



## NOTICE INVITING TENDER

FOR

**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities” on item Rate basis**

at

**Talcher Fertilizers Limited, Talcher, Odisha**

**NIT NO. : PNPM/PC-150/E-121/NCB DATED 21.07.2023**

**PREPARED AND ISSUED BY**





**PROJECTS & DEVELOPMENT INDIA LTD.**

**(A Govt. of India Enterprise)**

**PDIL BHAWAN, A-14, Sector-1,**

**NOIDA-201301, U.P., India**

*Date of Issue: 21st July'23*

	<b>“Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”</b>	PC-150/E-121/MI	0	
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## MASTER INDEX

**NIT NO. : PNP/PC-150/E-121/NCB DATED 20.07.2023**

**NIT DESCRIPTION : “Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, 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]
Section-V	Special Conditions of Contract [SCC]
Section-VI	Specifications, Scope of Work and Drawing
Section-VII	Schedule of Rates





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**SECTION-I**

**INVITATION FOR BID (IFB)**



**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

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**SECTION-I**

**"INVITATION FOR BID (IFB)"**

Ref No: PNPM/PC-150/E-121/NCB

Date: 21.07.2023

To,

**PROSPECTIVE BIDDERS**

**SUB: : “Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

**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	<b>“Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”</b>	
<b>(B)</b>	TENDER NO. & DATE	<b>PNPM/PC-150/E-121/NCB dated 21.07.2023</b>	
<b>(C)</b>	TYPE OF BIDDING SYSTEM	SINGLE BID SYSTEM	<input type="checkbox"/>
		TWO BID SYSTEM	<input checked="" type="checkbox"/>
<b>(D)</b>	TYPE OF TENDER	E-TENDER (CPP PORTAL)	<input checked="" type="checkbox"/>
		MANUAL	<input type="checkbox"/>



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(E)	COMPLETION PERIOD	15 (Fifteen) months from date of issuance of FOA (Fax of Acceptance)				
(F)	BID VALIDITY	The bid validity period shall be 90 Days from Bid due date.				
(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.66.48 Lakh</b> (Rupees Sixty Six Lakh Forty Eight Thousand Only).</p> <p>Exempted Bidders (i.e. MSEs 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)	From 21.07.2023 (09:00 Hrs, IST) to 10.08.2023 (15:00 Hrs, IST) on following websites: (i) <a href="https://eprocure.gov.in">Govt. CPP Portal https://eprocure.gov.in</a> (ii) TFL Website - <a href="http://tflonline.co.in">http://tflonline.co.in</a> (iii) PDIL website - <a href="http://www.pdilin.com">www.pdilin.com</a>				
(I)	DATE, TIME & VENUE OF PRE-BID MEETING	On 28.07.2023 (14:30 Hrs, IST), through Physical mode at PDIL, Noida office.				
(J)	START OF BID SUBMISSION ON CPP PORTAL	01.08.2023 at 15:00 Hrs. (IST)				
(K)	DUE DATE & TIME OF BID-SUBMISSION	Date : 10.08.2023 Time : 15:00 Hrs (IST)				
(L)	DATE AND TIME OF UN-PRICED BID OPENING (IN PRESENCE OF AUTHORIZED REPRESENTATIVE OF BIDDERS)	Date: 11.08.2023 Time :15:00 hrs (IST) Onwards Venue: M/s 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)				



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<b>(M)</b>	ADDRESS FOR COMMUNICATION WITH PDIL	<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: 1) 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></p> <p>2) Mr. Md. Mahtab Ansari- Project Co-ordinator Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 371 Mob. No. : 8319864089 Fax no. : +91-120-2529801 E-mail : <a href="mailto:mahatab@pdilin.com">mahatab@pdilin.com</a></p>				
	ADDRESS FOR COMMUNICATION WITH OWNER (TFL) AT PROJECT OFFICE	<p>GAIL INDIA LIMITED, PLOT NO. 24, FILM CITY, SECTOR 16A, NOIDA- 201301 Kind Attention : Mr. S.M. Badruddoja DGM (Projects) E-mail : <a href="mailto:sm.badruddoja@gail.co.in">sm.badruddoja@gail.co.in</a> Mob. No. : +91-8859500094</p>				
<b>(O)</b>	ADDRESS FOR COMMUNICATION WITH OWNER (TFL) AT SITE FOR SITE VISIT	<p>M/s Talcher Fertilizers Ltd. (TFL), Administrative Building, Talcher, Post: Vikrampur, Dist: Angul, Pincode-759106, Odisha</p> <p>Mr. Satyabrata Mishra-GM (Projects) Mob No. : +91-9927339444 E-mail : <a href="mailto:smishra@gail.co.in">smishra@gail.co.in</a></p>				
<b>(P)</b>	Reverse Auction	<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> <p>(Also refer Clause No. 26.3 of ITB)</p>	APPLICABLE	<input checked="" type="checkbox"/>	NOT APPLICABLE	<input type="checkbox"/>
APPLICABLE	<input checked="" type="checkbox"/>					
NOT APPLICABLE	<input type="checkbox"/>					



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<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
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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
  - iv) Line of credit (if any)
- 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.



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- 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





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**DO NOT OPEN - THIS IS A QUOTATION**  
**PHYSICAL DOCUMENTS**

**Tender Document No.** : .....

**Description** : “Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”

**Due Date & Time** : 10.08.2023 at 15:00 Hrs.

**From:**

.....  
.....  
.....  
.....

**To:**

Projects & Development India Limited,  
(Project Management Department)  
P.D.I.L Bhawan, A-14, Sector-1,  
Noida , (India)  
Fax no.:0120-2529801

Kind Attention:

1) 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 : [kjoshi@pdilin.com](mailto:kjoshi@pdilin.com)

2) Mr. Md. Mahtab Ansari- Project Co-ordinator  
Tel no. : +91-120-2529842/43/47/51/53/54  
Extn. 374  
Mob. No. : 8319864089  
Fax no. : +91-120-2529801  
E-mail : [mahatab@pdilin.com](mailto:mahatab@pdilin.com)

**(To be pasted on the envelope containing Physical Document)**



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**SECTION-II**

**BID EVALUATION CRITERIA**

**&**

**EVALUATION METHODOLOGY**

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## 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 experience as under, during the last Seven (07) years reckoned from the original bid due date.

- A) Bidder shall have experience of having successfully completed at least one composite order/ contract of value not less than **INR62.76 Crore (including taxes)**, involving work of **“Supply, Laying / installation and testing/ commissioning** of buried steel pipeline minimum 6.4 KM length of Dia. 24” or above, which must include at least one HDD crossing of Road/Canal/water body **OR** one Railway crossing by trenchless method.

**OR**



Bidder shall have experience of having successfully completed at least two composite order / contract of each value not less than **INR39.22Crore (including taxes)**, involving work of **“Supply, Laying / installation and testing/commissioning** of buried steel pipeline of minimum 4 Km length (in each work order) of Dia. 24” or above, which must include at least one HDD crossing of Road/Canal/water body **OR** one Railway crossing by trenchless method.

**OR**

Bidder shall have experience of having successfully completed at least three composite order / contract of each value not less than **INR31.38Crore (including taxes)**, involving work of **“Supply, Laying / installation and testing/commissioning** of buried steel pipeline of minimum 3.2 Km length (in each work order) of Dia. 24” or above”, which must include at least one HDD crossing of Road/Canal/water body **OR** one Railway crossing by trenchless method.

**OR**

- B) Bidder shall have experience of having successfully completed at least one composite order / contract of value not less than **INR36.72Crore (including taxes)**, involving work of **“Laying / installation, testing/ commissioning of** buried steel pipeline of minimum 6.4 KM length of Dia. 24” or above, which must

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include at least one HDD crossing of Road/Canal/water body **OR** one Railway crossing by trenchless method.

**OR**

Bidder shall have experience of having successfully completed at least two composite order / contract of each value not less than **INR22.95Crore (including taxes)**, involving work of **“Laying / installation and testing/ commissioning** of buried steel pipeline of minimum 4 Km length (in each order) of Dia. 24” or above”, which must include at least one HDD crossing of Road/Canal/water body **OR** one Railway crossing by trenchless method.

**OR**

Bidder shall have experience of having successfully completed at least three composite order / contract of each value not less than **INR18.36Crore (including taxes)**, involving work of **“Laying / installation and testing/ commissioning** of buried steel pipeline of minimum 3.2 Km length (in each order) of Dia. 24” or above”, which must include at least one HDD crossing of Road/Canal/water body **OR** one Railway crossing by trenchless method.

## **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.

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

- I. 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.
- II. 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

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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.



- III. The bidder must submit the completion certificate/acceptance certificate issued by 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.
- IV. 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.
- V. Experience of bidder acquired as a sub-contractor is acceptable against submission of certificate from end user by such bidder along with other specified documents.
- VI. Bids from Consortium / Joint Venture shall not be accepted
- VII. In case the bidder has an experience as a consortium member and such a member has executed earlier a job within its scope as a member of the consortium, which is required as experience as per the qualification criteria in clause no. A.1, will be considered. Appropriate documentary evidence to establish this is to be submitted towards such experience

## 2.0 Financial Criteria:

- 2.1 The Average Annual financial Turnover during the three preceding financial years of the bidder should be minimum **INR31.38Crore**.
- 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 **INR6.27Crore** 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 **INR6.27Crore**. The line of credit from bank shall be submitted strictly as per prescribed format.

