero Only
53.12	<b>Vertical Inside Bends</b>							
53.13	600mm wide, 1000mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
53.14	450 mm wide, 1000mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
53.15	300 mm wide, 1000mm radius	30	Nos.		0.00	0.00	0.00	INR Zero Only
53.16	150 mm wide	20	Nos.		0.00	0.00	0.00	INR Zero Only
53.17	<b>Vertical Outside Bends</b>							
53.18	600 mm wide, 1000 mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
53.19	450 mm wide, 1000 mm radius	10	Nos.		0.00	0.00	0.00	INR Zero Only
53.20	300 mm wide, 1000 mm radius	35	Nos.		0.00	0.00	0.00	INR Zero Only
53.21	150 mm wide	20	Nos.		0.00	0.00	0.00	INR Zero Only

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53.22	<b>Reducer</b>							
53.23	600 mm / 450 mm wide	10	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.24	450/300mm wide	10	Nos.		0.00	0.00	0.00	INR Zero Only
53.25	300/150mm wide	10	No.		0.00	0.00	0.00	INR Zero Only
53.26	<b>Regular Tees</b>							
53.27	600 mm wide , 700 mm radius	5	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.28	450 mm wide, 700 mm radius	8	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.29	<b>Cross</b>							
53.30	600 mm wide , 700 mm radius	10	Mtrs.		0.00	0.00	0.00	INR Zero Only
53.31	450 mm wide, 700 mm radius	5	Mtrs.		0.00	0.00	0.00	INR Zero Only
<b>54.00</b>	<b>SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF ELECTRICAL COMPOSITE ITEMS (PART-C)</b>							
<b>55.00</b>	<b>DISTRIBUTION BOARDS:</b>							
55.01	Supply, unloading, Handling, Storage, transporation within site, Erection, Installation, testing and commissioning etc. of following floor / wall mounted Distribution Boards/Sub distribution board having minimum IP-54 protection, Aluminium Bus Bar with Color Coded Heat Shrinkable Sleeves, storage, handling, site trasporation from store to site of installation, including supply and fabrication of epoxy painted MS frame, operational and functional checking, drilling of gland plates with requisite holes, supply & fixing of suitable double compression nickel plated brass/rolled Al cable glands & suitable lugs, termination of all power and control cables, shrouding,plugging of all unused cable entries and other holes found in the boards to make the same dust and vermin proof with all labour and consumable materials to make installation complete of following Distribution Boards as specified in Technical Specification - Electrical,Technical Specification PC183-TS-0808 and attached SLD, data sheets, drawings, specifications and directions of engineer-in-charge :							

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NUMBE R #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
55.02	415 V, 3 Ph & N, IP54 floor mounted sheet steel enclosed Main Lighting Distribution Board MLDB) consisting of 2 nos. incoming 250 A MCCB incomer with 150/1 CT, 250A contactor, MFM, voltmeter, VSS & RYB indications & 5 nos. 63 A TPN RCCB outgoing feeders on indoor bus and 4 nos. 125A TPN RCCB & 3 nos. 63A TPN RCCB outgoing feeders on outdoor bus with Photocell controlled (125A contactor with MCCB) as indicated in attached SLD for MLDB enclosed with Technical specification PC183-TS-0808.	1	Nos.		0.00	0.00	0.00	INR Zero Only
<b>56.00</b>	<b>WALL / STRUCTURE MOUNTED SUB DISTRIBUTION BOARDS / FEEDAR PILLAR BOXES</b>							
56.01	Supply,unloading,Handling, Storage,transporation within site, Installation, testing and commissioning of following floor / wall mounted Distribution Boards, including supply and fabrication of epoxy painted MS frame, operational and functional checking, drilling of gland plates with requisite holes, fixing of cable glands, plugging of all unused cable entries and other holes found in the boards to make the same dust and vermin proof with all labour and consumable materials to make installation complete of following wall / structure mounted Distribution Boards as specified in Technical Specification - Electrical, Technical Specification PC183-TS-0809., Single Line Diagrams, Specification Sheets, Specifications and directions of Engineer-in-Charge.							
56.02	415 V, 12-way, wall / structure mounted Sheet Steel enclosed Industrial Type Hose Proof and weatherproof (IP-65) Lighting Sub Distribution Boards having 1 No. Incoming (63 A 4PMCCB) and 3 nos. feeder circuit of 63A DP RCBO having 12 Nos. outgoing of 16 A DP MCB as indicated in attached SLD along with technical specifications, standards etc. (i.e.4 nos. 16 A DP MCB per circuit).	3	Nos.		0.00	0.00	0.00	INR Zero Only
56.03	415 V, 9-way, wall / structure mounted Sheet Steel enclosed Industrial Type Hose Proof and weatherproof (IP-65) Lighting Sub Distribution Boards having 1 No. Incoming (63 A 4PMCCB) and 3 nos. feeder circuit of 63A DP RCBO having 9 Nos. outgoing of 16 A DP MCB as indicated in attached SLD along with technical specifications, standards etc.(i.e.3 nos. 16 A DP MCB per circuit).	2	Nos.		0.00	0.00	0.00	INR Zero Only

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**Item Rate BoQ**

Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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<b>Sl. No.</b>	<b>Item Description</b>	<b>Quantity</b>	<b>Units</b>	<b>BASIC RATE In Figures To be entered by the Bidder in Rs. P</b>	<b>GST @ 18% in RS. P</b>	<b>TOTAL AMOUNT Incl. All taxes &amp; duties (Excl. GST) in Rs. P</b>	<b>TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P</b>	<b>TOTAL AMOUNT Incl. All taxes, duties and GST In Words</b>
56.04	415V Hose proof and weatherproof industrial type sheet steel enclosed, 18 way Lighting Distribution Board (LSDB) with IP-55 degree of protection having 1 no.(63 A 4PMCCB) and 3 nos. feeder circuit of 63A DP RCBO having 18 nos.16A DP MCBs outgoing as indicated in attached SLD along with technical specifications, standards etc.	3	No.		0.00	0.00	0.00	INR Zero Only
56.05	415 V, 3 Ph & N, IP55, wall/structure mounted sheet steel enclosed Feeder pillar box consisting of 1 nos. incoming 125A TPN MCCB incomer with RYB indications and 4 nos. 63A TPN MCCB outgoing feeders as indicated in attached SLD for feeder pillar box enclosed with Technical specification EM251-TS-0803.	1	No.		0.00	0.00	0.00	INR Zero Only
<b>57.00</b>	<b>PRESSURIZATION SYSTEM</b>							
57.01	Design, engineering, manufacturing, testing & delivery at site (supply), unloading, handling, storage, transporation within site, assembly and erection, testing, commissioning & guarantee test for final acceptance of Pressurization System consisting of Blower, Air filter, Air washer internals, moisture eliminator, Air damper, louvers, vibration isolation pads, motor pump set for water spraying, local control station, supply and fixing of rolled aluminium cable glands and suitable cable lugs (Al/Cu/Bimetalic), termination of power and control cable, plugging of all unused cable entries and other accessories required for completeness of system as specified in Technical Specification (Doc. No. PC183-TS-0839). Note: Installation & Commissioing shall be executed by Pressurization system manufacturer.	1	Lot.		0.00	0.00	0.00	INR Zero Only
<b>58.00</b>	<b>EMERGENCY PUSH BUTTON STATION FOR TRANSFORMER (Weatherproof)</b>							

## Item Rate BoQ

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58.01	Supply ,erection,testing and commissioning of Weather Proof push button(OFF) control station of approved make for emergency transformer tripping at field including connection and termination of copper control cable, fabricating, earthing the supporting structure,termination of cables painting the same, including supply & installation of cable glands & plugs for sealing all spare entries including the cost of all labour,tools, materials etc. complete in every respect as per the specification and directions of the Engineer-in-charge.	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>59.00</b>	<b>BATTERY CHARGER WITH BATTERY BANK ALONG WITH DCDB</b>							
59.01	Supply, storage at site, Handling, Transporation from store to site of installation, erection, installation, testing and commissioning of Medium discharge Nickle Cadmium type, 110 V, 80 AH battery bank with 50 A dual Float cum Boost Charger (FCBC) complete with DC distribution board (DCDB) as per SLD and one no. cell booster as per Technical Specification - Electrical, Technical Specification (PC183-TS-0813 & PC183-TS-0814) of approved make only. The item includes batteries, float cum boost charger, DCDB, battery stand, interconnecting copper cables, insulated copper links, earthing of FCBC and battery stand, connection and termination of all power and control cables of battery charger, battery bank and DCDB etc., supply and fxing of double compression cable glands and suitable lugs, plugging of all unused cable entries etc., all consumables, materials, labour, tools and tackles, etc. for the completeness of system as per drawings, specification and directions of Site Engineer / Engineer-in-Charge	1	No.		0.00	0.00	0.00	INR Zero Only
<b>60.00</b>	<b>LIGHTING</b>							

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60.01	Supply, unloading, storage, handling, transporation within site from store to site of installation, installation, connection, earthing and testing of the following LED fittings, including supply and installation of drop pipes, hooks, JB/TB for looping of fixtures, fittings, fixtures, nuts, bolts, supports, on walls and all other required materials gland, lugs as required etc. as specified in Technical Specification and all hardware for fixing the lighting fittings with ceiling/wall pole including cable glanding, crimping of lugs on cable conductor & connecting cables at fixtures in looping and from lighting DB, earthing, junction boxes, etc., drawings and directions of the Site Engineer including cost of all labour, tools, materials as well as transportation from store to site of erection with all labour and material to make installation complete in all respect. Make of the fittings shall be as per approved make as metioned in Technical specification.							
60.02	LED Tube light fitting industrial type of approved make suspension mounting suitable for 240V AC as per Technical specification complete with 2x18 W LED fixture with all accessories such as LED lamp/chip, electronic driver, Refelector, Terminal block etc.The fittings shall be provided with suspension accessory / wall mounting bracket depending upon directions by EIC / Site Engineer. The minimum degree of protection shall be IP 20.	20	Nos.		0.00	0.00	0.00	INR Zero Only
60.03	LED Tube light fitting industrial type of approved make suspension mounting/wall mounting suitable for 240V AC as per Technical specification complete with 1x20 W LED fixture with all accessories such as LED lamp/chip, electronic driver, Refelector Terminal block etc etc.. The fittings shall be provided with suspension accessory / wall mounting bracket depending upon directions by EIC / Site Engineer. The minimum degree of protection shall be IP 20.	2	Nos.		0.00	0.00	0.00	INR Zero Only
60.04	LED Tube light fitting industrial type of approved make wall mounting suitable for 240V AC as per Technical specification complete with 1 x 20 W LED fixture with all accessories such as LED lamp/chip, electronic driver , Refelector , terminal block etc.. The fittings shall be provided with wall mounting bracket depending upon directions by EIC / Site Engineer. The minimum degree of protection shall IP 55.	15	Nos.		0.00	0.00	0.00	INR Zero Only

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**Item Rate BoQ**

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Contract No: PNP/PC-183/E/206/NCB

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60.05	Corrosion resistant LED Tube light fitting industrial type of approved make wall /ceiling mounting suitable for 240V AC as per Technical specification complete with 1 x 20 W LED fixture with all accessories such as LED lamp/chip,, electronic driver , Refelector,terminal block etc.. The fittings shall be provided with suspension accessory / wall mounting bracket depending upon directions by EIC / Site Engineer. The minimum degree of protection shall IP 65.	18	Nos.		0.00	0.00	0.00	INR Zero Only
60.06	Supply,unloading, storage, handling, transporation within site from store to site of installation, installation, connection, testing and commissioning of pre-wired 240V AC,1-Ph, WP outdoor,LED Lighting fixtures including LED lamp with driver and JB for looping of cables of following type which shall be suitable for use in safe area having IP-65 degree of protection complete with all accessories, double compression Ni-plated brass cable glangs & plugs, blanking plugs etc. as specified in Technical specification and all hardware for fixing the lighting fittings with structure/ lighting pole including cable glanding, crimping of lugs on cable conductor & connecting cables at fixtures, earthing, junction boxes, etc. including supply of all connecting materials like clamps, supports, conduits, down rods etc. as required as well as transportation from store to site of erection with all labour and material to make installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge. The rates shall be valid for all mounting heights.							
60.07	120 W LED Flood light, WP type lighting fixturesof Philips make or approve equivalent make as per technical specification with led lamp/chip, driver etc. complete with increased safety cable glands, plug suitable for 3 X 2.5mm <sup>2</sup> XLPE-A-PVC cable and stopping plug.	12	Nos.		0.00	0.00	0.00	INR Zero Only