### “Notes for 2.1, 2.2 & 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 30th Sept. of the relevant financial year. In case the tenders having the due date for submission of bid up to 30th 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.

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In case the date of constitution/incorporation of the bidder is less than 3 years old, the average turnover in respect of the completed financial years after the date of constitution/ incorporation shall be taken into account for minimum Average Annual Financial Turnover criteria.

**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 30th September of the relevant financial year. In case the tenders having the due date for submission of bid up to 30th Sep. 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 Networth / Working Capital.

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 in 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 format at F-9. Declaration Letter/Certificate for line of credit due to short fall of working capital shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will also be acceptable wherein a group of banks can jointly provide line of credit to the bidder. The bank shall be required to issue the letter for declaration/ certificate of line of credit on their letter head along with the contact details of the issuing authority like email id, contact number etc.



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:**

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.

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**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://www.xe.com/currencyconverter>

<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.

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



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

a) 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 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.

b) In cases where bidder has executed the work as a sub-contractor, such Completion certificate (for compliance to **1.1**) issued by the “Order issuing Authority “is also acceptable, provided that a certificate or letter from end user/Owner is submitted that the bidder has worked as a sub-contractor for that project.

c) 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

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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 the preceding three (03) financial years.
- (b) To meet the criteria for Sr. No. **2.2**, Bidder shall submit the Audited Financial Statements of the last financial year.
- (c) To meet the criteria for Sr. No. **2.3**, Bidder shall submit the Audited Financial Statements of last 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 (ii) above, the “Notes for (2.1), (2.2) & (2.3) under 2.0” (Financial Criteria of BEC) shall apply.**

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



**6.0 Authentication of 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. TUV Rheinland (India) Pvt. Ltd.
7. TÜV SÜD South Asia Pvt. Ltd.
8. TUV 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



	<b>“Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”</b>	PC-150/ E-121/ S-II	0	
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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).

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 BOQ 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.

## 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.



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**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.

**10.0 E-Reverse Auction (eRA)-** eRA is applicable for subject Tender. Refer clause no. 26.3 of section-III of NIT for detailed methodology

**11.0** Bidder shall submit CBA Format as per attached Appendix-II.



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**Appendix-I**

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



# भारत का राजपत्र The Gazette of India

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**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।

[फा. सं. 3(2)/2018-आईडीडी]

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 क्वाड्रल 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 प्रीफेब्रिकेटेड 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 हार्डिंग 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 हार्डिंग 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 एसेम्बली कब्ड रेल, स्लाइड रेल, हॉट सिंटर ब्रेकर और गिजली, डिप रेल एंड रनिंग रेल, प्रोसेस फेन के लिए इम्पेलर एसेम्बली, सिंटर मशीन का ड्राइव एसेम्बली, उच्च तीव्रता वाला मिक्सर और नोडूलाइजर	50%
6	पेलेट संयंत्र उपकरण	पेलेट कार, ड्राइव/डिस्चार्ज इंड स्पोकेट एसेम्बली कब्ड रेल, स्लाइड रेल, रनिंग रेल बरटिकल रोलर मिल, प्रोसेस फेन के लिए इम्पेलर एसेम्बली, इनडूरेटिंग मशीन का ड्राइव एसेम्बली, 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 एसेम्बली, वेस्ट हीट रिक्वरी प्रणाली, बी एफ एवं हॉट ब्लास्ट स्टोव प्रौद्योगिकीय वाल, एन्व ब्रईन 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 इगनिवेशन सिस्टम, स्क्रबिंग टोवर सेल - चेट गैस क्लीनिंग सिस्टम, डॉंग हाउस लेडल ड्रायर, लेडल	50%

		प्री-हीटर, लेडल कूलर, फ्यूम कोलेक्शन हूड्स, क्लीन गैस स्टेक, इस्ट 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 रेगुलैटिंग 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 आक्सीलिरिज, 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/टेशन रिल/अनक्वाइलर, ए जी सी सिलेंडर, शेयर्स, लेवेलेर्स, लाजेर वेल्डर, पेकेजिंग मशीन, नॉन कान्टेक्ट, गेज/प्रोफाइल गेज, एंटी-फ्रिक्शन रोल नेक बियेरिंग, आयल फिल्म बियेरिंग, गियर बॉक्स, मिल मोटर्स	50%
13	लॉग मिल	मिलम हाउसिंग, बेड प्लेट, वर्क रोल, बेकअप रोल, स्पिनडेल्स; रोलर टेबल, कॉयलर /टेशन रिल /अनकॉयलर, शेयर्स, बिल्डट वेल्डर, पेकेजिंग मशीन, नान-कान्टेक्ट गॉज/प्रोफाइल गॉज, एंटी-फ्रिक्शन रोल नेक बियेरिंग, आयल फिल्म बियेरिंग, 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 / O2 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.>



सत्यमेव जयते

# भारत का राजपत्र

## The Gazette of India

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EXTRAORDINARY

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PART II—Section 3—Sub-section (i)

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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 इन्कायरी (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 इन्कायरी (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 ऐंठा 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 रोलड	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 रोलड इस्पात	7225	35%
24	इलेक्ट्रिकल स्टील सहित 600 मि. मी. से कम की चौड़ाई वाले अन्य एलॉय स्टील का फ्लेट रोलड इस्पात	7226	35%
25	अन्य एलॉय स्टील का अनियमित रूप से ऎंठा हुआ क्वाइल में बार्स और रोड, हॉट रोलड	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 प्रीफेब्रिकेटेड 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.



**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

PC-150/ E-121/ S-II

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DOC. NO.

REV.

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**Annexure-1 to Appendix-I**

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

To,  
M/s Talcher Fertilizers Limited

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

APPENDIX-II (COMMERCIAL BID ANALYSIS (CBA) - WORKS)		
TENDER SUBJECT		
TENDER DOCUMENT NUMBER & DESCRIPTION::		
S.NO.	NAME OF BIDDER	M/s. ....
<b>1.0 PARTICULARS</b>		
1.1	ADDRESS OF REGISTERED OFFICE	
1.2	ADDRESS WHERE CONTRACT TO BE PLACED	
1.3	ADDRESS FROM WHERE SERVICES ARE TO BE RENDRED ALONG WITH GST REGISTRATION NO.	ADDRESS: GST NO:
1.4	PHONE NO.	
1.5	E-MAIL	
1.6	NAME, DESIGNATION & CONTACT DETAILS OF CONTACT PERSON AS PER FORM F-3 (LETTER OF AUTHORITY)	
1.7	OFFER NUMBER & DATE	
1.8.1	STATUS OF BIDDER (MSE or Others) In case of MSE, specify the type of MSE i.e. Micro-SC/ST/WOMEN/others OR Small-SC/ST/WOMEN/others	
1.8.2	In case of MSE, submitted Udyam Registration Certificate duly certified by Chartered Accountant and Notary Public with Legible stamp	Submitted/ Not Submitted
1.9.1	STATUS OF BIDDER (Start-Up / Non-Start-up) Specify the type of bidder along with documents submitted.	
1.9.2	In case of Start-Up, submitted relevant documents duly certified by Chartered Accountant and Notary Public with Legible stamp	Submitted/ Not Submitted
<b>2.0 EMD DETAILS (WHEREVER APPLICABLE )</b>		
2.1	Item/ Section/ Group / Part Quoted	
2.2	Required EMD for Quoted Items	
2.3	EMD Amount submitted by the bidder	
2.4	Details of EMD / Bid Security	specify DD/ BG No, DD/BG date, issuing bank, DD/BG validity
2.5	Net Worth Letter for Bank regarding Net Worth >100 Crores (If Applicable)	Submitted/ Not Submitted with appropriate comments (if any)
<b>3.0 BEC FINANCIAL</b>		
3.1	<b>The Minimum Average Annual Turnover:</b> of the Bidder as per their audited financial results in any one of the immediately three preceding financial years.	
3.1.1	Item/ Section/ Group / Part Quoted	
3.1.2	Required Turnover for Quoted Item/ Section/ Group / Part	
3.1.3	Turnover of the bidder	FY ____ - ____ = INR/USD/Euro ____ FY ____ - ____ = INR/USD/Euro ____ FY ____ - ____ = INR/USD/Euro ____
3.2	<b>2. Net worth :</b> Net worth of the Bidder shall be positive as per the last audited financial statement.	Positive/ Negative (Enter the net worth as per Form F-10.)
3.3	<b>3. Working capital :</b> The minimum working capital of the Bidder as per the last audited financial statement shall be as under:  <b>Note:</b> If the bidder's working capital is inadequate, the bidder should supplement this with a letter from the bidder's bank, having net worth not less than Rs.100 Crores (or equivalent in USD), as per provisions of Tender Document.	
3.3.1	Item/ Section/ Group / Part Quoted	
3.3.2	Required Working Capital for Quoted Items	
3.3.3	Working capital of the bidder as per the last audited financial year	INR /US \$/ Euro/ home currency _____ as per FY _____ (refer Form F-10)
3.3.4	Deficiency of Working Capital Amount, if any	Yes/No (Specify amount (if any))
3.3.5	Working Capital letter from the bank as per Format F-9	Details of the letter (Amount, Bank, date etc.)
3.4	Submitted copy of Audited Annual Financial Statement [including Auditor's Report, Balance Sheets, Profit and Loss Accounts statements, Notes & schedules etc.] of three (3) preceding Financial Year(s) . Copy of the audited annual financial statements shall be duly certified / attested by Notary Public with legible stamp.	Submitted / Not Submitted with appropriate remarks (if any)
<b>4.0 FORMS &amp; FORMATS</b>		
4.1	FORMAT F-1: BIDDER'S GENERAL INFORMATION	Submitted/ Not Submitted
4.1.1	Status of Firm/ Company: Proprietorship Firm / Partnership Firm/ Company (Private or public) (As per Format F-1)	
4.1.2	Name of Proprietor/Partners/Directors (As per Format F-1)	
4.1.3	PAN No. (As per Format F-1)	
4.1.4	GST Registration No. (As per Format F-1)	