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60.08	Bulkhead type LED light fitting type of approved make wall mounting suitable for 110V DC as per Technical specification complete with 1 x 20 W LED fixture with all accessories such as LED lamp/chip, electronic driver , terminal block, Reflector etc.. The fittings shall be provided with suspension accessory / wall mounting bracket depending upon directions by EIC / Site Engineer. The minimum degree of protection shall IP 65.	15	Nos.		0.00	0.00	0.00	INR Zero Only
<b>61.00</b>	<b>Local control station for Motors</b>							
61.01	Supply, Handling, storage at site, transportation from store to site of installation, erection, installation, testing and commissioning of weatherproof Local control station in die cast aluminium alloy (LM-6) enclosure along with suitable rain protection hood of following type as per technical specification, data sheet, codes & standards. For the motor on, off control from field including connection and termination of copper control cable, fabricating, earthing the supporting structure, painting the same. This shall also include transporation of store to site of erection, fixing control stations with nuts and bolts on new support (1.8 mtr height including grouting of 300mm below ground), connecting control cable for start, stop, L/R selector switch, ammeter and indication lamps as required and testing to make the installation complete in all respect as per approved drawings, specifications & direction of engineer-in-charge							
61.02	Type-1 LCS with Trip Neutral Close Control Switch + Auto / Manual Selector Switch + 3 nos. Indication Lamps + Ammeter for all ACB fed motors.	1	Nos.		0.00	0.00	0.00	INR Zero Only
61.03	Type-2 LCS with Start Stop Push Button + Auto / Manual Selector Switch + 1 no. Indication Lamp + Ammeter for all DOL motor feeders of rating: 30 kW ≤ P < 75 kW	18	Nos.		0.00	0.00	0.00	INR Zero Only
61.04	Type-3 LCS with Start Stop Push Button + Auto / Manual Selector Switch + Ammeter for all DOL motor feeders of rating: 5.5 kW ≤ P < 30 kW	6	Nos.		0.00	0.00	0.00	INR Zero Only
61.05	Type-4 LCS with Start Stop Push Button + Auto / Manual Selector Switch for all DOL motor feeders of rating: P < 5.5 kW	15	Nos.		0.00	0.00	0.00	INR Zero Only



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Contract No: PNP/PC-183/E/206/NCB

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61.06	Supply, Installation, Testing & Commissioning of following single phase wall fan and exhaust fan with guards / louvres, along with necessary brackets, all required civil works, making good the walls after fixing the fans etc.							
61.07	380 mm sweep heavy duty exhaust fan	4	Nos		0.00	0.00	0.00	INR Zero Only
61.08	Corrosion proof, flameproof 300mm sweep heavy duty exhaust fan for battery room	2	Nos		0.00	0.00	0.00	INR Zero Only
<b>62.00</b>	<b>WP SWITCH CUM SOCKET :</b>							
62.01	Supply, erection, installation, testing and commissioning of flameproof/weatherproof switch cum socket/welding receptacle having IP65 protection of approved makes to be installed on walls, columns, structures, including handling, storage, transporation from store to site of installation, supply & installation of double compression cable glands, suitable lugs & WP/flame proof plugs for sealing all spare entries etc., including connection and termination of all power cables, earthing wire and conduits, etc. complete as per drawings, specifications and direction of the Site Engineer, including the cost of all labour, tools, consumable materials etc. complete in all respect							
62.02	250 V, 15 A switch cum socket with plug (Weatherproof)	4	Nos		0.00	0.00	0.00	INR Zero Only
62.03	415V, 63A, Switch & Socket with Plug (No. of Pins 3P +N+ E), (Weather proof)	3	Nos		0.00	0.00	0.00	INR Zero Only
<b>63.00</b>	<b>EARTHING AND LIGHTNING PROTECTION</b>							

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63.01	Supply, Installation, Testing & Commissioning of 100 NB, 3.8 M long G.I. pipe Earth Electrode in Earth pit as per PDS attached with TS Including handling, transportation to Erection site, Excavation of Earth pit in all types of soil, back filling of pit with common salt, charcoal / coke and loose Earth after installation of Electrode there in, removal of surplus Earth away from Erection site, consolidation of loose Earth on back filled pit, making of bricks work, Inspection chamber on back filled pit and cover of RCC, there of complete with lifting hook, fixing & connecting inside the chamber of G.I. Earth bracket and other accessories of the Earth Electrode, painting of Earth pit No. and Earthing symbol on the cover, supply of salt, charcoal / coke, bricks, sand, cement, stone chips, reinforcement rods, lifting hook, necessary stainless steel hardware, paints etc. (Excluding supply of G.I. Earth Electrode & its accessories), all works, labour & materials complete as per Drawings, specifications, code & standards and direction of consultant / owner.	10	Nos		0.00	0.00	0.00	INR Zero Only
63.02	Supply, Installation & Commissioning of GI Earth Bus bars (size: 390x50x12mm thick) as per PDS attached with TS Including handling, transportation, drilling of necessary holes/enlargement existing holes as required; all associated work for fixing the Bus bars in position e.g. cutting, leveling, aligning, chipping, grouting, welding bolting etc.; making good of broken/chipped portion on walls /columns by cement plastering. Supply of all necessary hardware (GI), paints, civil masonry materials etc. all work,labour complete as per drawings, specifications, codes and standards and directions of consultant /owner.Hot dip galvanized GI earth bus bar of size 390 x 50 x 12 thick (with min. coating 610gm/sq.m of zinc) with fixing materials as per specifications and direction of Engineer in charge	5	Nos		0.00	0.00	0.00	INR Zero Only
63.03	Supplying and laying of the stainless steel SS-304 air terminations, base plate & clamping of down Conductor complete with base plate, concrete coping fixing accessories and clamping with down Conductor	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>64.00</b>	<b>HT CABLE JOINT (11 KV)</b>							

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64.01	Supply, Making straight-through joint on 11 KV Aluminium XLPE insulated armoured screened cable, including the supply of required materials such as cable jointing kit (of heat shrinkable sleeve type of Raychem, materials, labour, tools and tackles, consumables etc., as per drawings, specification and directions of Site Engineer / Engineer-in-Charge. For cables of size upto 3 core x 400 sq. mm Note: Lugs supplied with HT cable joint shall be Al/Cu/Bimetallic (as per cable/bus bar type).							
64.02	11KV (UE) grade XLPE insulated, 3Cx240 (Al)	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>65.00</b>	<b>HT Cable Termination (11 KV):</b>							
65.01	Supply, termination and connection of following 11KV(UE) Multicore/single core, XLPE cable termination kit (indoor type), heat shrinkable sleeve type of Raychem make with all accessories, including cutting (tools and accessories for termination should meet the selected standards), stripping of cable insulation providing copper cable end lugs and cable glands as required, restoration of insulation, supplying and providing the cable supporting clamps, straps, cable tags connection to the terminals of HT panel, VFDs, Isolators, transformer, DG etc., earthing of armouring, materials, labour, tools and tackles, consumables etc., as per drawings, specification and directions of Site Engineer / Engineer-in-Charge. Note: Lugs supplied with HT cable termination shall be Al/Cu/Bimetallic (as per cable/bus bar type).							
65.02	11KV (UE) grade XLPE insulated, 3Cx240 (Al)	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>66.00</b>	<b>GI PIPE</b>							

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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66.01	Supply, erection & installation of cable conduits made up of GI pipes of medium class 'B' subject to owner's approval in trenches (already made), on walls, concrete structure etc., including supply and installation of all the necessary pipe fittings such as bends, sockets, elbows, tees etc., bending, threading, binding, clamping, providing, spacers, plugs, packings, bushings etc., as required Job complete in all respects including the cost of all labour, tools, material etc. and as per specifications and directions of site engineer / Engineer-in-Charge.							
66.02	100 mm	10	Meter		0.00	0.00	0.00	INR Zero Only
66.03	50 mm	10	Meter		0.00	0.00	0.00	INR Zero Only
<b>67.00</b>	<b>HDPE PIPE</b>							
67.01	Supply, laying of HDPE 32mm dia 3mm thick as per IS 7238 grade 80, Pipe in trenches / walls / concrete structure / panels etc. as per specifications and drawings & blowing / laying of Optical Fibre Cable in HDPE pipe, carrying out end to end testing of laid Optical fibre cables by taking OTDR traces and submitting the OTDR trace printouts to Site Engineer / Engineer-in-charge. The job includes the supply and installation of required materials such as fixing clamps, screws, tags etc. as required to complete the job in all respects as per drawings and directions of Site Engineer / Engineer-in-charge including cost of all labour, tools & tackles, test instruments, materials etc. The job includes handing over the tested cables to the Telecom / Control System Works Contractor in commissioning of Local Area Network.	1200	Mtrs.		0.00	0.00	0.00	INR Zero Only
67.02	Supply, fabrication, erection, installation of steel structural works of any type and shape such as cable raks, cable trays, push button control posts etc., as required job complete in all respects including the cost of all labour, tools, material etc., complete and as per specifications and directions of site engineer/Engineer-in-Charge.	3000	Kg		0.00	0.00	0.00	INR Zero Only
67.03	Supply, Fabrication & installation of 2 mm thick Al sheet for rain protective hood for outdoor equipment e.g. motors, switch sockets, junction boxes etc.	10	M <sup>2</sup>		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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67.04	Supply, Fabrication and Installation of 8mm thick chequered plate in flooring, steps, covers over cable trenches in switch board room, painting with one coats of bitumen paint in the 50% thinner with two coats of black bitumen paints including supply of all consumables and paints.	500	Kg		0.00	0.00	0.00	INR Zero Only
<b>68.00</b>	<b>WP JUNCTION BOX</b>							
68.01	Supply, erection, installation, testing and commissioning of flameproof & weather proof 240 V, 25A, junction box for providing cable termination, including connection and termination of earthing wire and conduits etc., including supply & installation of double compression cable glands & flame proof plugs for sealing all spare entries complete as per drawings, specifications and direction of the Site Engineer, including the cost of all labour, tools, consumable materials etc., complete in all respect.							
68.02	240V, 16A, 4 way junction box with 4 cable entries (4 x 3/4") at bottom & 20 nos. terminals.	5	Nos.		0.00	0.00	0.00	INR Zero Only
68.03	Supplying and spreading of approved quality fine dry river sand in cable trenches including the cost of all material, transport, load and lift charges, labour, tools and tackles, consumables etc., as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.	150	M3		0.00	0.00	0.00	INR Zero Only
68.04	Supply laying, spreading of Class B 9"x 4.25" x 3" bricks for cable trenches soling with sand filling in the interstices, in cable trenches for protection including the cost of all brick and sand, labour, load and lift charges, tools and tackles etc., as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.	15000	Nos		0.00	0.00	0.00	INR Zero Only
68.05	Supply, erection & installation of MS cable markers, including excavation, installation of the markers, cement concrete grouting, backfilling, materials, labour, tools and tackles, consumables etc., as per drawings, specification and directions of Site Engineer / Engineer-in-Charge.	50	Nos.		0.00	0.00	0.00	INR Zero Only
<b>69.00</b>	<b>TERMINATION OF CABLES (LT)</b>							

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Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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69.01	End termination and subsequent testing of XLPE insulated single core/ multi core armoured cables of 1.1KV grade, Al/ Cu cable.,including supply of double compression rolled aluminium cable glands, suitable lugs (Al/Cu/Bimetallic)and lugs of all phases & neutral , all labour and consumable materials to make installation complete in all respect. Modification in existing switch board for accomodating the proposed cables. The rate shall include drilling, taping of cable insulation, crimping of lugs to the conductor, connection of the lugs to equipment terminal, supply and fixing of supports & clamps for cables, G.I. nuts, screws, bolts, washers and other necessary hardware, PVC tape of required grade for taping, making cable entries dust and vermin proof, earthing etc. as per instruction of manufacturer, approved drawings, specifications and directions of engineer-in-charge.							
69.02	3.5C x 400 mm <sup>2</sup> (Al)	16	Nos		0.00	0.00	0.00	INR Zero Only
69.03	3.5C x 120 mm <sup>2</sup> (Al)	2	Nos		0.00	0.00	0.00	INR Zero Only
69.04	3.5C x 70 mm <sup>2</sup> (Al)	10	Nos		0.00	0.00	0.00	INR Zero Only
69.05	3.5C x 50 mm <sup>2</sup> (Al)	2	Nos		0.00	0.00	0.00	INR Zero Only
69.06	3.5C x 25 mm <sup>2</sup> (Al)	8	Nos		0.00	0.00	0.00	INR Zero Only
69.07	4C x 4 mm <sup>2</sup> (Cu)	10	Nos		0.00	0.00	0.00	INR Zero Only
69.08	4C x 6 mm <sup>2</sup> (Cu)	4	Nos		0.00	0.00	0.00	INR Zero Only
69.09	4C x 16 mm <sup>2</sup> (Al)	8	Nos		0.00	0.00	0.00	INR Zero Only
69.10	3C x 120 mm <sup>2</sup> (Al)	8	Nos		0.00	0.00	0.00	INR Zero Only
69.11	3C x 70 mm <sup>2</sup> (Al)	8	Nos		0.00	0.00	0.00	INR Zero Only
69.12	3C x 25 mm <sup>2</sup> (Al)	10	Nos		0.00	0.00	0.00	INR Zero Only
69.13	3C x 6 mm <sup>2</sup> (Cu)	12	Nos		0.00	0.00	0.00	INR Zero Only
69.14	3C x 4 mm <sup>2</sup> (Cu)	4	Nos		0.00	0.00	0.00	INR Zero Only
69.15	3C x 2.5 mm <sup>2</sup> (Cu)	50	Nos		0.00	0.00	0.00	INR Zero Only
69.16	5C x 2.5 mm <sup>2</sup> (Cu)	58	Nos		0.00	0.00	0.00	INR Zero Only
69.17	7C x 2.5 mm <sup>2</sup> (Cu)	110	Nos		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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69.18	12C x 2.5 mm <sup>2</sup> (Cu)	8	Nos		0.00	0.00	0.00	INR Zero Only
69.19	1Cx185 mm <sup>2</sup> (Al)	4	Nos		0.00	0.00	0.00	INR Zero Only
69.20	6 fiber, multi mode optical fiber cable along with all accessories like reciever, converter, transmiitor, patch card etc	4	Set		0.00	0.00	0.00	INR Zero Only
70.00	<b>Supply, Installation , testing and commissioning of 240V, 1-Ph, Wall Mounting Fans / Ceiling Fans (with Electronic Regulator) / Man Cooler Fans etc on wall / Ceiling / Steel Structure including supply, fabricating and grouting of MS Frame / Hooks and other hardware etc.</b>	4	Nos.		0.00	0.00	0.00	INR Zero Only
70.01	Supply,Installation, testing and commissioning of 240V room lighting boards along with required wiring (concealed in PVC conduit / on wall) having following features:-							
70.02	1 no. Switch & Socket for 6 / 16 Amp 2 nos. 6 Amp switches with regulators for ceiling Fan 2 nos. 6 Amp switches for lighting	4	Nos.		0.00	0.00	0.00	INR Zero Only
70.03	1 no. Switch & Socket for 6 / 16 Amp 5 nos. 6 Amp switches for lighting	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>71.00</b>	<b>CONTROL &amp; INSTRUMENTATION WORKS (PART- III)</b>							

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71.01	Supply , erection, testing & commissioning of <b>PLC BASED CONTROL PANEL WITH REDUNDANT PROCESSORS AND I/O MODULES with spares as per SEC VI-10.0 elsewhere attatched with the tender</b> at the unit including supervision for termination of control cables & erection of panels, looptesting, and commissioning of complete control systems along with support for interfacing with existing/other system and field instrumentation systems for operation of unit in remote & auto mode. This shall include development of control logics, database, MMI screens etc. for commisosing of the system complete as per drawings / specifications and acceptance of system by Owner. Supply of all labour, consumables, tools, services rendered etc. shall be in the contractors's scope.	1	SET		0.00	0.00	0.00	INR Zero Only
71.02	<b>INSTRUMENTATION CABLE with spares as per SEC VI-10.0 elsewhere attatched with the tender</b> Supply & Laying of all type of cables LT (PVC / XLPE / Armoured/Unarmoured/Power/ Control/ Signalling) in trenches, in cable racks, in trays, in protective pipes, poles,columns, in conduits, in panels and on structures etc.;including the supply and installation of all required materials such as fixing clamps ,screws, cable straps, tags etc. as required (other than the supply of the conduits, cables, pipes, cable racks, trays, poles, structures and panels) complete in all respect, including cost of all labour, tools, consumable materials etc. and cutting the cables in required lengths as per specification and directions of Site Engineer / Engineer-in-Charge							
71.03	2PX1.5 Sq.mm (F)	1200	Mtrs		0.00	0.00	0.00	INR Zero Only
71.04	2PX1.5 Sq.mm (G)	700	Mtrs		0.00	0.00	0.00	INR Zero Only
71.05	4PX1.5 Sq.mm (G)	2200	Mtrs		0.00	0.00	0.00	INR Zero Only
71.06	8PX1.5 Sq.mm (G)	400	Mtrs		0.00	0.00	0.00	INR Zero Only
71.07	12PX1.5 Sq.mm (G)	600	Mtrs		0.00	0.00	0.00	INR Zero Only
71.08	<b>C&amp;I Instrumentation cable Glands</b> with spares as per SEC VI-10.0 (Supply ,Installation ,Erection & Comissioning)							



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71.09	Cable Gland (Double Compression) CBW01SS	500	No.		0.00	0.00	0.00	INR Zero Only
71.10	Cable Gland (Double Compression) CBW01S	250	No.		0.00	0.00	0.00	INR Zero Only
71.11	Cable Gland (Double Compression) CBW01	250	No.		0.00	0.00	0.00	INR Zero Only
71.12	Cable Gland (Double Compression) CBW03	120	No.		0.00	0.00	0.00	INR Zero Only
71.13	20A, Float Cum Boost (2x100%) 24V DC Battery Charger with Ni-Cd batteries for PLC based Control Panel with spares as per SEC VI-10.0 elsewhere attached with the tender	1	Set		0.00	0.00	0.00	INR Zero Only
71.14	<b>JUNCTION BOX with spares as per SEC VI-10.0 elsewhere attached with the tender(Fibre Glass Reinforced Polyester)</b> Supply,Installation & Testing of junction box, explosion proof / flame proof junction boxes for marshalling of control cables, terminating the cables at field and control panel end, mounting the junction boxes, connecting to earthing grid by supplying and installing all the required materials such as supporting structure, cement concrete, painting, GI wire etc.							
71.15	12 TB's	16	Nos.		0.00	0.00	0.00	INR Zero Only
71.16	24 TB's	12	Nos.		0.00	0.00	0.00	INR Zero Only
71.17	36 TB's	3	Nos.		0.00	0.00	0.00	INR Zero Only
71.18	Supply/Erection / installation/testing and commissioning (Including drilling of blind flange where ever required, impulse piping, glanding, and termination, erection of Statction & Supports Canopy etc) of <b>Pressure Transmitter with spares as per SEC VI-10.0 elsewhere attached with the tender</b>	12	Nos.		0.00	0.00	0.00	INR Zero Only
71.19	Supply/Erection / installation/testing and commissioning (Including drilling of blind flange where ever required, impulse piping, glanding, and termination, erection of Statction & Supports Canopy etc) of <b>Level Transmitterwith spares as per SEC VI-10.0 elsewhere attached with the tender</b>	5	Nos.		0.00	0.00	0.00	INR Zero Only
71.20	Supply/Erection / installation/testing and commissioning (Including drilling of blind flange where ever required, impulse piping, glanding, and termination, erection of Statction & Supports Canopy etc) of <b>Level Switch with spares as per SEC VI-10.0 elsewhere attached with the tender</b>	4	Nos.		0.00	0.00	0.00	INR Zero Only

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71.21	Supply/Erection / installation, testing and commissioning of <b>PRESSURE Gauges (PG) with spares as per SEC VI-10.0.</b> as per drawings, recoomendations of OEM and directions of Engineer in-charge/ Site engineer	25	Nos.		0.00	0.00	0.00	INR Zero Only
71.22	Supply/Erection / installation, testing and commissioning of Diaphragm <b>PRESSURE Gauges (PG) with seal</b> as per drawings, recoomendations of OEM and directions of Engineer in-charge/ Site engineer	3	Nos.		0.00	0.00	0.00	INR Zero Only
71.23	Supply/Erection / installation, testing and commissioning (Including drilling of blind flange where ever required, impulse piping, glanding, and termination, erection of Statction & Supports Canopy etc) of <b>Diaphragm Seal Pressure Transmitter with spares as per SEC VI-10.0.</b>	3	Nos.		0.00	0.00	0.00	INR Zero Only
71.24	<b>Instrument Fittings with spares as per SEC VI-10.0 elsewhere attatched with the tender (Supply ,Installation &amp; Erection )</b>							
71.25	2 Valve Manifold, SS316, 300 LBS, 1/2" NPT (F)	12	Nos.		0.00	0.00	0.00	INR Zero Only
71.26	3 Way Gauge Cock SS316L,300 LBS 1/2" NPT (F)	12	Nos.		0.00	0.00	0.00	INR Zero Only
71.27	Drain Valve, (Ball Valve) CS,300 LBS 1/2" NPT (F)	12	Nos.		0.00	0.00	0.00	INR Zero Only
71.28	Male Connector,SS316,300 LBS,1/2" NPT (M)X1/2" OD	25	Nos.		0.00	0.00	0.00	INR Zero Only
71.29	Needle Valve, SS, 1/2" NPT (F)	25	Nos.		0.00	0.00	0.00	INR Zero Only
71.30	Nipple (150 mm Long) ,SS316,300 LBS 1/2" NPT (M)X1/2" OD	25	Nos.		0.00	0.00	0.00	INR Zero Only
71.31	Snubber SS316,300 LBS,1/2" NPT (F)x(M)	25	Nos.		0.00	0.00	0.00	INR Zero Only
71.32	SS TUBE ,SS316	25	Mtrs		0.00	0.00	0.00	INR Zero Only
71.33	Tee ,SS316, 300 lbs ,1/2" OD	25	Nos.		0.00	0.00	0.00	INR Zero Only
71.34	15 nb MS Socket	25	Nos.		0.00	0.00	0.00	INR Zero Only
71.35	<b>Operator &amp; Engineering Work Station with spares as per SEC VI-10.0 elsewhere attatched with the tender. ( Supply , Installation &amp; testing )</b>							
71.36	CPU Including Monitor, UPS, keyboard and Accessories	2	No.		0.00	0.00	0.00	INR Zero Only
71.37	Laser B/W Printer (A4 size)	1	No.		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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**SCHEDULE OF RATE** (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
72.0	SUPPLY ,ERECTION OF MECHANICAL ITEMS (MOVING MACHINERY/SKID/AGITATOR) - (PART- IV)							
73.0	SUPPLY, TESTING, COMMISSIONING OF ELECTRIC MOTOR DRIVEN MACHINERY/SKID/AGITATOR WITH ASSOCIATED INSTRUMENTATION AND CONTROL SYSTEM (Supply of Pumps & Its Drive Motor Etc. As per Technical Specification of NIT(PC183/PNMC-SEC VI-5.0 ).							
73.01	RECOVERY WATER PUMP	2	Nos		0.00	0.00	0.00	INR Zero Only
73.02	RECYCLE WATER PUMP	2	Nos		0.00	0.00	0.00	INR Zero Only
73.03	SLUDGE PUMP	2	Nos		0.00	0.00	0.00	INR Zero Only
73.04	FLASH MIXER	1	Nos		0.00	0.00	0.00	INR Zero Only
74.0	<b>SPARES</b>							
75.0	<b>AGITATOR</b>							
75.01	Complete set of all Bearings	1	Set		0.00	0.00	0.00	INR Zero Only
75.02	Complete set of High speed flexible coupling with bushes / elements.	1	Set		0.00	0.00	0.00	INR Zero Only
75.03	High speed Coupling bushes	3	Sets		0.00	0.00	0.00	INR Zero Only
75.04	Complete set of Low speed flexible coupling with bushes / elements.	1	Set		0.00	0.00	0.00	INR Zero Only
75.05	Low speed Coupling bushes	3	Sets		0.00	0.00	0.00	INR Zero Only
75.06	Complete set of all Oil seal for gear box	1	Set		0.00	0.00	0.00	INR Zero Only
75.07	Complete set of all Oil seal for bearing housing	4	Sets		0.00	0.00	0.00	INR Zero Only
75.08	Complete set of Seal packing.	2	Sets		0.00	0.00	0.00	INR Zero Only
75.09	<b>PUMPS</b>							
75.10	Impeller	1	Set		0.00	0.00	0.00	INR Zero Only
75.11	Impeller locking nut	2	Sets		0.00	0.00	0.00	INR Zero Only
75.12	Wear Rings complete set	1	Set		0.00	0.00	0.00	INR Zero Only
75.13	Shaft with keys	1	No		0.00	0.00	0.00	INR Zero Only
75.14	Shaft Sleeve	1	Set		0.00	0.00	0.00	INR Zero Only
75.15	Complete Set of Mech. Seal	1	Set		0.00	0.00	0.00	INR Zero Only
75.16	Constant level Oiler	2	Sets		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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75.17	Deflectors	2	Sets		0.00	0.00	0.00	INR Zero Only
75.18	Complete set of coupling with element and fasteners	1	Set		0.00	0.00	0.00	INR Zero Only
75.19	Complete set of all Bearings	1	Set		0.00	0.00	0.00	INR Zero Only
75.20	Complete set of Gaskets & 'O' Rings	2	Set		0.00	0.00	0.00	INR Zero Only
75.21	Throat Bushing	1	No		0.00	0.00	0.00	INR Zero Only
75.22	Throttle Bushing	1	No		0.00	0.00	0.00	INR Zero Only
75.23	Complete set of Oil Seals	2	Sets		0.00	0.00	0.00	INR Zero Only
75.24	Leak-off valve-gaskets, 'O' Rings and springs	2	Sets		0.00	0.00	0.00	INR Zero Only
76	<b>ERECTION/INSTALLATION OF PUMPS ALONG WITH COMPLETE ASSEMBLY:</b> Unloading, transportation, Erection, alignment of Equipments/SKID/Machinery/Agitator etc. from Owner/ Consultant's/Contractor's stores/storage yard; reinstatement of structures, building sheets (if required) etc., to facilitate for erection, assembly of parts / sub-assemblies; checking, cleaning, chipping and preparing the top of foundation and cleaning of pockets for erection; placing the equipments, machinery & SKID etc., on foundation or structure; leveling, alignment, bolting, welding, grouting(shall be paid seperatly); first maintenance & carrying out testing / carrying out alignment, trial runs and start up runs and providing manpower for testing, rectifying and defect and completion of works in all respects including earthing protection by way of fixing strips and electrodes as per drawings & specifications, completion of all jobs as per drawings, scope of work & technical conditions as defined in the enquiry specifications, standards, codes and all jobs are to be carried out as per the instruction and to the full satisfaction of the Engineer-in-Charge/Owner. Job also includes supplying of all types of tools, tackles, lifting arrangements, tractor trolley & equipments, machineries all consumables and labour to complete the job in a workman like manner, erection and removal of steel scaffolding wherever required, Grouting shall be paid seperatly.	15	MT		0.00	0.00	0.00	INR Zero Only
77.0	<b>SUPPLY ,ERECTION/INSTALLATION OF EOT CRANE WITH COMPLETE ASSEMBLY:</b>							
77.01	Supply,Loading, Unloading, transportation, Erection, Testing & Commissioning of <b>02 NOS having 5.0M T</b> capacity each including its drives and all other relevant electrical items as per TS ATTACHED IN TENDER.This shall also include testing, commissioning to complete electrical equipment as required in TS & other associated work if any.	2	Lot		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
77.02	<b>Note:</b> 1-01 EOT FOR WATER PUMP HOUSE + 01EOT FOR RECYCLE WATER PUMP HOUSE 2-Handling including lifting, transportation from Owner Stores to CONTRACTOR's site is in scope of erection contractor.							
77.03	Supply & Installation of Split AC (1.5 TON OF Each) including all its associated work with other relevant electrical items as per TS ATTACHED IN TENDER..	2	Nos		0.00	0.00	0.00	INR Zero Only
77.04	<b>GROUTING:</b>							
77.05	Machineries with ≥500 H.P., Araldite of M/s CIBA Geigy or equivalent or SHRINKOM - 20 or Conbextra GP-2 shall be used. However, for balance equipments / machineries and structurals ordinary 1:1:2 cement grout mix added with anti-shrinkage compound shall be used without any extra cost to Owner.							
77.06	SHRINKOMP-20 Or Conbextra GP-2	10	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only
77.07	EPOXY GROUTING	1	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only
77.08	<b>Clarifier along with dosing system (Package Item)</b>							
77.09	Supply ,Installation & Testing & Pre-Commissioning & Commissioning of above package item as per Process design philosophy & P&ID. The scope of supply for the Package items i.e. Clarifier along with Dosing System" shall include but not limited to the items as listed following. • RCC Clarifier along with Agitator & Scrapper – One nos. • Poly Electrolyte Dosing system (Two RCC Tanks + Two Agitators + Two Pumps) • Alum Dosing system (Two RCC Tanks + Two Agitators + Two Pumps) • Lime Dosing system (Two RCC Tanks + Two Agitators + Two Pumps) • Over head water Tank (FRP) – One nos.	1	Lot		0.00	0.00	0.00	INR Zero Only
<b>78.00</b>	<b>SUPPLY OF PIPING ITEMS</b>							
<b>79.00</b>	<b>FOR PIPING(AG/UG)</b>							
79.01	"Supply of as given piping material as per given specifications/drgs/docs, for SLURRY SYSTEM, RECOVERY SYSTEM & for SILO SYSTEM, handling, loading/unloading , transportation, and safe storage including other materials like valve, fittings, flanges, nut/bolt, gasket etc. to Contractor's stock yard/workshop/work-site including preliminary activities, preparation of drawings, wherever required for crossing etc. Handling, stacking, stringing of the piping material, Carrying out inspection of materials including at the time of laying/ installation.							