(PREPARED BY: )

(CHECKED BY: )

(VETTED BY: )



TENDER DOCUMENT NUMBER & DESCRIPTION::		
S.NO.	NAME OF BIDDER	M/s. ....
<b>1.0</b>	<b>PARTICULARS</b>	
4.1.5	EPF Registration No.	
4.1.6	ESI code No.	
4.2	FORMAT F-2B:DECLARATION FOR BID SECURITY [applicable for bidders who are exempted from submission of EMD/Bid Security]	Submitted/ Not Submitted with appropriate comments (if any)
4.3	FORMAT F-3:LETTER OF AUTHORITY (ON LETTER HEAD)	Submitted/ Not Submitted
4.4	FORMAT-F-5: AGREED TERMS & CONDITIONS (ATC)	Submitted/ Not Submitted
4.4.1	Acceptance of Bid validity	Accepted/ Not Accepted
4.4.2	Acceptance of payment terms	Accepted/ Not Accepted
4.4.3	Acceptance of Contract Performance Security	Accepted/ Not Accepted
4.4.4	Acceptance of Completion Schedule	Accepted/ Not Accepted
4.4.5	Acceptance of Price Reduction Schedule	Accepted/ Not Accepted
4.4.6	Whether bidder is liable to raise E-Invoice as per GST Act.	Yes/No
4.4.7	If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.	Accepted/ Not Accepted
4.4.8	Whether in the instant tender services/works are covered in reverse charge rule of GST (CGST & SGST/UTGST or IGST)	Yes/No
4.4.9	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	Confirmed / Not Confirmed
4.5	FORMAT F-9: CERTIFICATE FROM BANK IF BIDDER'S WORKING CAPITAL IS INADEQUATE/NEGATIVE	Submitted/ Not Submitted with appropriate comments (if any)
4.6	FORMAT F-10: FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE FOR FINANCIAL CAPABILITY OF THE BIDDER	Submitted/ Not Submitted
4.7	FORMAT F-13: E-BANKING MANDATE FORM	Submitted/ Not Submitted with appropriate comments (if any)
4.8	FORMAT-F-14: [IF APPLICABLE] INTEGRITY PACT (ON PLAIN PAPER)	Submitted/ Not Submitted
4.9	ANNEXURE-1 to APPENDIX - I: [IF APPLICABLE] SELF-CERTIFICATE TOWARDS POLICY FOR PROVIDING PREFERENCE TO DOMESTICALLY MANUFACTURED IRON & STEEL PRODUCTS IN GOVERNMENT PROCUREMENT	Submitted/ Not Submitted with appropriate comments (if any)
5.0	POWER OF ATTORNEY & NAME OF PERSON	Specify the complete details of the Power of Attorney [like POA is submitted in the name of Mr.....authorized through Board Resolution dated.....]
5.1	NAME OF DIGITAL SIGNATORY	
6.0	<b>IBID DOCUMENT / GCC / REPLY TO BIDDERS QUERIES / PRICE SCHEDULE (WITH PRICES BLANKED OUT)</b>	
6.1	ACCEPTANCE & SUBMISSION OF COMPLETE BID DOCUMENT WITH IFB, ITB, FORMS & FORMATS, GCC, VENDOE PERFORMANCE ETC.	Accepted/ Not Accepted AND Submitted/Not Submitted
6.2	ACCEPTANCE & SUBMISSION OF REPLY TO BIDDER QUERIES	Accepted/ Not Accepted AND Submitted/Not Submitted
6.3	ACCEPTANCE & SUBMISSION OF CORRIGENDUM	Accepted/ Not Accepted AND Submitted/Not Submitted
6.4	SUBMISSION OF COPY OF 'SCHEDULE OF RATES' WITH PRICES BLANKED OUT	Submitted/Not Submitted
6.5	Name of the bidder is not appearing in Holiday/ Banning list as per provisions of tender	Yes/No
7.0	<b>LAND BORDER SHARING</b>	
7.1	submission of certificate as Form-I to Annexure-VII of Section-III w.r.t Provisions of 'Procurement from a Bidder which shares a land border with India'	Submitted/Not Submitted Not from such Country OR from such country
8.0	<b>PPP-III POLICY</b>	
8.1	Undertaking as per FORM - II of ANNEXURE - V to Section-III and certificate from Statutory Auditor or Cost Auditor (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 of ANNEXURE -V to Section-III have been submitted.	Submitted/Not Submitted
8.2	Class-I Local supplier or Class-II Local Supplier	
9.0	<b>ADDITIONAL CLAUSES, IF ANY (*)</b>	
9.1	.....	
9.2	.....	
9.3	.....	
9.4	.....	
9.5	.....	
10.0	REMARKS	
	(*) Dealing Officers may add additional clauses, if any, based on requirement of specific tender document.	

TENDER DOCUMENT NUMBER & DESCRIPTION::	
S.NO.	NAME OF BIDDER
1.0	M/s. ....
PARTICULARS	
<u>Note:</u> In case of contradiction between the confirmations provided in this format and to confirmations provided in the bid, the confirmations provided in the bid shall prevail.	



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**SECTION-III**

**INSTRUCTION TO BIDDERS**

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



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### **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.



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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).

- (I) 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





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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 A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices. The bidder found to have a conflict of interest shall be disqualified. A bidder shall be considered to have a conflict of interest with one or more bidders in this bidding process, if:
- they have controlling partner (s) in common; or
  - they receive or have received any direct or indirect subsidy/ financial stake from any of them; or
  - they have the same legal representative/authorized signatory/agent for purposes of this bid; or
  - they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; or
  - Bidder participates in more than one bid in bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid.
  - a Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid;
  - In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business.

Bidders are required to submit a confirmation for no conflict of interest with other bidders in Format F-5.

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



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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**

### **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.

## **7 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".

## **8 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



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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.

### **[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'



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- (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 EMD/ 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. **(Applicable for all bidders irrespective of seeking purchase preference or not).**
- (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**

- (a) The Prices are to be submitted strictly as per the Schedule of Rate of the bidding documents. TFL shall not be responsible for any failure on the part of the bidder to follow the instructions.
- (b) Bidders are advised NOT to mention Rebate/Discount separately, either in the SOR format or anywhere else in the offer. In case Bidder(s) intend to offer any Rebate/Discount, they should include the same in the item rate(s) itself under the "Schedule of Rates (SOR)" and indicate the discounted unit rate(s) only.
- (c) If any unconditional rebate has been offered in the quoted rate the same shall be considered in arriving at evaluated price. However no cognizance shall be taken for any conditional discount for the purpose of evaluation of the bids.
- (d) In case, it is observed that any of the bidder(s) has/have offered suo-moto Discount/Rebate after opening of unpriced bid but before opening of price bids such discount /rebate(s) shall not be considered for evaluation. However, in the event of the bidder emerging as the lowest evaluated bidder without considering the discount/rebate(s), then such discount/rebate(s) offered by the bidder shall be



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considered for Award of Work and the same will be conclusive and binding on the bidder.

- (e) In the event as a result of techno-commercial discussions or pursuant to seeking clarifications / confirmations from bidders, while evaluating the un-priced part of the bid, any of the bidders submits a sealed envelope stating that it contains revised prices; such bidder(s) will be requested to withdraw the revised prices failing which the bid will not be considered for further evaluation.

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.

- 11.2 **PART-I: “TECHNO-COMMERCIAL/UN-PRICED BID”** comprising all the above documents mentioned at 11.1.1 along with copy of EMD/Bid Security/Declaration for Bid Security, copy of Power of Attorney and copy of integrity pact should be uploaded in the technical bid in the e-tender portal.

Further, Bidders must submit the original " EMD, Power of Attorney, Integrity Pact (wherever applicable) and any other documents specified in the Tender Document to the address mentioned in IFB, in a sealed envelope, superscribing the details of Tender Document (i.e. tender number & tender for) within 7 days from the date of un-priced bid opening.

Bidders are required to submit the EMD in original by Due Date and Time of Bid Submission or upload a scanned copy of the same in the Part-I of the Bid. If the Bidder is unable to submit EMD in original by Due Date and Time of Bid Submission, the Bidder is required to upload a scanned copy of the EMD in Part-I of Bid, provided the original EMD, copy of which has been uploaded, is received within 7 days from the Due Date of Bid Opening, failing which the Bid will be rejected irrespective of their status/ranking in tendering process and notwithstanding the fact that a copy of EMD was earlier uploaded by the Bidder.

- 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.
- 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



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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 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 Form F-5.

**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)**



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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 actual 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, Bids will be evaluated as per quoted prices without loading of **GST (CGST & SGST/UTGST or IGST)**, if not quoted. 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. 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





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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.



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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 Full payment including GST will be released at the time of processing of invoice for payment, where the GST amount reflects in Form GSTR-2A of TFL. However, in case where the GST amount doesn't reflect in Form GSTR-2A of TFL, the amount of GST will be released after reflection of GST amount of corresponding invoice in Form GSTR-2A of TFL.

**14 BID CURRENCIES:**

Bidders must submit bid in Indian Rupees only.

**15 BID VALIDITY**



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- 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’/ ‘Insurance Surety Bond’/ Fixed Deposit Receipt’** [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 The bidder can also submit the EMD through online banking transaction i.e. IMPS/NEFT/RTGS etc. For this purpose, the details of TFL’s Bank Account are mentioned under BDS. While remitting, the bidder must indicate EMD and tender/E-tender no. under remarks. Bidders shall be required to submit/ upload the successful transaction details along-with their bid/e-bid in addition to forwarding the details to dealing officer through email/letter with tender reference number immediately after remittance of EMD. In absence of submitting/ uploading the remittance details, the bid is likely to be considered as bid not accompanied with EMD. Further, in case of the online transaction, submission of EMD in original is not applicable.
- 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( excluding Co-operative banks and regional Rural 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. Purchaser will verify the BG from issuing bank.
- 16.4 Any Bid not secured in accordance with “ITB: Clause-16.1 & Clause-16.3” may be rejected



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- 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:
- If a Bidder withdraws his Bid during the “Period of Bid Validity”
  - If a Bidder has indulged in corrupt/fraudulent /collusive/coercive practice
  - If the Bidder modifies Bid during the period of bid validity (after Due Date and Time for Bid Submission).
  - Violates any other condition, mentioned elsewhere in the Tender Document, which may lead to forfeiture of EMD.
  - ~~In case of Cartelization of bid.~~
  - In the case of a successful Bidder, if the Bidder fails to:
    - to acknowledge receipt of the “Notification of Award” / Fax of Acceptance [FOA] / Detailed Letter of Acceptance [DLOA]”,
    - to furnish “Contract Performance Security / Security Deposit”, in accordance with “ITB: Clause-38”.
    - to accept ‘arithmetical corrections’ as per provision of the clause 30 of ITB
- 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 EMD/Bid Bond will not be accepted in case the same has reference of ‘remitter’/financer’ other than bidder on the aforementioned financial instrument of EMD/ Bid Bond submitted by the bidder and bid of such bidder will be summarily rejected.



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**16A 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



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responsiveness is based on the content of the bid itself without recourse to extrinsic evidence.

Bidder is requested not to take any deviation(s)/exception(s) to the terms & conditions of Tender Document, and submit all requisite documents as mentioned in this Tender Document, failing which their Bid 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.

As a principle, clarifications from bidders after opening of tenders will not be sought. However, where clarifications / documents from the bidders on important aspects are absolutely necessary for finalization of tender, clarifications from bidder can be asked. The request for clarification shall be given in email/portal, asking the bidder to respond by a specified date, and also mentioning therein that, if the bidder does not comply or respond by the date, his tender will be liable to be rejected. Depending on the outcome, such tenders are to be ignored or considered further. No change in prices or substance of the bid including specifications, shall be offered or permitted. No post-bid clarification at the initiative of the bidder shall be entertained. The shortfall information/ documents should be sought only in case of historical documents which pre-existed bids and which have not undergone change since then.

**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) PRS Clause
- 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.



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**20 E-PAYMENT**

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

**[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



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- 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**

- 25.1 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(s) or any obligations to inform the affected Bidder(s) 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.
- 25.2 A bidder is to be permitted to send his representation in writing to dealing officer specified in tender for rejection of bid. But, such representation has to be sent upto 10(ten) days from the date of Notification of Award/FOA. A decision on representation will be taken by TFL within 15 (fifteen) days of the receipt of the representation. Only a directly affected bidder can represent in this regard:
- Only a bidder who has participated in tender can make such representation
  - In case technical bid has been evaluated before the opening of the financial bid, an application for review in relation to the financial bid may be filed only by a bidder whose technical bid is found to be acceptable
- 25.3 However, following decisions of TFL shall not be subject to review:
- Determination of the need for procurement;
  - Selection of the mode of procurement or bidding system;
  - Choice of selection procedure;
  - Provisions limiting participation of bidders in the procurement process;
  - The decision to enter into negotiations with the L1 bidder;
  - Cancellation of the procurement process except where it is intended to subsequently re-tender the same requirements;
  - Issues related to ambiguity in contract terms may not be taken up after a contract has been signed, all such issues should be highlighted before consummation of the contract by the vendor/ contractor; and





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h) Complaints against specifications except under the premise that they are either vague or too specific so as to limit competition may be permissible.

## 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 bid is determined to be technically and commercially responsive. Techno-commercial bid evaluation status will be are to be informed to all bidders (including informing the techno-commercially not qualified Bidders). Price bids are to be opened in the presence of only techno-commercially acceptable bidders, who are willing to attend the bid opening, at a pre-publicised date, time and place or on the portal in case of e-procurement. The bidder's name, bid price, discount (if any) and any such details considered appropriate shall be read out during the price bid opening. Offers should not, repeat not, be circulated amongst the bidder's representative. Bidders selected for opening of their price bid shall be informed about the date & time of price bid opening. Bidders may depute their authorized representative to witness the price bid opening. The Bidders' representatives, who are present shall sign a Price Bid Opening 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.

### 26.3 **Reverse Auction**

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**



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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



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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



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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 bidders or any other person not officially concerned with such a process until the award to the successful bidder.

## **28 CONTACTING THE EMPLOYER**

- 28.1 From the time of bid opening to the time of contract award, no bidder shall contact TFL on any matter related to the bid, except on request and prior written permission.
- 28.2 Any effort by the bidder to influence TFL in bid evaluation, bid comparison or contract award decisions will vitiate the process and will result in the rejection of the bidder's bid and action shall be initiated as per the TFL's 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"



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- 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:
- “Deviation” is departure from the requirement specified in the tender documents.
  - “Reservation” is the setting of limiting conditions or withholding from complete acceptance of the requirement in the tender documents.
  - “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,
- If accepted would,
    - Affect in any substantial way the scope, quality, or performance of the job as specified in tender documents.
    - Limit, in any substantial way, inconsistent with the Tender Document, the Employer’s rights or the tenderer’s obligations under the proposed Contract.
  - 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 Tenders that do not meet the basic requirements specified in the bid documents are to be treated as unresponsive {both during Techno-commercial evaluation and Financial Evaluation incase of Two Bid System) and will be ignored. All tenders received will first be scrutinized to see whether the tenders meet the basic requirements as incorporated in the Bid document and to identify unresponsive tenders, if any. Unresponsive offers may not subsequently be made responsive by correction or withdrawal of the non-conforming stipulation. Some important points on the basis of which a tender may be declared as unresponsive and be ignored during the initial scrutiny are:
- The tender is not in the prescribed format or is unsigned or not signed as per the stipulations in the bid document;
  - The required EMD has not been provided or exemption from EMD is claimed without acceptable proof of exemption;
  - The bidder is not eligible to participate in the bid as per laid down eligibility criteria
  - The bid departs from the essential requirements specified in the bidding document (for example, the tenderer has not agreed to give the required contract performance security); or
  - Against a schedule in the list of requirements in the tender enquiry, the tenderer has not quoted for the entire requirement as specified in that schedule (example: in a schedule, it has been stipulated that the tenderer will supply the equipment, install and commission it and also train the TFL’s personnel for operating the equipment. The tenderer has, however, quoted only for supply of the equipment).



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**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**

Not Applicable

**34 PURCHASE PREFERENCE**

Purchase Preference as per Policy to Provide Purchase Preference as per Public Procurement (Preference to Make in India), Order 2017 shall be allowed as per Government instructions in vogue, as applicable from time to time

The Policy to Provide Purchase Preference as per Public Procurement (Preference to Make in India), Order 2017 is enclosed as Annexure V to ITB herewith.

Evaluation and applicability of purchase preference policy will be based on the confirmations & documents submitted by the bidder in their bid.