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<b>80.00</b>	<b>SLURRY SYSTEM</b>							
80.01	600 NB (12.5 mm thk.) Motor MS ERW Fe 410 grade pipe as per IS: 3589	24	Mtr	0.00	0.00	0.00	0.00	INR Zero Only
80.02	600 NB Elbow 90 degree, 12.5 mm ASTM A234 WPB-WLDD,ASME B16.9	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.03	600 dia Motor operated Plug valve for sump isolation (2 sumps) with Limit Switches for motor cut-off.	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.04	600 NB Manual operated Knife Gate Vave, rating shall be PN10	1	No	0.00	0.00	0.00	0.00	INR Zero Only
80.05	600 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	5	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.06	300 NB (9.52mm thk.) MS ERW Fe 410 grade pipe as per IS: 3589 for Slurry disposal into Ash Dyke	1380	Mtr	0.00	0.00	0.00	0.00	INR Zero Only
80.07	300NB, 90 Deg - 3D Radius Alloy Cast Iron Bend with 450 BHN Hardness for above Slurry Disposal Pipe	10	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.08	300NB, Alloy Cast Iron Lateral with 450 BHN Hardness for above Slurry Diposal Pipe	4	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.09	300 NB sleeve coupling (Followers and Sleeves shall be MS Fabricated, the fasteners shall be Galvanized and the gasket shall be Neoprene)	129	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.10	300NB Motor operated Knife Gate Valve, Uni Direction type at Slurry Pump Suction suitable slurry duty and the rating shall be PN10.	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.11	300NB Motor operated Knife Gate Valve, bi-directional type at Slurry Pump discharge suitable for slurry duty and the rating shall be PN10.	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.12	300NB Manual operated Knife Gate Valve, bi-directional type at Slurry Pump discharge interconnection suitable for slurry duty and the rating shall be PN10.	5	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.13	300NB Manual operated Knife Gate Valve, bi-directional type at Slurry line discharge at dyke end suitable for slurry duty and the rating shall be PN10.	4	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.14	100 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	20	Mtr	0.00	0.00	0.00	0.00	INR Zero Only
80.15	100 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	10	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.16	100 NB Blind Flanges, 150#, ASME B16.5, ASTM A105	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.17	100 NB X 80 NB REDUCER CONC., Heavy thick X Heavy thick, ASTM A234 WPB-WLDD,ASME B16.9	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.18	100 NB Manual operated Knife Gate Vave / Plug Valve for Drain Pump discharge.	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.19	100 NB Non Return Valve for Drain Pump Discharge.	2	Nos	0.00	0.00	0.00	0.00	INR Zero Only
80.20	50 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	100	Mtr	0.00	0.00	0.00	0.00	INR Zero Only

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Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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80.21	65 NB Cast Iron Body Gate Valve for Seal Water Pump Suction,	2	Nos		0.00	0.00	0.00	INR Zero Only
80.22	50 NB Gun Metal Body Gate Valve for Seal Water Pump Discharge,	2	Nos		0.00	0.00	0.00	INR Zero Only
80.23	50 NB Gun Metal Body Non Return Valve for Seal Water Pump Discharge	2	Nos		0.00	0.00	0.00	INR Zero Only
80.24	25 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	50	Mtr		0.00	0.00	0.00	INR Zero Only
80.25	25 NB Gun Metal Body Globe Valve	4	Nos		0.00	0.00	0.00	INR Zero Only
80.26	25 NB Gun Metal Body Gate Valve.	2	Nos		0.00	0.00	0.00	INR Zero Only
80.27	25 NB Gun Metal Body Non Return Valve	2	Nos		0.00	0.00	0.00	INR Zero Only
80.28	25 NB SS 316 body Two way Solenoid Valve suitable for 24V DC Supply	2	Nos		0.00	0.00	0.00	INR Zero Only
80.29	Miscellaneous Pipe supports for above specified system pipings	4	Ton		0.00	0.00	0.00	INR Zero Only
80.30	GI Bolts and nuts as per IS-1363 and 3mm thk. minimum Rubber Gasket	2	Ton		0.00	0.00	0.00	INR Zero Only
80.31	20 NB Nipple (P-P)	40	Nos		0.00	0.00	0.00	INR Zero Only
80.32	20 NB Blind Flange	20	Nos		0.00	0.00	0.00	INR Zero Only
80.33	20 NB Flange SW	20	Nos		0.00	0.00	0.00	INR Zero Only
80.34	20 NB Manual operated Gate Vave	20	Nos		0.00	0.00	0.00	INR Zero Only
80.35	15 NB Nipple (P-P)	2	Nos		0.00	0.00	0.00	INR Zero Only
80.36	15 NB Nipple (P-THD)	2	Nos		0.00	0.00	0.00	INR Zero Only
80.37	15 NB Manual operated Gate Vave	2	Nos		0.00	0.00	0.00	INR Zero Only
80.38	15 NB Blind Flange	2	Nos		0.00	0.00	0.00	INR Zero Only
80.39	15 NB Flange SW	2	Nos		0.00	0.00	0.00	INR Zero Only
80.40	25 NB Manual operated Gate Vave	10	Nos		0.00	0.00	0.00	INR Zero Only
80.41	25 NB Nipple (P-P)	20	Nos		0.00	0.00	0.00	INR Zero Only
80.42	25 NB Blind Flange	10	Nos		0.00	0.00	0.00	INR Zero Only
80.43	25 NB Flange SW	10	Nos		0.00	0.00	0.00	INR Zero Only
<b>81.00</b>	<b>RECOVERY SYSTEM</b>							
81.01	900 NB 17.5 mm thk MS ERW Fe 410 grade pipe as per IS: 3589	100	Mtr		0.00	0.00	0.00	INR Zero Only
81.02	900 NB Motor optd. Butterfly Valve at recovery water sump inlet	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.03	900 NB Flanges, SORF, 150#, ASME B16.47 Seiries B, ASTM A105	4	Nos.		0.00	0.00	0.00	INR Zero Only

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
81.04	600 NB, 8 thk. MS ERW Fe 410 grade pipe as per IS: 3589 (Rubber lined inside) enclosed with RCC from Flash mixer to Clarifier	60	Mtr		0.00	0.00	0.00	INR Zero Only
81.05	200 NB, 6.35 thk. MS ERW Fe 410 grade pipe as per IS: 3589 enclosed with RCC / CI Class D Pipe from Clarifier to Sludge Sump	60	Mtr		0.00	0.00	0.00	INR Zero Only
81.06	300 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589 for Pump Suction from Water Sumps	60	Mtr		0.00	0.00	0.00	INR Zero Only
81.07	300 NB Elbow 90 degree, 6.4 mm ASTM A234 WPB-WLDD,ASME B16.9	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.08	300 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	12	Nos.		0.00	0.00	0.00	INR Zero Only
81.09	300 NB X 300 NB TEE, 6.4 mm X 6.4 mm, ASTM A234 WPB-WLDD,ASME B16.9,	3	Nos.		0.00	0.00	0.00	INR Zero Only
81.10	300 NB X 250 NB REDUCER ECC., 6.4 mm X 6.4 mm, ASTM A234 WPB-WLDD,ASME B16.9,	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.11	300 NB X 200 NB REDUCER ECC., 6.4 mm X 6.4 mm, ASTM A234 WPB-WLDD,ASME B16.9,	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.12	250 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589	6	Mtr		0.00	0.00	0.00	INR Zero Only
81.13	250 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	3	Nos.		0.00	0.00	0.00	INR Zero Only
81.14	200 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589 for Pump discharge up to the discharge point	1100	Mtr		0.00	0.00	0.00	INR Zero Only
81.15	200 NB Elbow 90 degree, 6.4 mm ASTM A234 WPB-WLDD,ASME B16.9	10	Nos.		0.00	0.00	0.00	INR Zero Only
81.16	200 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	26	Nos.		0.00	0.00	0.00	INR Zero Only
81.17	200 NB Blind Flanges, 150#, ASME B16.5, ASTM A105	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.18	200 NB X 200 NB TEE, 6.4 mm X 6.4 mm, ASTM A234 WPB-WLDD,ASME B16.9,	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.19	200 NB X 150 NB REDUCER CONC., 6.4 mm X 6.4 mm, ASTM A234 WPB-WLDD,ASME B16.9,	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.20	200 NB X 25 NB, SOCKOLET, CS ASTM A105,MSS SP 97,	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.21	300 NB, Manually operated Cast Iron body Gate Vave at Recovery / Recycle Water Pump Suction suitable for water duty and the rating shall be PN10	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.22	200 NB, Manually operated Cast Iron body Butterfly Vave at Recovery / Recycle Water Pump discharge suitable for water duty and the rating shall be PN10	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.23	200 NB Cast Iron body Non Return Vave at Recovery / Recycle Water Pump discharge suitable for water duty and the rating shall be PN10	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.24	300 Dia suction strainers (SS) (Mesh Size 1mm) for Recovery Water and Recycle water pump Suction	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.25	200NB Manually operated PN 10 Class Cast Iron Body Gate Valve with 2m extended Spindle	1	No.		0.00	0.00	0.00	INR Zero Only