**[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



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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 PRS 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 case the individual contract value as specified in Notification of Award is more than INR 10 Lakhs exclusive of GST) 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 forfeiture of EMD/Security Deposit / Action as per Bid Security declaration.



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**38 CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT ((f/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 Insurance Surety Bond or Fixed Deposit Receptor 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).

If contractor has failed to submit CPS/ SD within specified time, a penal interest of Marginal Cost of Fund based Lending Rate (MCLR) for one year charged by SBI (applicable on due date of submission of CPBG/SD i.e. 30th day after issuance of FOA/ Notification of award) plus 4.0% p.a (on CPBG/SD amount) shall be charged for delay beyond 30 days i.e. from 31st days after issuance of FOA.

The first payment to contractor/ vendor/supplier is to be released only after submission of Contract Performance Security (CPS)/ Security Deposit (SD) & deduction of applicable interest OR deduction of Contract Performance Security (CPS)/ Security Deposit (SD) along with applicable interest from the due payment as mentioned herein above.

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 (excluding Co-operative banks and Regional Rural 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 Forefeiture 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 Deleted.





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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 detail 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.

38.10 The first payment to vendor is to be released only after submission of CPS / Security Deposit (SD).

38.11 Before the CPS / Security Deposit (SD) is released a "No Claim Certificate" is to be submitted by the supplier/vendor.

**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.



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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 Udyam Registration Certificate for availing benefit under Public Procurement Policy for MSEs-2012.**

Vide Gazette notification dated 18.10.2022 of Ministry of MSME, the following is notified:

*“In case of an upward change in terms of investment in plant and machinery or equipment or turnover or both, and consequent re-classification, an enterprise shall continue to avail of all nontax benefits of the category (micro or small or medium) it was in before the re-classification, for a period of three years from the date of such upward change”*

**Accordingly, in case of upward change in status, MSE bidder is required to submit the previous certificate also to get the MSE benefit.**

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.



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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**



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- (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 file 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:-



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- 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.



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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 it's 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 provides 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



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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)**

~~.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 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 PRS**

PRS 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 Price Reduction Schedule Clause (PRS clause). If service provider has raised the invoice for full value, then service provider should issue Credit Note towards the applicable PRS amount with applicable taxes.

In such cases if service provider fails to submit the invoice with reduced value or does not



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issue credit note as mentioned above, TFL will release the payment to service provider after giving effect of the PRS 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. DOCUMENTS FOR PAYMENT:**

Payment terms shall be as mentioned in GCC-Works/SCC.



However, for release of payment, Contractor is required to submit invoice along with other documents as mentioned in SCC. The final bill is to be submitted within one month after completion.

**53. SUB-LETTING OF WORKS**

The following is added to the Clause no. 37 of General Conditions of Contract (GCC)-Works:

- (i) Procurement of material, hire of equipment or engagement of labour will not mean sub-contracting.
- (ii) Sub-contracting by the contractor without the approval of TFL shall be a breach of contract, unless explicitly permitted in the contract.
- (iii) However, If specified in SCC Sub-contracting for Specialized Items of Work is allowed upto certain percentage of work



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### Annexure-I to Section-III

## 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 concerns which come within the sphere of effective influence of the banned/suspended agency shall be treated as allied agency. In determining this, the following factors may be taken into consideration:
- Whether the management is common;
  - Majority interest in the management is held by the partners or directors of banned/ suspended agency;
  - Substantial or majority shares are owned by the banned/ suspended agency and by virtue of this it has a controlling voice.
  - Directly or indirectly controls, or is controlled by or is under common control with another bidder.
  - All successor agency will also be considered as allied agency.
- 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.



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A.10 "Obstructive practice": materially impede the procuring entity's investigation into allegations of one or more of the above mentioned practices either by deliberately destroying, falsifying, altering; or by concealing of evidence material to the investigation; or by making false statements to investigators and/ or by threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or by impeding TFL's rights of audit or access to information.

**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.



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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.

In addition to above, Recovery of payments (other than due payments) including balance advance payments, if any, made by along with interest thereon at the prevailing rate shall be recovered.

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

If an agency is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, after execution of contract and during DLP/ Warranty/Guarantee Period, the 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.

Further, the Contract cum Performance Bank Guarantee (CPBG)/Contract Performance Security (CPS) submitted by agency against such order (s)/ contract (s) shall be forfeited.

**(iii) After expiry of Defect liability period (DLP)/ Warranty/Guarantee Period**

If an agency is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, after expiry of Defect liability period (DLP)/ Warranty/Guarantee Period, the 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.2.2 Period of Banning**

The period of banning of agencies indulged in Corrupt/Fraudulent/Collusive/Coercive Practices shall be as under and to be reckoned from the date of banning order:

S. No.	Description	Period of banning from the date of issuance of Banning order
1	Misrepresentation/False information other than pertaining to BEC of tender but having impact on the selection process.  For example, if an agency confirms not being in holiday in	06 Months



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	TFL/PSU's PMC or banned by PSUs/ Govt. Dept., liquidation, bankruptcy & etc. and subsequently it is found otherwise, such acts shall be considered in this category.	
2	Corrupt/Fraudulent (except mentioned sl. no. 1 above) /Collusive/Coercive Practices	01 year
2.1	If an agency again commits Corrupt/Fraudulent (except mentioned sl. no. 1 above) /Collusive/ Coercive Practices in subsequent cases after their banning, such situation of repeated offense to be dealt with more severity	2 years (in addition to the period already served)
3	Indulged in unauthorized disposal of materials provided by TFL	<b>2 years</b>
4	If act of vendor/ contractor is a threat to the National Security	2 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. . In case such agency is lowest (L-1), next lowest bidder shall be considered as L-1

**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.



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- (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. In case such agency is lowest (L-1), next lowest bidder shall be considered as L-1.
- 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:**



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- 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.

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## Annexure-II to Section III

### **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:**



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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





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4	VERY GOOD	No further action
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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 One Year**

(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 Two 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 Two (2) 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 Two 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. 32(C)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 Two (2) 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



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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 two 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 Two 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



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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 One 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 TwoYears**

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 Two(2) 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 TwoYears.**

- 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. 32(C) 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 Two(2) 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



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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 two 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 TwoYears 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.



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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. In case such agency is lowest (L-1), next lowest bidder shall be considered as L-1.

**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).



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Further, such bidder will be put on Watch List (Yellow Card) for a period of two 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.



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Annexure-1

**TALCHER FERTIZERS 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:



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**Instructions for allocation of marks**

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
marks	ii) When quality failure endanger system integration and safety of the system	Failure of severe nature	0
		- Moderate nature	5 marks
		- low severe nature	10-25 marks
	iii) Number of deviations	1. No deviation	5 marks
		2. No. of deviations $\leq 2$	2 marks
		3. No. of deviations $> 2$	0 marks

**1.3 RELIABILITY PERFORMANCE 20 Marks**





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<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



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Annexure-2

**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:



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

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 endanger system integration and safety of the system	Failure of severe nature - Moderate nature - low severe nature		0 marks 5 marks 10-25 marks
iii) Number of deviations	1. No deviation 2. No. of deviations $\leq 2$ 3. No. of deviations $> 2$		5 marks 2 marks 0 marks



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**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



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**Annexure-III**

**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.



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- 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-2B provided in the NIT. Otherwise the uploaded bid will be rejected.



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- 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**

- x. 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.
- xi. 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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**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

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**ANNEXURE-IV**

**BIDDING DATA SHEET (BDS)**

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

<b>A. GENERAL</b>					
<b>ITB clause</b>	<b>Description</b>				
1.1	The Employer/Owner is: The Employer/Owner is: Talcher Fertilizers Limited				
2.1	The name of the Works/Services to be performed is: “Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”.				
3	BIDS FROM CONSORTIUM/ JOINT VENTURE: <table border="1"><tr><td>APPLICABLE</td><td>X</td></tr><tr><td>NOT APPLICABLE</td><td>✓</td></tr></table>	APPLICABLE	X	NOT APPLICABLE	✓
APPLICABLE	X				
NOT APPLICABLE	✓				
<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: 1) Mr. Kailash Joshi- Project Manager Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 314, 9718762091 Fax no. : +91-120-2529801 E-mail : <a href="mailto:kjoshi@pdilin.com">kjoshi@pdilin.com</a>  2) Md. Mahtab Ansari- Project Co-ordinator Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 316 Mob. No. : 8319864089 Fax no. : +91-120-2529801 E-mail : <a href="mailto:mahatab@pdilin.com">mahatab@pdilin.com</a>				
<b>C. PREPARATION OF BIDS</b>					
<b>ITB clause</b>	<b>Description</b>				





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<b>11.1.1 (r)</b>	Additional documents to be submitted by the Bidder with its Part-I (Techno-commercial/ Unpriced bid) : as per SCC/Scope of Work.								
<b>12 &amp; 13</b>	<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.: 41256023769 Bank &amp; Branch Name: SBI, CAG-II, New Delhi IFSC Code: SBIN0017313</td></tr></table>	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.: 41256023769 Bank & Branch Name: SBI, CAG-II, New Delhi IFSC Code: SBIN0017313
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.: 41256023769 Bank & Branch Name: SBI, CAG-II, New Delhi IFSC Code: SBIN0017313								
<b>14</b>	The currency of the Bid shall be INR								
<b>15</b>	The bid validity period shall be 90 Days from 'Bid Due Date'.								
<b>16.1, 16.10 and 38.6</b>	<p>In case '<b>Earnest Money / Bid Security</b>' or "<b>Contract Performance Security</b>" is in the form of '<b>Demand Draft</b>' or '<b>Banker's Cheque</b>', or '<b>Insurance Surety Bond</b>' / '<b>Fixed Deposit Receipt</b>', the same should be favor of "Talcher Fertilizers Limited, payable at New Delhi</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:</p> <p>Account Holder's Name: Talcher Fertilizers Limited Account No.: 41256023769 Bank &amp; Branch Name: SBI, CAG-II, New Delhi IFSC Code: SBIN0017313 Bidder to mention reference no. "EMD/CPS/....." in narration while remitting the CPS amount in TFL's Bank Account.</p>								
<b>D. SUBMISSION AND OPENING OF BIDS</b>									



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ITB clause	Description				
18	In addition to the original of the Bid, the number of copies required is one. Not applicable in case of e-tendering.				
4.0 of IFB	<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:</p> <p>1) Mr. Kailash Joshi- Project Manager Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 314, 9718762091 Fax no. : +91-120-2529801 E-mail : <a href="mailto:kjoshi@pdilin.com">kjoshi@pdilin.com</a></p> <p>2) Md. Mahtab Ansari- Project Co-ordinator Tel no. : +91-120-2529842/43/47/51/53/54 Extn. 316 Mob. No. : 8319864089 Fax no. : +91-120-2529801 E-mail : <a href="mailto:mahatab@pdilin.com">mahatab@pdilin.com</a></p>				
<b>E. EVALUATION, AND COMPARISON OF BIDS</b>					
ITB clause	Description				
32	Evaluation Methodology is mentioned in Section-II.				
33	Compensation for Extended Stay: <table border="1" style="margin-left: 20px;"><tr><td>APPLICABLE</td><td style="text-align: center;">✘</td></tr><tr><td>NOT APPLICABLE</td><td style="text-align: center;">✔</td></tr></table>	APPLICABLE	✘	NOT APPLICABLE	✔
APPLICABLE	✘				
NOT APPLICABLE	✔				
34	<p>The following Purchase Preference Policy will be applicable as per provisions mentioned in tender:</p> <p>i) Policy to Provide Purchase Preference as per Public Procurement (Preference to Make in India), Order 2017</p>				
<b>F. AWARD OF CONTRACT</b>					
ITB clause	Description				
37	State of India of which stamp paper is required for Contract Agreement: <b>Uttar</b>				



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	<b>Pradesh/ State where Bidder's registered office is located.</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>The value/ amount of Contract Performance Security/ Security Deposit:</p> <p>SD/ CPBG @10% of Total order/ contract value within 30 days of FOA/ notification of award.</p> <p style="text-align: center;">Or,</p> <p>Initial Security Deposited (ISD) @ 5% of Total Contract value within 30 days of FOA/ notification of Award and deduction @ 10% of the RA Bill subsequently from RA bills till the total amount of security deposite (including ISD and deducted amount) reaches 10% of total 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	✓				



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**Annexure-V**

**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.

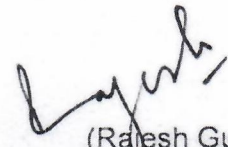
**16. Standing Committee:** A standing committee is hereby constituted with the following membership:

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)



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**FORM – I of ANNEXURE V**

**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.		



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

Name:

Date:

Designation:

Seal:

Membership No.:

UDIN:



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**FORM-II of ANNEXURE-V**

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

Sr. No.	Description	Parameter / Document
1	<b>Minimum Local Content (LC) for Availing Preference under this Policy</b>	50%
2	<b>Margin of Purchase Preference</b>	20%
3	<b>Local Content (LC) % declared by bidder</b> (Documents to be submitted as per Sr. No. 4 below)	[Tick ( <input type="checkbox"/> ) 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"/>
4	<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.
5	<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





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**FORM-III of ANNEXURE-V**

**(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



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**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:  
Date:

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

**Note:**

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



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**Annexure-VI**

**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 Two sheets:
  - Schedule of Rates containing Item Rates & GST for Part-A (BOQ-1)
  - Schedule of Rates containing Item Rates & GST for Part-B (BOQ-2)
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.
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. The variation of work may be that the quantity of individual item of work may vary upto any extent; and /or any item may be deleted altogether; and / or any extra item may be added etc. The contractor shall not be entitled to any claim whatsoever on account of any variation in the quantities and/or omission/deletion of items from/to the schedule of rates 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. ***For variation in value of contract, please refers clause no. 60 of GCC.***



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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 relevant standard & specification.
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 labour, supervision and consumables, cost towards providing necessary tools and tackles, 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.



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20. Schedule of Rates is to be read in conjunction with all the sections/sub-sections or Part of this contract document.

Note: The quantities mentioned in the SOR (Section-VII) are tentative. Contractor to take confirmation for firm quantity from Owner/Consultant before placement of order against the supply items



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**Annexure-VII**

**CLAUSE REGARDING PROVISION FOR PROCUREMENT FROM A BIDDER WHICH SHARES A LAND BORDER WITH INDIA**

1. OM no. 7/10/2021-PPD(1) dated 23.02.2023, Department of Expenditure, Ministry of Finance, Govt. of India refers. The same are available at website <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. 4) dated 23.02.2023.

Further, any bidder (including bidder from India) having specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India, shall also require to be registered with the same competent authority.

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:



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- 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
- Note :
- (i) A person who procures and supplies finished goods from an entity from a country which shares a land border with India will, regardless of the nature of his legal or commercial relationship with the producer of the goods, be deemed to be an Agent for the purpose of this Order.
- (ii) However, a bidder who only procures raw material, components etc. from an entity from a country which shares a land border with India and then manufactures or converts them into other goods will not be treated as an Agent.]
- 7. "Transfer of Technology"** means dissemination and transfer of all forms of commercially usable knowledge such as transfer of know-how, skills, technical expertise, designs,



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processes and procedures, trade secrets, which enables the acquirer of such technology to perform activities using the transferred technology independently. (Matters of interpretation of this term shall be referred to the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade, and the interpretation of the Committee shall be final.)

8. **"Specified Transfer of Technology"** means a transfer of technology in the sectors and/ or technologies, specified at Schedule-I, II & 3 of this order.

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

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

For cases falling under the category of Transfer of Technology, Bidder shall submit a certificate in this regard as Form-II.

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.

10. 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.

11. **PROVISION TO BE IN 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-I.

[Note: Procurement of raw material, components, etc. does not constitute sub-contracting]





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**Form-I**

**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:



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**Form-II**

**UNDERTAKING ON LETTERHEAD**

***(Applicable in case of Transfer of Technology cases only)***

To,

M/s TALCHER FERTILIZERS LIMITED

SUB:  
TENDER NO:

Dear Sir

We have read the clause regarding Provisions for Procurement from a Bidder having Transfer of Technology (ToT) arrangement which shares a land border with India, we certify that, bidder M/s \_\_\_\_\_ **(Name of Bidder)** is :

- (i) Does not have ToT with such a country [      ]
- (ii) If having ToT 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 (✓) above).***

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

Place:  
Date:

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



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**Schedule I**

List of Category-I Sensitive sectors:

Sr. No.	Sector
(i)	Atomic Energy
(ii)	Brocasting/ Print and Digital Media
(iii)	Defense
(iv)	Space
(v)	Telecommunications

**Schedule II**

List of Category-II Sensitive sectors:

Sr.No.	Sector
(i)	Power and Energy (including exploration/ generation/transmission/ distribution/ pipeline)
(ii)	Banking and Finance including Insurance
(iii)	Civil Aviation
(iv)	Construction of ports and dams & river valley projects
(v)	Electronics and Microelectronics
(vi)	Meteorology and Ocean Observation
(vii)	Mining and extraction (including deep sea projects)
(viii)	Railways
(ix)	Pharmaceuticals & Medical Devices
(x)	Agriculture
(xi)	Health
(xii)	Urban Transportation



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### Schedule III

#### List of Sensitive Technologies:

Sr.No.	Sensitive Technologies
(i)	Additive Manufacturing (e.g. 3D Printing)
(ii)	Any equipment having electronic programmable components or autonomous systems (e.g. SCADA systems)
(iii)	Any technology used for uploading and streaming of data including broadcasting, satellite communication etc.
(iv)	Chemical Technologies
(v)	Biotechnologies including Genetic Engineering and Biological Technologies
(vi)	Information and Communication Technologies
(vii)	Software



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**FORMS & FORMATS**

### LIST OF FORMS & FORMATS

Form No.	Description
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	Deleted
F-20	FORMAT FOR POWER OF ATTORNEY
F-21	UNDERTAKING REGARDING SUBMISSION OF ELECTRONIC INVOICE( E-INVOICE AS PER GST LAW)



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F-22	UNDERTAKING REGARDING SUBMISSION CONTRACT PERFORMANCE SECURITY (CPS) / SECURITY DEPOSIT (SD) WITHIN STIPULATED TIME LINE
F-23	PROFORMA FOR CONTRACT AGREEMENT
F-24	NO CLAIM CERTIFICATE



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**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	No. 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	





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	Information of address where order is to be placed	(Country Code) (Area Code) (Telephone Number) FAX No. : ..... e-mail ID: .....
10	E-mail Address	
11	Deleted	
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:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:



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**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) Noida	<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:

- The Bank's liability under this Guarantee shall not exceed (currency in figures) . . . . . (currency in words only) . . . . .
- 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



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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 \_\_\_\_\_.