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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Name of the Bidder/ Bidding Firm / Company :	
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**SCHEDULE OF RATE** (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
81.26	150 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	6	Mtr		0.00	0.00	0.00	INR Zero Only
81.27	150 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.28	Pipe sleeves - SS 316 fabricated - 40NB x 500mm long with ANSI B 16.5 150 Class flange on one side along with matching flange	18	Nos.		0.00	0.00	0.00	INR Zero Only
81.29	150 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	4	Nos.		0.00	0.00	0.00	INR Zero Only
81.30	50 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I) with same rating fittings from FRP tank to Dosing Baskets, Sludge sumps	120	Mtr		0.00	0.00	0.00	INR Zero Only
81.31	50 NB Elbow 90 degree, 6.4 mm ASTM A234 WPB-WLDD,ASME B16.9	22	Nos.		0.00	0.00	0.00	INR Zero Only
81.32	80 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	12	Mtr		0.00	0.00	0.00	INR Zero Only
81.33	50 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	40	Nos.		0.00	0.00	0.00	INR Zero Only
81.34	50 NB X 50 NB TEE, Heavy thick X Heavy thick, ASTM A234 WPB-WLDD,ASME B16.9,	9	Nos.		0.00	0.00	0.00	INR Zero Only
81.35	50 NB X 40 NB REDUCER CONC., Heavy thick X Heavy thick, ASTM A234 WPB-WLDD,ASME B16.9	5	Nos.		0.00	0.00	0.00	INR Zero Only
81.36	40 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I) with same rating fittings from FRP tank to Dosing Baskets, Sludge sumps	50	mtr		0.00	0.00	0.00	INR Zero Only
81.37	40 NB Flanges, SORF, 150#, ASME B16.5, ASTM A105	10	Nos.		0.00	0.00	0.00	INR Zero Only
81.38	40 NB Blind Flanges, 150#, ASME B16.5, ASTM A105	10	Nos.		0.00	0.00	0.00	INR Zero Only
81.39	50NB PN 6 CPVC Pipe with same rating Fittings & Flanges as required from Chemical tanks to Recovery water sump	150	mtr		0.00	0.00	0.00	INR Zero Only
81.40	40NB PN 6 CPVC Pipe with same rating Fittings & Flange as required from Chemical tanks to Flash mixer / Parshall flume / Drain	150	mtr		0.00	0.00	0.00	INR Zero Only
81.41	25 NB PN 6 CPVC Pipe with same rating Fittings & Flanes as required	250	mtr		0.00	0.00	0.00	INR Zero Only
81.42	50 NB Manual operated Gun Metal body Gate Vave for isolation of FRP tank, agitator water tanks, sludge sumps and Chemical line flushing connection	11	Nos.		0.00	0.00	0.00	INR Zero Only
81.43	40NB PN 6 class Ebonite lined Diaphargm valves for chemical tank outlet, chemical pump discharge and tank drain connection, along with companion Flanges	24	Nos.		0.00	0.00	0.00	INR Zero Only
81.44	40NB PN 6 class Ebonite lined Non Return valves for chemical pump discharge, along with companion Flanges	6	Nos.		0.00	0.00	0.00	INR Zero Only
81.45	100 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	20	Mtr.		0.00	0.00	0.00	INR Zero Only
81.46	100 NB Elbow 90 Heavy Grade, ASTM A234 WPB-WLDD,ASME B16.9	5	Nos.		0.00	0.00	0.00	INR Zero Only

**Item Rate BoQ**

Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE : Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Name of the Bidder/ Bidding Firm / Company :	
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**SCHEDULE OF RATE** (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only )

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
81.47	100 NB Elbow 45 Heavy Grade, ASTM A234 WPB-WLDD,ASME B16.9	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.48	100 NB Manual operated Knife Gate Vave / Plug Valve for Sludge Pump discharge,	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.49	100 NB Non Return Valve for Sludge Pump Discharge	2	Nos.		0.00	0.00	0.00	INR Zero Only
81.50	GI Bolts and nuts as per IS-1363 and 3mm thk. minimum Rubber Gasket	2	Ton		0.00	0.00	0.00	INR Zero Only
<b>82.00</b>	<b>SILO SYSTEM</b>							
82.01	300 NB manually optd. Knife gate valve - Ash Silo (PN 6 Class)	2	Nos.		0.00	0.00	0.00	INR Zero Only
82.02	300 NB cyld. optd. Knife gate valve - Ash Silo (PN 6 Class),	1	Nos.		0.00	0.00	0.00	INR Zero Only
82.03	300 NB manually optd. Knife gate valve - Slag Silo (PN 6 Class)	2	Nos.		0.00	0.00	0.00	INR Zero Only
82.04	300 NB cyld. optd. Knife gate valve - Slag Silo (PN 6 Class)	1	Nos.		0.00	0.00	0.00	INR Zero Only
82.05	25NB SS 304 Sch 40 pipe from IA terminal point at LSTK Silo Area to Dyke Area Silo Area Air receiver and Air Receiver to Knife Gate Valve with SS fittings as required	500	m		0.00	0.00	0.00	INR Zero Only
82.06	25NB SS forged Ball Valve, along with companion Flanges as required	4	Nos.		0.00	0.00	0.00	INR Zero Only
82.07	SS 316 body 5/4 way - 1/4" Solenoid Valve suitable for 24V DC power Supply with SS fittings for connection with Pneumatic Cylinder	2	Set		0.00	0.00	0.00	INR Zero Only
<b>83.00</b>	<b>SAFETY / FIRE FIGHTING SYSTEM</b>							
83.01	Safety Shower and Eyewash	2	Set		0.00	0.00	0.00	INR Zero Only
83.02	Fire water Piping system including Hydrants, Monitors, Valves, Hose Boxes, Hoses, Nozzles, Hose reels, couplings and accessories as per TAC /NFPA/NBC requirements for yard areas and buildings, as applicable	1	Lot		0.00	0.00	0.00	INR Zero Only
83.03	Fire Extinguishers as per TAC /NFPA/NBC requirements, as applicable	1	Lot		0.00	0.00	0.00	INR Zero Only
83.04	Fire water spray/sprinkler system alongwith accessories as per TAC /NFPA/NBC requirements, as applicable	1	Lot		0.00	0.00	0.00	INR Zero Only
83.05	Gas flooding system, as applicable	1	Lot		0.00	0.00	0.00	INR Zero Only
83.06	Fire fighting system Personnel Protection Equipments, as applicable	1	Lot		0.00	0.00	0.00	INR Zero Only
83.07	Fire alarm & detection system as per tender requirements, as applicable	1	Lot		0.00	0.00	0.00	INR Zero Only
83.08	<b>Note: 1-Quantities mentioned in SOR are indicative and not exhaustive in nature.Payment shall be made as per actual quantity used/certified at site.2-Piping Spares shall be considered as per Section 10.0 of NIT(Part-ii) rate to be quoted accordingly in above mentioned qty as applicable.</b>							

**Item Rate BoQ**

Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE : Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Name of the Bidder/ Bidding Firm / Company :	
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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
<b>84.00</b>	<b>FABRICATION &amp; ERECTION OF PIPING:</b>							
<b>85.00</b>	<b>FABRICATION &amp; ERECTION OF PIPING(AG)</b>							
85.01	Transportation of all piping materials from Contractor (Own) storage point to work site/shop including from shop to work site, cleaning, stacking, surface preparation/shot blasting of piping, supply & application of <b>paints and primers</b> (including all coats-primer, intermediate & final coats), for piping and equipments as per enclosed painting specification in NIT(TS-2001), prefabrication / fabrication at shop and/or site including rubber lining (as per NIT spec), RCC on pipes as per spec, marking, cutting, edge preparation, beveling, bending, etc., providing all branch connections, re-enforcement pads, threading etc., welding of all fitting and specials, erection including lifting, placing, installing of supports etc. at all levels and locations (payment shall be made seperatly), leveling, aligning, jointing of flanges including insertion of gaskets, orifice plates, spectacle blinds etc., bolting, joining by threading or welding, ,connecting the system to the required other system, equipments, pumps, including hook up of new lines with existing lines, and welding of Tie-in points as per tie-in list, installation of all in line fittings / all type of valves / Instruments / strainers / filters / spray nozzles / traps, safety / control valves rapture disc, flow meters, flow orifice etc. as applicable including shifting to & collection from painting contractor's shop for erection, hydro testing, flushing and blowing, seal/leak testing and making ready for commissioning as per drawings, specification ,standards ,codes, instructions of Owner/Consultant and scope of work defined in NIT. Welding shall include all the examination and testing required such as but not limited to DP, radiography, ultrasonic, magnaflux /dye check etc and pre and post heat treatment wherever required.The cost towards radiography only shall be paid separately as per given in SOR . Unit rates shall include the cost of supervision, labour, overheads/profits, consumables, and other associated arrangements required to execute all the related activities.The quoted rates shall include seal welding of thermocouples, Orifice flange plug, nipple, and hydro testing drain and vents caps.							
<b>86.00</b>	<b>SLURRY SYSTEM, RECOVERY SYSTEM &amp; SILO SYSTEM :</b>							
86.01	<b>PIPE: MS, ERW PIPE AS PER GIVEN SPECIFICATION.</b>							
86.02	25 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	60	Mtr.		0.00	0.00	0.00	INR Zero Only
86.03	40 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I) with same rating fittings from FRP tank to Dosing Baskets, Sludge sumps	55	mtr		0.00	0.00	0.00	INR Zero Only
86.04	50 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	120	Mtr.		0.00	0.00	0.00	INR Zero Only
86.05	80 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	12	Mtr		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
86.06	100 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	30	Mtr.		0.00	0.00	0.00	INR Zero Only
86.07	150 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	6	Mtr		0.00	0.00	0.00	INR Zero Only
86.08	200 NB, 6.35 thk. MS ERW Fe 410 grade pipe as per IS: 3589 enclosed with RCC / CI Class D Pipe from Clarifier to Sludge Sump	65	Mtr.		0.00	0.00	0.00	INR Zero Only
86.09	200 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589 for Pump discharge up to the discharge point	1200	Mtr.		0.00	0.00	0.00	INR Zero Only
86.10	250 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589	6	Mtr		0.00	0.00	0.00	INR Zero Only
86.11	300 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589 for Pump Suction from Water Sumps	65	Mtr.		0.00	0.00	0.00	INR Zero Only
86.12	300 NB (9.52mm thk.) MS ERW Fe 410 grade pipe as per IS: 3589 for Slurry disposal into Ash Dyke	1400	Mtr.		0.00	0.00	0.00	INR Zero Only
86.13	600 NB, 8 thk. MS ERW Fe 410 grade pipe as per IS: 3589 (Rubber lined inside) enclosed with RCC from Flash mixer to Clarifier	65	Mtr.		0.00	0.00	0.00	INR Zero Only
86.14	600 NB (12.5 mm thk.) Motor MS ERW Fe 410 grade pipe as per IS: 3589	30	Mtr.		0.00	0.00	0.00	INR Zero Only
86.15	900 NB 17.5 mm thk. MS ERW Fe 410 grade pipe as per IS: 3589	120	Mtr.		0.00	0.00	0.00	INR Zero Only
86.16	<b>PIPE: SMLS,ASTM A312TP304/ EFW,STR.WELD,ASTM A312 TP304</b>							
86.17	25NB SS 304 Sch 40 pipe from IA terminal point at LSTK Silo Area to Dyke Area Silo Area Air receiver and Air Receiver to Knife Gate Valve with SS fittings as required	520	Mtr.		0.00	0.00	0.00	INR Zero Only
86.18	<b>PIPE: CPVC PIPE AS PER GIVEN SPECIFICATION.</b>							
86.19	25 NB PN 6 CPVC Pipe with same rating Fittings & Flanes as required	250	mtr		0.00	0.00	0.00	INR Zero Only
86.20	40NB PN 6 CPVC Pipe with same rating Fittings as required from Chemical tanks to Flash mixer / Parshall flume / Drain	160	Mtr.		0.00	0.00	0.00	INR Zero Only
86.21	50NB PN 6 CPVC Pipe with same rating Fittings as required from Chemical tanks to Recovery water sump	160	Mtr.		0.00	0.00	0.00	INR Zero Only
<b>87</b>	<b>UNDER GROUND(U-G) PIPING WORKS:</b>							
<b>88</b>	<b>EARTHWORK</b>							
88.01	Excavation of trenches for pipelines in all kinds of soil including soft and hard rock mixed in nature both dry and wet conditions including dressing of sides and bottom getting out excavated material in the approved dump yard in all leads of 100 meter including spreading and leveling as per instruction of owner	100	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only
88.02	Same as above but lift from 1.5 Mtr.to 3.0 Mtr.	300	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
88.03	Providing and filling with fine river sand in trenches a layer of 150 mm from BOP(Bottom of pipe) and 200 mm top of pipes(In case of pipe size>24" NB) and for pipe<24" filling of sand in trenches shall be 150mm from BOP and 100 mm from top of pipe including watering, ramming, consolidating and complete dressing.	300	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only
88.04	Filling with available earth excavated without stones & unwanted materials in the trenches in layer other than Sr. No. III. In depth consolidation each deposited layer by ramming and watering all complete.	400	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only
88.05	Removal or excess excavated materials after back filling of trenches from site of work to other area in factory premises, as directed by owner and spreading and leveling the same.	600	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only
88.06	Cutting and disposal of RCC, PCC and paved surface at all level other than I & II	400	M <sup>3</sup>		0.00	0.00	0.00	INR Zero Only
<b>89</b>	<b>FABRICATION &amp; ERECTION OF UNDERGROUND PIPING</b>							
89.01	Transportation of materials to work site such as pipes, valves, fittings, etc., from Contractor's shop/site. Piping fabrication, Primer/Painting, rubber lining as per NIT spec, Pickling & Passivation, consumables, laying of U/G piping, laying of U/G piping inclusive of Casing pipes for Road Crossing, Casting of civil sleeper supports/Padestel, inter-connection with the existing system/unit, RCC cutting, PCC dismantling/cutting, excavation, backfilling, sand filling, compaction, NDT except RT as per given in SOR, hydro test of piping & other works related to UG piping to complete the system in all respect is in scope of contractor. The cost towards radiography only shall be paid separately as per SOR. Unit rates shall include the cost of supervision, labour, overheads/profits, consumables, and other associated arrangements required to execute all the related activities.							
89.02	200 NB, 6.35 thk. MS ERW Fe 410 grade pipe as per IS: 3589 enclosed with RCC / CI Class D Pipe from Clarifier to Sludge Sump	24	Mtr		0.00	0.00	0.00	INR Zero Only
89.03	300 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589 enclosed with RCC for Pump Suction from Water Sumps	24	Mtr		0.00	0.00	0.00	INR Zero Only
<b>90.0</b>	<b>PRE-FABRICATED PIPING (VENDOR SUPPLIED):</b>							
<b>91</b>	<b>ERECTION OF PRE-FABRICATED PIPING (VENDOR SUPPLIED)</b>							