Details of next Higher Authority of the Officials who have issued the Bank Guarantee:

Name .....  
Designation .....



WITNESS:

(SIGNATURE)  
(NAME)

(SIGNATURE)  
(NAME)  
Designation with Bank Stamp

(OFFICIAL ADDRESS)

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

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**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.



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

1	<b>BANK GUARANTEE NO</b>	:				
2	<b>VENDOR NAME</b>	:				
3	<b>BANK GUARANTEE AMOUNT</b>	:				
4	<b>TENDER NO</b>	:				
5	<b>NATURE OF BANK GUARANTEE</b>	:				
	<b>(Please Tick (√) Whichever is Applicable</b>		<b>PERFORMANCE BANK GUARANTEE</b>	<b>SECURITY DEPOSIT</b>	<b>EMD</b>	<b>ADVANCE</b>
6	<b>BG ISSUED BANK DETAILS</b>		(A) <b>EMAIL ID</b> :			
			(B) <b>ADDRESS</b> :			
			(C) <b>PHONE NO</b> :			



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**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



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**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'.



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**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





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- 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.



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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:
- The Bank’s liability under this Guarantee shall not exceed (currency in figures) \_\_\_\_\_ (currency in words only) \_\_\_\_\_
  - 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
  - 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.

Details of next Higher Authority of the Officials who have issued the Bank Guarantee:

Name .....

Designation .....

Yours faithfully,

Bank by its Constituted Attorney

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

\_\_\_\_\_



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**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.

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**Form-4 (a)**

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

1	<b>BANK GUARANTEE NO</b>	:				
2	<b>VENDOR NAME</b>	:				
3	<b>BANK GUARANTEE AMOUNT</b>	:				
4	<b>TENDER NO</b>	:				
5	<b>NATURE OF BANK GUARANTEE</b>	:				
	<b>(Please Tick (√) Whichever is Applicable</b>		<b>PERFORMANCE BANK GUARANTEE</b>	<b>SECURITY DEPOSIT</b>	<b>EMD</b>	<b>ADVANCE</b>
6	<b>BG ISSUED BANK DETAILS</b>	(A)	<b>EMAIL ID</b>	:		
		(B)	<b>ADDRESS</b>	:		
		(C)	<b>PHONE NO</b>	:		



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**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:  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 GST ( <b>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. _____
5.	Bidder confirms acceptance of relevant Terms of Payment specified in the Bid Document.	
6.	Bidder confirms that Contract Performance Security will be furnished as per Bid Document within 30 days of FOA in case of successful bidder..	



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Sl.	DESCRIPTION	BIDDER'S CONFIRMATION	
7.	Bidder confirms that Contract Performance Security shall be from any Indian scheduled bank (excluding Co-operative banks and Regional Rural 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 Price Reduction Schedule 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 PRS 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.	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.		



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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.	<p>Bidder to ensure all documents as per tender including clause 11 of Section III and all Formats are included in their bid.</p>	
21.	<p>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.</p>	
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>	



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Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
	<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 list of TFL or any of the JV partner of TFL viz. GAIL, RCF, CIL, FCIL.</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>	
23	<p>Bidder certifies that they would adhere to the Fraud Prevention Policy of TFL [<del>available on TFL's website (www.https://tflonline.co.in/)</del>] 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>	
24	<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>	
25	<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>	
26.	<p>Bidder confirms that there is no conflict of interest with other bidders, as per clause no.4.2 of Section-III (ITB) of Tender Document.</p>	
27.	<p>Bidder confirms that, in case of contradiction between the confirmations provided in this format and to the terms &amp;</p>	





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Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
	conditions mentioned elsewhere in the offer, the confirmations given in this format shall prevail.	

Place:

Date:

[Signature of Authorized Signatory of Bidder]

Name:

Designation:

Seal:



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**F-6**

**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 : .....



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**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. Name, designation and address of Engineer/Officer-in-Charge	Capacity	Value of Contract/ Order (Specify Currency Amount)	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:



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**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:

<b>S. No.</b>	<b>DESCRIPTION</b>	<b>CHECK BOX</b>
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	EMD / 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. (Applicable for all bidders)	
6.0	Confirm that Undertaking as per <i>Form-1 to Annexure-VII</i> have been submitted by the bidder (Guidelines from Procurement from a Country sharing a Land Border with India)	



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7.0	Confirm submission of Checklist against Bid Evaluation Criteria as per format F-8(B)	
-----	--	--

Place:

Date:

[Signature of Authorized Signatory of Bidder]

Name:

Designation:



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**F-8(B)**

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

BEC Clause No.	Description	Documents required for qualification	Documents Submitted by Bidder	Documents attested as per Section-II of Tender	Reference Page No. of the Bid submitted
<b>Technical BEC</b>					
1.	<b>Experience</b>	<p>(a) To meet the criteria 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.</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>Experience of bidder acquired as a subcontractor</b>	Certificate from End User			
3.	<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	
4.	<b>Any other technical criteria in BEC</b>			Yes/No	



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Financial BEC					
1.	<b>Average Annual Turn Over</b>	Audited Financial Statements [including Auditor’s Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for preceding three Audited Financial Years	Submitted	Yes/No	
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 .....)	Yes/No	
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.  <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>	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



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**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

**Note:**

This Declaration Letter for line of credit shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will be acceptable wherein a group of banks can jointly provide line of credit to the bidder.





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**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:	
Total (A)	
Average Annual Financial Turnover during the last three financial years (A/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 the above figures 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:

Membership No.:

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



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**Instructions for Format F-10:**

1. The Separate Pro-forma shall be used for each member in case of JV/ Consortium (If applicable).
2. The financial year would be the same as one normally followed by the bidder for its Annual Report.
3. 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.
4. For the purpose of this Tender document:
  - (i) **Annual Turnover** shall be “Revenue from Operations” as per profit & Loss account of audited annual financial statements.
  - (ii) **Working Capital** shall be “Current Assets less Current liabilities” and
  - (iii) **Net Worth** shall be Aggregate value of the paid-up share capital and all reserves created out of the profits and securities premium account, after deducting the aggregate value of the accumulated losses, deferred expenditure and miscellaneous expenditure not written off, if any, but does not include reserves created out of revaluation of assets, write back of depreciation and amalgamation.

In case the date of constitution/incorporation of the bidder is less than 3 years old, the average turnover in respect of the completed financial years after the date of constitution/ incorporation shall be taken into account for minimum Average Annual Financial Turnover criteria.

5. **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.**
6. This certificate is to be submitted on the letter head of Chartered Accountant/CPA.



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F-11

**FORMAT FOR CONSORTIUM AGREEMENT  
(ON NON- JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)  
CONSORTIUM/JV AGREEMENT-**

**Not Applicable**





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**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)



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**F-14**

**INTEGRITY PACT**

**Pre-signed Integrity Pact**

# **INTEGRITY PACT**

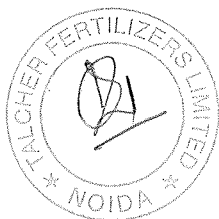
## INTEGRITY PACT

### 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”

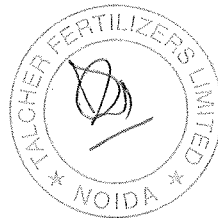


### **INDEPENDENT EXTERNAL MONITORS (IEMS)**

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 Sanjeev Prasad Narain Singh (Email ID: [spns108@gmail.com](mailto:spns108@gmail.com))
- ii) Shri Anil Kumar Sharma (Email ID: [aksharma1512@gmail.com](mailto:aksharma1512@gmail.com))

This panel is authorised to examine / consider all references made to it under this tender/ contract. "The bidder(s), in case of any dispute(s) / complaint(s) pertaining to this tender falling under provisions of Integrity Pact may raise the same either directly with the IEMs on the panel viz Shri Sanjeev Prasad Narain Singh (Email ID: [spns108@gmail.com](mailto:spns108@gmail.com)) & Shri Anil Kumar Sharma (Email ID: [aksharma1512@gmail.com](mailto:aksharma1512@gmail.com)) or with CC to them through their Nodal Officer - Sh. Manna Paul, DGM (C&P) – Email: [mannapaul@gail.co.in](mailto:mannapaul@gail.co.in), Address: Talcher Fertilizers Limited, C/o GAIL Training Institute, PARC Building, Plot No. 24, Sector-16A, Film City, Noida (U.P.) - 201301. On receipt of such complaints/representations, Nodal Officer shall coordinate with IEM Panel and TFL authorities concerned for their disposal as per extant guidelines."