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## Item Rate BoQ

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Name of the Bidder/ Bidding Firm / Company :								
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Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
91.01	Transportation of prefabricated spools from Owner/ Consultant's storage point to work site/shop including from shop to work site, cleaning, stacking, collecting from painting Contractor's shop, erection by bolting/screwing, making necessary scaffoldings at all elevations, welding, primer and painting, supporting , hydro-testing/pneumatic testing, flushing & blowing, seal/leak testing and ready for commissioning as per drawings, specifications, standards, codes, instructions of Owner/Consultant and scope of work defined in Tender.							
91.02	Bidders shall quote the erection rate in Rupees per M.T. include the cost of labour, supervision, overheads/profits, and temporary supports, primer & painting wherever required. Materials which are in Contractor's scope, consumables, conditions listed in preamble to Schedule of Rates and other associated arrangements required to execute all the related activities. However, piping with field joint connection payment shall be made on No. of joint basis as per SOR Cl.No. 8.2							
91.03	The prefabricated spools may be supplied in 100 mm extra at each field weld joints for adjustments.Cutting of extra length on prefabricated spools as per site requirement,beveling and edge preparation as per standard shall also be included as part of this activity.							
91.04	<b>A. PIPING ≤ 2" SIZE</b>							
91.05	Carbon Steel	1.0	MT.		0.00	0.00	0.00	INR Zero Only
91.06	Stainless Steel	0.2	MT.		0.00	0.00	0.00	INR Zero Only
91.07	<b>B.PIPING &gt; 2" SIZE</b>							
91.08	Carbon Steel	1.0	MT.		0.00	0.00	0.00	INR Zero Only
91.09	Stainless Steel	0.2	MT.		0.00	0.00	0.00	INR Zero Only
91.10	<b>FIELD WELDING OF PRE-FABRICATED PIPING JOINTS(VENDOR SUPPLIED):</b>							
91.11	The field welds for piping shall be as indicated below and in the scope of this contract shall be done as per markings on drawings. Making necessary scaffoldings at all elevations & Welding shall include all examination and inspection required, such as but not limited to DP, radiograph, ultrasonic, magnaflux/dye check etc. and pre and post weld heat treatment wherever required.							

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91.12	Rates shall also include the cost of supervision, labour, overloads/profits, primer/painting,NDT, materials which are in the Contractor's scope. Consumables, conditions listed in preamble to Schedule of Rates and other associate arrangements required executing all the related activities. The rates quoted shall be per joint basis.							
91.13	<b>PIPE MATERIAL: CARBON STEEL</b>							
91.14	25 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	5	No. of joints		0.00	0.00	0.00	INR Zero Only
91.15	50 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	10	No. of joints		0.00	0.00	0.00	INR Zero Only
91.16	100 NB MS ERW Heavy Grade Pipe as per IS: 1239 (Part I)	5	No. of joints		0.00	0.00	0.00	INR Zero Only
91.17	200 NB, 6.35 thk. MS ERW Fe 410 grade pipe as per IS: 3589 enclosed with RCC / CI Class D Pipe from Clarifier to Sludge Sump	5	No. of joints		0.00	0.00	0.00	INR Zero Only
91.18	200 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589 for Pump discharge up to the discharge point	10	No. of joints		0.00	0.00	0.00	INR Zero Only
91.19	300 NB, 6.4 thk. MS ERW Fe 410 grade pipe as per IS: 3589 for Pump Suction from Water Sumps	5	No. of joints		0.00	0.00	0.00	INR Zero Only
91.20	300 NB (9.52mm thk.) MS ERW Fe 410 grade pipe as per IS: 3589 for Slurry disposal into Ash Dyke	10	No. of joints		0.00	0.00	0.00	INR Zero Only
91.21	600 NB, 8 thk. MS ERW Fe 410 grade pipe as per IS: 3589 (Rubber lined inside) enclosed with RCC from Flash mixer to Clarifier	5	No. of joints		0.00	0.00	0.00	INR Zero Only
91.22	<b>PIPE MATERIAL : STAINLESS STEEL</b>							
91.23	1" 33.4 Sch.40S	30	No. of joints		0.00	0.00	0.00	INR Zero Only
91.24	1 1/2" 48.3 Sch.40S	10	No. of joints		0.00	0.00	0.00	INR Zero Only
91.25	2" 60.3 Sch.10S	10	No. of joints		0.00	0.00	0.00	INR Zero Only
91.26	<b>PIPE: CPVC PIPE AS PER GIVEN SPECIFICATION.</b>							
91.27	40NB PN 6 CPVC Pipe	10	No. of joints		0.00	0.00	0.00	INR Zero Only

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91.28	50NB PN 6 CPVC Pipe	10	No. of joints		0.00	0.00	0.00	INR Zero Only
92	<b>ERECTION OF VALVES(SPECIFICATION AS GIVEN IN SUPPLY ITEMS)</b>							
92.01	Transportation from Owner/ Consultant's storage points to shop/site, (including testing of all kind of valves/ PSV/TSV and setting of safety valves but excluding testing of control valves which shall be issued from Owner/ Consultant's stores or instrument contractor's shop/stores), making necessary scaffoldings at all elevations, installation in position by threading, bolting or welding as per drawings, specifications, standards / codes, instructions of Owner/Consultant and scope of work defined in NIT. Welding shall include all the examination and inspection required such as but not limited to radiography, ultrasonic, magnaflux, dye check etc, pre and post heat-treatment wherever required.							
92.02	The cost towards radiography shall be paid separately as per Cl. 11.0 of Schedule of Rates, whereas the cost of all other tests is included in the rates quoted as per Schedule of Rates. Rates shall also include the cost of supervision, labour, Overhead / profits, consumables, statutory approval and conditions listed in preamble to Schedule of Rates and other associated arrangements required to execute all the related activities. The quoted rates shall also include tightening of gland packing, lapping and bonnet flange of valves if required during hydro-testing of piping. If any leakage or pressure drop found during testing in Valves/PSV,s then contractor will replace the Valves/ PSV's with repair without any extra cost to owner.							
92.03	<b>FLANGED/SCREWED VALVES</b>							
92.04	Up to 1.5"	40	No		0.00	0.00	0.00	INR Zero Only
92.05	2" to 4"	50	No		0.00	0.00	0.00	INR Zero Only
92.06	6" to 8"	5	No		0.00	0.00	0.00	INR Zero Only
92.07	10" to 12"	20	No		0.00	0.00	0.00	INR Zero Only
92.08	14" to 16"	2	No		0.00	0.00	0.00	INR Zero Only
92.09	24" to 36"	10	No		0.00	0.00	0.00	INR Zero Only
92.10	<b>SW/BW VALVES</b>							
92.11	Up to 3/4"	20	No		0.00	0.00	0.00	INR Zero Only
92.12	1" TO 1 1/2"	10	No		0.00	0.00	0.00	INR Zero Only



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92.13	2" to 4"	10	No		0.00	0.00	0.00	INR Zero Only
92.14	6" to 8"	10	No		0.00	0.00	0.00	INR Zero Only
92.15	10" to 12"	10	No		0.00	0.00	0.00	INR Zero Only
<b>93.00</b>	<b>NOTES:</b>							
93.01	WAFER TYPE VALVES shall be treated as flanged valves							
93.02	Above includes valves of all materials, rating, IBR/Non IBR.							
93.03	Above includes all types of valves.							
93.04	Rates are inclusive of Installation/Removal of Control valves or any other type of valve during Pressure Testing/Testing. No extra payment will be made for the same.							
<b>94</b>	<b>PIPE SUPPORTS</b>							
<b>95</b>	<b>SUPPLY, FABRICATION &amp; ERECTION OF PIPE SUPPORTS</b>							
95.01	Supply & Fabrication & Erection of pipe supports as per drawings, standards, Specifications, NIT conditions & instructions of Owner/Consultant. The rate shall include the cost of materials consumables, surface preparation & application of primer and painting, labour & overheads/profits etc. The rate shall include cost of erection as part of piping, welding (including dissimilar welding), labour, consumables, application of finish paint, casting of civil padstel for trunion supports, casting of civil sleeper supports for piping, overheads/profits etc to complete all related activities as per NIT and instruction of Owner/ Consultant.							
<b>96</b>	<b>MATERIAL OF CONSTRUCTION</b>							
96.01	PS 1 - Means carbon steel supports.							
96.02	PS 2 - Means alloy steel supports (Alloy steel parts of supports only)Material supplied by clients							
96.03	PS 3 - Means stainless steel supports (SS parts of Support only) Material supplied by clients							
96.04	PS 4 - PUF supports							
96.05	PS 5 - Means Turn buckles (Forged)							
96.06	PS 6 - Means Spring support							
96.07	PS 1	6	MT		0.00	0.00	0.00	INR Zero Only
96.08	PS 3	1	MT		0.00	0.00	0.00	INR Zero Only
96.09	PS 5	0.5	MT		0.00	0.00	0.00	INR Zero Only

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<b>97</b>	<b>Note :</b>							
97.01	Irrespective of whether pipe supports and/or pipe support materials are supplied by Contractor or Vendor, all fasteners such as bolts, studs, nuts, washers etc., are to be supplied by Contractor at his own cost.							
97.02	Welding for supports shall include preheating and all tests (excluding radiography , which shall be paid separately) such as dye- penetrent test, hardness test etc. as required by standards, codes, specifications and instructions of Owner/Consultant.							
97.03	Turn buckles shall be as per Engineering Standard							
<b>98</b>	<b>STRUCTURAL STEEL WORKS</b>							
98.01	All structural work under this enquiry has been divided in to two categories:							
98.02	<b>CATEGORY-A :</b> Equipment platforms , valve operating platforms, ladders and hand railing (but excluding gratings) and any other additional equipment supports, if required , to be fabricated including primer and final painting as per clour coding at site.							
98.03	<b>CATEGORY-B :</b> Galvanized Gratings (35 mm)							
98.04	The rates for above items shall be quoted for supply, fabrication and Erection as per the format below.							
<b>99</b>	<b>Supply, Fabrication &amp; Erection of Steel Structure</b>							
99.01	Structural steel is also to be arranged and supplied by CONTACTOR.							
99.02	The rate shall include cost of preparation, submission and obtaining approval of fabrication drawings from CONSULTANT, labour, materials, consumables, surface preparation & application of primer and final painting, tools & tackles and other associated arrangement required to execute all the related activities. The cost shall also include cost of bolts, nuts, washers and anchor bolts. The rate shall include cost of withdrawal and transportation from OWNER/CONSULTANT'S stores /storage yard (if prefabricated structurals issued by OWNER/CONSULTANT) or from his own stores/ shop to place of erection, grouting etc.							
99.03	CATEGORY-A	2	MT		0.00	0.00	0.00	INR Zero Only

**Item Rate BoQ**

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99.04	CATEGORY-B	1	MT		0.00	0.00	0.00	INR Zero Only
100	<b>Note:</b>							
100.01	Prior approval shall have to be obtained from OWNER/CONSULTANT, in writing for making a change in sections due to non-availability of certain sections or using built-up section, compound sections, for fabrication of built-up compound sections either recommended by CONSULTANT or CONTRACTOR, no extra payment shall be made.							
100.02	For hand railing under clause 10.b.1 pipes shall also be supplied by CONTRACTOR including primer & final painting as per colour coding.							
100.03	During execution of piping etc. gratings may have to be cut and the same shall be repaired by cold galvanization (Zinc spray) of thickness 80 microns after proper surface preparation. This activity shall be deemed covered within the unit rate of erection of grating and nothing extra shall be paid for this.							
101	<b>RADIOGRAPHY (GAMMA RAY) :</b>							
101.01	The unit rate shall include cost of radiograph viewer and films, consumables, scaffolding, manpower, overheads/profits etc. Payment shall be made only for those films after examination for joints found acceptable as per codes, standards & NIT. Films for defective joints shall not be paid. Overlapping Length of radiography film is not payable.							
101.02	<b>At outside, the place of erection using film size</b>							
101.03	3" wide film	100	Inches		0.00	0.00	0.00	INR Zero Only
101.04	4" wide film	100	Inches		0.00	0.00	0.00	INR Zero Only
101.05	<b>In-situ (Erected position) using</b>							
101.06	3" wide film	100	Inches		0.00	0.00	0.00	INR Zero Only
101.07	4" wide film	100	Inches		0.00	0.00	0.00	INR Zero Only
102	<b>NOTES:</b>							

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102.01	Length and width of film to be used which shall be decided by Owner before execution of radiography.							
102.02	As a guide line the radiography film shall be used as below: -							
102.03	3" wide film shall be used up to 4" dia pipes							
102.04	4" wide film shall be used above 4" dia pipes							
102.05	Payment shall be made on the basis of weld length radiographed & for those joints which are found acceptable.							
102.06	Length of radiographed film shall be calculated (O.D. x 3.14) in inch.							
<b>103</b>	<b>DELETED</b>							
<b>104.00</b>	<b>MATERIAL HANDLING WORKS (SUPPLY &amp; ERECTION) (PART- V)</b>							
<b>105.00</b>	<b>PART-A : SUPPLY OF MATERIAL HANDLING ITEMS</b>							
<b>106</b>	<b>Motors</b>							
106.01	Supply of Motors with all accessories, as specified in data sheets, Technical Specification - Electrical, Technical Specification attached with the NIT - 37 kW Motor for Conveyor # BC-1/1A	2	Nos.		0.00	0.00	0.00	INR Zero Only
106.02	Supply of Motors with all accessories, as specified in data sheets, Technical Specification - Electrical, Technical Specification attached with the NIT - 18 kW Motor For Movable Conveyor # MBC-1/1A	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>107</b>	<b>Gear Box with intergral holdback</b>							
107.01	Supply of Bevel Helical Type gear Box for 37kw motor.	2	Nos.		0.00	0.00	0.00	INR Zero Only
107.02	Supply of Bevel Helical Type gear Box for 18kw motor.	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>108</b>	<b>Coupling &amp; Brake</b>							
108.01	LS Coupling	4	Nos.		0.00	0.00	0.00	INR Zero Only
108.02	HS Coupling for LT Motor	4	Nos.		0.00	0.00	0.00	INR Zero Only
108.03	Hydraulically operated Thrustor Brakes	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>109</b>	<b>Belting</b>							
109.01	HD NN-400/3 (M-24) for 650mm belt width Top Cover: 5mm and Bottom Cover: 2mm	715	mtr		0.00	0.00	0.00	INR Zero Only

## Item Rate BoQ

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Name of the Bidder/ Bidding Firm / Company :	
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<b>110</b>	<b>Pulley with Lagging / Bearing &amp; Plummer Block</b>							
110.01	Drive Pulley (Φ 400mm x 750 Face width x 1200 Bearing Crs. X 12 thk. shell) with Lagging 10mm (4mm ceramic+6mm rubber)	4	Nos.		0.00	0.00	0.00	INR Zero Only
110.02	Non Pulley (Φ 315mm x 750 Face width x 1200 Bearing Crs. X 10 thk. shell) with lagging 10 mm (plain) natural rubber	14	Nos.		0.00	0.00	0.00	INR Zero Only
110.03	Deflector Pulley (Φ 189mm x 750 Face width x 1200 Bearing Crs. X 6 thk. shell) with lagging 6 mm (plain) natural rubber	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>111</b>	<b>Idlers</b>							
111.01	Carrying Idlers for 650mm belt width	248	Nos.		0.00	0.00	0.00	INR Zero Only
111.02	S.A.C Idler for 650mm Belt	30	Nos.		0.00	0.00	0.00	INR Zero Only
111.03	10° Tr. Transition idler for 650mm Belt	4	Nos.		0.00	0.00	0.00	INR Zero Only
111.04	20° Tr. Transition idler for 650mm Belt	4	Nos.		0.00	0.00	0.00	INR Zero Only
111.05	Impact Idlers for 650mm belt width	16	Nos.		0.00	0.00	0.00	INR Zero Only
111.06	Flat Return Idlers for 650mm belt width	90	Nos.		0.00	0.00	0.00	INR Zero Only
111.07	S.A.C Return Idler for 650mm Belt width	10	Nos.		0.00	0.00	0.00	INR Zero Only
111.08	Self-cleaning type rubber disc for 650mm Belt width	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>112</b>	<b>Belt Scraper</b>							
112.01	Primary Belt Cleaner	4	Nos.		0.00	0.00	0.00	INR Zero Only
112.02	Multi bladed Type Secondary Belt	4	Nos.		0.00	0.00	0.00	INR Zero Only
112.03	V-Plow type cleaner	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>113</b>	<b>Safety Switches</b>							
113.01	Pull Cord Switches	10	Nos.		0.00	0.00	0.00	INR Zero Only
113.02	Belt Sway Switches	6	Nos.		0.00	0.00	0.00	INR Zero Only
113.03	Zero Speed switch	2	Nos.		0.00	0.00	0.00	INR Zero Only
113.04	Electronic Hooter with flash light	4	Nos.		0.00	0.00	0.00	INR Zero Only

## Item Rate BoQ

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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<b>114</b>	<b>Conveyor Technological Structure</b>							
114.01	Head Frame	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.02	Tail Frame	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.03	Bend Frame	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.04	Drive Base Frame	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.05	Take-up frame & Support with counter weight (C.I.)	2	Nos.		0.00	0.00	0.00	INR Zero Only
114.06	Stringer & Short Support	47250	Kg		0.00	0.00	0.00	INR Zero Only
114.07	Safety Guard	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.08	Skirt Board	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.09	Chute	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.10	Interconnecting Chute	4	Nos.		0.00	0.00	0.00	INR Zero Only
114.11	Hardware	10	kg		0.00	0.00	0.00	INR Zero Only
<b>115</b>	<b>Hydraulic Cylinder (Cap. 1.5 ton x 2800mm stroke x 180 bar Pressure)</b>	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>116</b>	<b>Structure Tyre mounted Movable belt conveyor with hydraulic cylinder</b>	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>117</b>	<b>Front End Loader (Min. 2.7cum bucket )</b>	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>118</b>	<b>Electric Hoist (1.5T capacity)</b>	4	Nos.		0.00	0.00	0.00	INR Zero Only
<b>119</b>	<b>Manual Hoist (1.0T capacity)</b>	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>120</b>	<b>SILO SYSTEM</b>							
120.01	Pressure Relief Access Door - Ash Silo	2	Nos.		0.00	0.00	0.00	INR Zero Only
120.02	Silo Adaptor for Ash Silo - MS plate (IS: 2062 Grade A/B) fabricated from 10mm thk.	5	Nos.		0.00	0.00	0.00	INR Zero Only
120.03	Vibrating Feeder - Ash Silo	1	No.		0.00	0.00	0.00	INR Zero Only
120.04	Pressure Relief Access Door - Slag Silo	2	Nos.		0.00	0.00	0.00	INR Zero Only
120.05	Silo Adaptor for Slag Silo - MS plate (IS: 2062 Grade A/B) fabricated from 10mm thk.	5	Nos.		0.00	0.00	0.00	INR Zero Only
120.06	Vibrating Feeder - Slag Silo	1	No.		0.00	0.00	0.00	INR Zero Only
120.07	1 Cum cap MS Fabricated Air Receiver as per Indian Code / American Code	1	No.		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

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<b>121</b>	<b>LIFTING SYSTEM</b>							
121.01	3 T Elec. hoist for silo top - Lift 20 mtrs.	2	Nos.		0.00	0.00	0.00	INR Zero Only
121.02	2 T Elec. hoist for Chemical House	1	Nos.		0.00	0.00	0.00	INR Zero Only
121.03	2 T manual hoist for silo platform - Lift 10 mtrs.	2	Nos.		0.00	0.00	0.00	INR Zero Only
121.04	50 Sq. Bar	250	m		0.00	0.00	0.00	INR Zero Only
121.05	DSL for EOT Cranes - Length of buildings	250	m		0.00	0.00	0.00	INR Zero Only
121.06	Current Collector - 1 Set per EOT Crane	2	Nos.		0.00	0.00	0.00	INR Zero Only
121.07	Trailing Cable for Electric Hoist - 3 Hoists with 15 mtr travel length of each hoist	60	m		0.00	0.00	0.00	INR Zero Only
<b>122</b>	<b>SPARE</b>							
123.00	Supply of spares of following equipments							
<b>124</b>	<b>Conveyors System</b>							
<b>124.01</b>	<b>Pulleys</b>							
124.02	Head Pulley for conveyors	1	No.		0.00	0.00	0.00	INR Zero Only
124.03	Tail Pulley for conveyors	1	No.		0.00	0.00	0.00	INR Zero Only
124.04	Snub Pulley for conveyors	1	No.		0.00	0.00	0.00	INR Zero Only
124.05	Bend Pulley for conveyors	1	No.		0.00	0.00	0.00	INR Zero Only
124.06	Take-up Pulley for conveyors	1	No.		0.00	0.00	0.00	INR Zero Only
<b>124.07</b>	<b>Plummer Blocks</b>							
124.08	Plummer block with bearing for Head Pulley	2	Nos.		0.00	0.00	0.00	INR Zero Only
124.09	Plummer block with bearing for Tail Pulley	2	Nos.		0.00	0.00	0.00	INR Zero Only
124.10	Plummer block with bearing for Snub Pulley	2	Nos.		0.00	0.00	0.00	INR Zero Only
124.11	Plummer block with bearing for Bend Pulley	2	Nos.		0.00	0.00	0.00	INR Zero Only
124.12	Plummer block with bearing for Take-up Pulley	2	Nos.		0.00	0.00	0.00	INR Zero Only
<b>124.13</b>	<b>Rollers</b>							
124.14	Carrying Rollers for conveyors	30	Nos.		0.00	0.00	0.00	INR Zero Only
124.15	Return Rollers for conveyors	10	Nos.		0.00	0.00	0.00	INR Zero Only

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Tender Inviting Authority: Projects & Development India Limited, Noida

Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

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124.16	Impact Rollers for conveyors	10	Nos.		0.00	0.00	0.00	INR Zero Only
124.17	Guide roller for self-aligning idler	10	Nos.		0.00	0.00	0.00	INR Zero Only
124.18	<b>Idlers (complete set with bracket)</b>							
124.19	Carrying Idlers for conveyors	25	Nos.		0.00	0.00	0.00	INR Zero Only
124.20	Return Idlers for conveyors	10	Nos.		0.00	0.00	0.00	INR Zero Only
124.21	S.A Carrying Idlers for conveyors	6	Nos.		0.00	0.00	0.00	INR Zero Only
124.22	10° Tr. Transition idler	1	No.		0.00	0.00	0.00	INR Zero Only
124.23	20° Tr. Transition idler	1	No.		0.00	0.00	0.00	INR Zero Only
124.24	S.A Return Idlers for conveyors	2	Nos.		0.00	0.00	0.00	INR Zero Only
124.25	Impact Idlers for conveyors	5	Nos.		0.00	0.00	0.00	INR Zero Only
124.26	Self-cleaning type rubber disc idler	1	No.		0.00	0.00	0.00	INR Zero Only
124.27	<b>Couplings</b>							
124.28	Coupling	2	Each		0.00	0.00	0.00	INR Zero Only
124.29	<b>Gear Box</b>							
124.30	Gear Box	1	Each		0.00	0.00	0.00	INR Zero Only
<b>125</b>	<b>ERECTION, TESTING &amp; COMMISSIONING OF MATERIAL HANDLING ITEMS (PART-B)</b>							
<b>126</b>	<b>Motors</b> -Loading, Unloading, transportation, Erection, Testing & Commissioning and all other relevant electrical items as per TS ATTACHED IN TENDER.& other associated work if any.							
126.01	Erection of Motors with all accessories, as specified in data sheets, Technical Specification - Electrical, Technical Specification attached with the NIT - <b>37 kW</b> Motor for Conveyor # BC-1/1A (2 nos)	900	kg.		0.00	0.00	0.00	INR Zero Only



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126.02	Erection of Motors with all accessories, as specified in data sheets, Technical Specification - Electrical, Technical Specification attached with the NIT - <b>18 kW</b> Motor For Movable Conveyor # MBC-1/1A (2 nos)	600	kg.		0.00	0.00	0.00	INR Zero Only
<b>127</b>	<b>Gear Box with intergral holdback</b> -Loading, Unloading, transportation, Erection, Testing & Commissioning and all other relevant electrical items as per TS ATTACHED IN TENDER.& other associated work if any.							
127.01	Erection of Bevel Helical Type gear Box for 37kw motor. (2 nos)	1600	kg.		0.00	0.00	0.00	INR Zero Only
127.02	Erection of Bevel Helical Type gear Box for 18kw motor. (2 nos)	1200	kg.		0.00	0.00	0.00	INR Zero Only
<b>128</b>	<b>Coupling &amp; Brake</b> -Loading, Unloading, transportation, Erection Testing & Commissioning							
128.01	LS Coupling (4 nos)	800	kg.		0.00	0.00	0.00	INR Zero Only
128.02	HS Coupling for LT Motor (4 nos)	1000	kg.		0.00	0.00	0.00	INR Zero Only
128.03	Hydraulically operated Thrustor Brakes (4 nos)	600	kg.		0.00	0.00	0.00	INR Zero Only
<b>129</b>	<b>Belting</b> -Loading, Unloading, transportation, Erection, Testing & Commissioning and all other relevant as per TS ATTACHED IN TENDER.& other associated work if any.							
129.01	HD NN-400/3 (M-24) for 650mm belt width Top Cover: 5mm and Bottom Cover: 2mm (715 mtr)	10010	kg.		0.00	0.00	0.00	INR Zero Only
<b>130</b>	<b>Pulley with Lagging / Bearing &amp; Plummer Block</b> -Loading, Unloading, transportation, Erection, Testing & Commissioning and all other relevant as per TS ATTACHED IN TENDER.& other associated work if any.							
130.01	Drive Pulley (Φ 400mm x 750 Face width x 1200 Bearing Crs. X 12 thk. shell) with Lagging 10mm (4mm ceramic+6mm rubber) (4 nos)	1000	kg.		0.00	0.00	0.00	INR Zero Only

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130.02	Non Pulley (Φ 315mm x 750 Face width x 1200 Bearing Crs. X 10 thk. shell) with lagging 10 mm (plain) natural rubber (14 nos)	2520	kg.		0.00	0.00	0.00	INR Zero Only
130.03	Deflector Pulley (Φ 189mm x 750 Face width x 1200 Bearing Crs. X 6 thk. shell) with lagging 6 mm (plain) natural rubber (4 nos)	480	kg.		0.00	0.00	0.00	INR Zero Only
<b>131</b>	<b>Idlers</b> -Loading, Unloading, transportation, Erection, Testing & Commissioning and all other relevant as per TS ATTACHED IN TENDER.& other associated work if any.							
131.01	Carrying Idlers for 650mm belt width (248 nos)	10463.12	kg.		0.00	0.00	0.00	INR Zero Only
131.02	S.A.C Idler for 650mm Belt (30 nos)	1925.70	kg.		0.00	0.00	0.00	INR Zero Only
131.03	10° Tr. Transition idler for 650mm Belt (4 nos)	168.76	kg.		0.00	0.00	0.00	INR Zero Only
131.04	20° Tr. Transition idler for 650mm Belt (4 nos)	168.76	kg.		0.00	0.00	0.00	INR Zero Only
131.05	Impact Idlers for 650mm belt width (16 nos)	773.28	kg.		0.00	0.00	0.00	INR Zero Only
131.06	Flat Return Idlers for 650mm belt width (90 nos)	2131.20	kg.		0.00	0.00	0.00	INR Zero Only
131.07	S.A.C Return Idler for 650mm Belt width (10 nos)	616.80	kg.		0.00	0.00	0.00	INR Zero Only
131.08	Self-cleaning type rubber disc for 650mm Belt width (2 nos)	47.36	kg.		0.00	0.00	0.00	INR Zero Only
<b>132</b>	<b>Belt Scraper</b> -Loading, Unloading, transportation, Erection, Testing & Commissioning and all other relevant as per TS ATTACHED IN TENDER.& other associated work if any.							
132.01	Primary Belt Cleaner (4 nos)	400	kg.		0.00	0.00	0.00	INR Zero Only
132.02	Multi bladed Type Secondary Belt (4 nos)	480	kg.		0.00	0.00	0.00	INR Zero Only
132.03	V-Plow type cleaner (4 nos)	480	kg.		0.00	0.00	0.00	INR Zero Only
<b>133</b>	<b>Safety Switches</b>							
133.01	Pull Cord Switches (10 nos)	300	kg.		0.00	0.00	0.00	INR Zero Only

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Name of Work: TENDER FOR SUPPLY AND CONSTRUCTION OF ASH POND AND ALLIED SERVICES AT TALCHER FERTILIZERS LTD., ANGUL, ODISHA

Contract No: PNP/PC-183/E/206/NCB

**NOTE :** Quantities mentioned in the Schedule of Rates are indicative and not exhaustive in nature. Payment shall be made as per actual quantity used/certified at site by Owner's Engineer-in-charge. Quantities indicated in Schedule of Rates are approximate and subject to variation on either side. The quantity of individual item may be deleted. Contractor shall not be entitled for any compensation on this account and the quoted rates shall hold good for such quantity variations etc. Payments on bills shall, however, be made on actual measurements of quantities of work done as per approved drawings. **Goods & Services Tax (GST) is applicable @ 18% on the quoted rates (being Works Contract)**

Name of the Bidder/ Bidding Firm / Company :	
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**SCHEDULE OF RATE** (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
133.02	Belt Sway Switches (6 nos)	180	kg.		0.00	0.00	0.00	INR Zero Only
133.03	Zero Speed switch (2 nos)	60	kg.		0.00	0.00	0.00	INR Zero Only
133.04	Electronic Hooter with flash light (4 nos)	120	kg.		0.00	0.00	0.00	INR Zero Only
<b>134</b>	<b>Conveyor Technological Structure-Loading, Unloading, transportation, Erection, Testing &amp; Commissioning and all other relevant as per TS ATTACHED IN TENDER.&amp; other associated work if any.</b>							
134.01	Head Frame (4 nos)	600	kg.		0.00	0.00	0.00	INR Zero Only
134.02	Tail Frame (4 nos)	480	kg.		0.00	0.00	0.00	INR Zero Only
134.03	Bend Frame (4 nos)	400	kg.		0.00	0.00	0.00	INR Zero Only
134.04	Drive Base Frame (4 nos)	1200	kg.		0.00	0.00	0.00	INR Zero Only
134.05	Take-up frame & Support with counter weight (2 nos)	2000	kg.		0.00	0.00	0.00	INR Zero Only
134.06	Stringer & Short Support (Lot)	47250	kg.		0.00	0.00	0.00	INR Zero Only
134.07	Safety Guard (4 nos)	320	kg.		0.00	0.00	0.00	INR Zero Only
134.08	Skirt Board (4 nos)	1200	kg.		0.00	0.00	0.00	INR Zero Only
134.09	Chute (4 nos)	4000	kg.		0.00	0.00	0.00	INR Zero Only
134.10	Interconnecting Chute (4 nos)	4000	kg.		0.00	0.00	0.00	INR Zero Only
134.11	Hardware (Lot)	10	kg.		0.00	0.00	0.00	INR Zero Only
<b>135</b>	<b>Hydraulic Cylinder (Cap. 1.5 ton x 2800mm stroke x 180 bar Pressure) (2 nos)</b>	900	kg.		0.00	0.00	0.00	INR Zero Only
<b>136</b>	<b>structure for Tyre mounted Movable belt conveyor with hydraulic cylinder (2 nos)</b>	16000	kg.		0.00	0.00	0.00	INR Zero Only
<b>137</b>	<b>Front End Loader (Min. 2.7cum bucket ) (2 nos)</b>	30000	kg.		0.00	0.00	0.00	INR Zero Only
<b>138</b>	<b>Electric Hoist (1.5T capacity) (4 nos)</b>	1680	kg.		0.00	0.00	0.00	INR Zero Only
<b>139</b>	<b>Manual Hoist (1.0T capacity) (2 nos)</b>	700	kg.		0.00	0.00	0.00	INR Zero Only
<b>140</b>	<b>SILO SYSTEM</b>							
140.01	Pressure Relief Access Door - Ash Silo	2	Nos.		0.00	0.00	0.00	INR Zero Only
140.02	Silo Adaptor for Ash Silo - MS plate (IS: 2062 Grade A/B) fabricated from 10mm thk.	5	Nos.		0.00	0.00	0.00	INR Zero Only

## Item Rate BoQ

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Tender Inviting Authority: Projects & Development India Limited, Noida

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Contract No: PNP/PC-183/E/206/NCB

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Name of the Bidder/ Bidding Firm / Company :								
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NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER #	NUMBER #	NUMBER #	TEXT #
Sl. No.	Item Description	Quantity	Units	BASIC RATE In Figures To be entered by the Bidder in Rs. P	GST @ 18% in RS. P	TOTAL AMOUNT Incl. All taxes & duties (Excl. GST) in Rs. P	TOTAL AMOUNT Incl. All taxes , duties and GST in Rs. P	TOTAL AMOUNT Incl. All taxes, duties and GST In Words
140.03	Vibrating Feeder - Ash Silo	1	No.		0.00	0.00	0.00	INR Zero Only
140.04	Pressure Relief Access Door - Slag Silo	2	Nos.		0.00	0.00	0.00	INR Zero Only
140.05	Silo Adaptor for Slag Silo - MS plate (IS: 2062 Grade A/B) fabricated from 10mm thk.	5	Nos.		0.00	0.00	0.00	INR Zero Only
140.06	Vibrating Feeder - Slag Silo	1	No.		0.00	0.00	0.00	INR Zero Only
140.07	1 Cum cap MS Fabricated Air Receiver as per Indian Code / American Code	1	No.		0.00	0.00	0.00	INR Zero Only
<b>141</b>	<b>LIFTING SYSTEM</b>							
141.01	3 T Elec. hoist for silo top - Lift 20 mtrs.	2	Nos.		0.00	0.00	0.00	INR Zero Only
141.02	2 T Elec. hoist for Chemical House	1	Nos.		0.00	0.00	0.00	INR Zero Only
141.03	2 T manual hoist for silo platform - Lift 10 mtrs.	2	Nos.		0.00	0.00	0.00	INR Zero Only
141.04	50 Sq. Bar	250	m		0.00	0.00	0.00	INR Zero Only
141.05	DSL for EOT Cranes - Length of buildings	250	m		0.00	0.00	0.00	INR Zero Only
141.06	Current Collector - 1 Set per EOT Crane	2	Nos.		0.00	0.00	0.00	INR Zero Only
141.07	Trailing Cable for Electric Hoist - 3 Hoists with 15 mtr travel length of each hoist	60	mtr		0.00	0.00	0.00	INR Zero Only
<b>Total in Figures</b>						<b>0.00</b>	<b>0.00</b>	INR Zero Only
<b>Quoted Rate in Words</b>				<b>INR Zero Only</b>				