**INTEGRITY PACT**

(To be executed on plain paper)

Between Talcher Fertilizers Limited (TFL) [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**

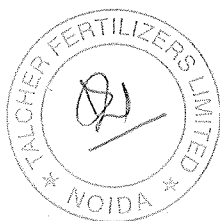
1. The Principal commits itself to take all measures necessary to prevent corruption and to observe the following Principles:-
  - i) No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for 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**

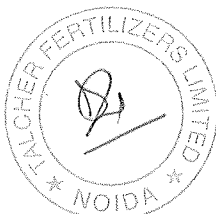
If the Bidder (s) / Contractor (s), before award or during execution has committed a transgression through a violation of Section 2, above or in any other form such as to put their reliability or credibility in question, the Principal is entitled to disqualify the Bidder (s) / Contractor (s) from the 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**

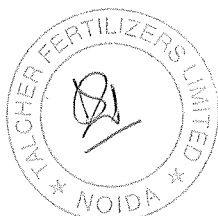
1. In case of sub-contracting, the Principal contractor shall take the responsibility of the adoption of IP by the sub-contractor. It is to be ensured by him that all sub-contractors also sign the IP.
2. The Principal will enter into agreements with identical conditions as this one with all Bidders and 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.

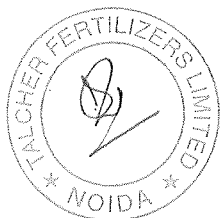
5. As soon as the Monitor notices, or believes to notice, a violation of this agreement, he/she will so inform the Management of the Principal and request the Management to discontinue or to take corrective action, or to take other relevant action. The monitor can in this regard submit non-binding recommendations. 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.



-----  
**मानना रॉल्लु/MANNA RALLU**  
 जन सामान्य (वित्तिय प्रबन्धी) General Manager (GM)  
 (For & on Behalf of Principal)  
 ताल्चर फर्टिलाइजर लिमिटेड / Talcher Fertilizers Ltd.  
 जीटीपार्क बिल्डिंग/ GTI PARC Building  
 प्लॉट नं.- 24, सेक्टर-16ए, 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 -----

Date -----

Witness 1:  
 (Sign, Name & Address)  
 [FOR PRINCIPAL]

*Geogam* [SORA DEOYAM, DM (CLP)]  
 TALCHER FERTILIZERS LIMITED (TFL)  
 PLOT NO. 24, SECTOR-16A, NOIDA,  
 U.P. - 201301

Witness 2:  
 (Sign, Name & Address)  
 [FOR BIDDER / CONTRACTOR]

.....  
 .....  
 .....





**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

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**F-15**  
**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.



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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.



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**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.



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**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.....



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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.



**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

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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)



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**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>	<table border="1"><tr><td>Contract Performance</td><td rowspan="3">Advance</td></tr><tr><td>Security</td></tr><tr><td>(CPS)</td></tr></table>	Contract Performance	Advance	Security	(CPS)
Contract Performance	Advance				
Security					
(CPS)					
<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>					



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**F-18**

**(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.





**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

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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:



**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

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- 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)



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**F-19**

**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.



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**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



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\_\_\_\_\_  
(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.: \_\_\_\_\_



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**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:



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**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:  
Date:

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



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**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.





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**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.



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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 behalf of EMPLOYER

Signed and Delivered for and on behalf of the CONTRACTOR.

TALCHER FERTILIZERS LIMITED

NAME OF CONTRACTOR

Date : \_\_\_\_\_

Date : \_\_\_\_\_

Place: \_\_\_\_\_

Place: \_\_\_\_\_

**IN PRESENCE OF TWO WITNESSES**

1. \_\_\_\_\_

1. \_\_\_\_\_

2. \_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



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**F-24**

**NO CLAIM CERTIFICATE  
(TO BE SUBMITTED BEFORE RELEASE OF CPS/SECURITY DEPOSIT)**

***[On the Letter-head of Supplier/Vendor]***

We, \_\_\_\_\_, a company incorporated under the laws of India/ a Consortium between \* \_\_\_ and \* \_\_\_ (*name of Consortium partners to be inserted*)/ a Partnership Firm consisting of \* \_\_\_ and \* \_\_\_ (*name of Partners to be inserted*)/ a Sole Proprietorship (as the case may be), having its registered office at \_\_\_\_\_ and carrying on business under the name and style M/s. \_\_\_\_\_ were awarded the contract by TFL in reference to Tender No. \_\_\_\_\_ dated \_\_\_\_\_ (“Order/Contract”).

After completion of the above-said items/job under the Order/Contract, we have scrutinized all our claims, contentions, disputes, issues and we hereby confirm that after adjusting all payments received by us against our R.A. Bills and final bill, we have no claims, dues, issues and contentions from TFL.

We further absolve TFL from all liabilities present or future arising directly or indirectly out of the Contract.

There is no economic duress or any other compulsion on us for submission of this no claim certificate.

Signature with Seal of Supplier/Vendor

Dated:



PROJECTS & DEVELOPMENT INDIA LIMITED

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## GENERAL CONDITIONS OF CONTRACT

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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 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.
- 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 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:

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, 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 slipping 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.

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.



**“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”**

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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.
- 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:

- 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.
- 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.
- 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, 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.

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**

9.1 The right to accept the tender will rest with the EMPLOYER. The EMPLOYER,

**or Reject Tender:**

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 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.

**11 Tenderer’s Responsibility**

- 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.

**12 Retired Government or Company Officers**

- 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.

**13 Signing of the Contract:**

- 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.

**14 Field Management & Controlling/Coordinating Authority:**

- 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.

**15 Note to Schedule of Rates:**

- 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.
- 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.

**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.
- 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.

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.
- 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.





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**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, 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

**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 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), (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 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.

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 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



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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 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, 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, toilage, 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 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 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.

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| <b>48 Certificate not to affect right of employer and liability of contractor:</b> | 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. |
| <b>49 Language and measures:</b>   | 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.   |
| <b>50 Transfer of title:</b>   | 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.  |
| <b>51 Release of information:</b>  | 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.   |
| <b>52 Brand names:</b>   | 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.   |
| <b>53 Completion of contract:</b>  | 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.   |
| <b>54 Spares:</b>  | 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 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 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:-

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.

60.3 If, the executed contract value decreases by more than 10% of the original contract value and vendor/contractor request for reduction in Contract Performance Security (CPS)/ Security Deposit (SD) the same is allowed after certification of EIC. In case the CPS/SD is submitted in form of DD or online transfer or deducted from payment CPS/SD amount in excess of required CPS/SD is to be released/returned to contractor/vendor. In case Contract Performance Security (CPS) is submitted in the form of Bank Guarantee/FDR/ Insurance Surety Bond the Vendor/ Contractor can reduce the Bank Guarantee/FDR/ Insurance Surety Bond and submit amended Bank Guarantee/FDR/ Insurance Surety Bond accordingly. TFL will provide the necessary communication for the same to issuing bank/Insurance company if required. Alternatively Vendor/ Contractor has option to submit the new Bank Guarantee/FDR/ Insurance Surety Bond of requisite value and upon receipt & confirmation of same the earlier Bank Guarantee/FDR/ Insurance Surety Bond can be returned.

**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 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/dates 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 get 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





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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 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**

64.1 The CONTRACTOR shall be entirely and exclusively responsible for the



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**alignment:**

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

*(Clause not applicable for this Tender)*

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 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:**

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

*(Clause not applicable for this Tender)*

Tender)

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.
- 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 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.

**69 Materials obtained from dismantling:**

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.

**70 Articles of value found:**

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.

**71 Discrepancies between instructions:**

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.

**72 Action where no specification is issued:**

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.

**73 Inspection of works:**

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 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 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 issue of completion certificate:**
- 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 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.

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 CONTRACT 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.





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- 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 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.



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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 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



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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.:

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



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Rates are fully inclusive of rates which have been fixed by the CONTRACTOR and agreed to by the EMPLOYER and cannot be altered.

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:**

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.

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| <p><b>89 Lumpsum in tender:</b></p>                                  | <p>89.1</p> | <p>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.</p>  |
| <p><b>90 Running account payments to be regarded as advance:</b></p> | <p>90.1</p> | <p>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</p>  |
| <p><b>91 Notice of claims for additional payments:</b></p>           | <p>91.1</p> | <p>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.</p> |
|  | <p>91.2</p> | <p>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 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,</p>  |

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:
- 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 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 TFL.
- 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





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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:

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-



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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 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.
- 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**

102.1 i)

CONTRACTOR shall be responsible for making good to the satisfaction of the EMPLOYER any loss or any damage to structures



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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 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 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.



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**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 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.

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.



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**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.

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).

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.

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.
- 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 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.

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| <b>117 Care in handling inflammable gas:</b> | 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   |
| <b>118 Temporary combustible structures:</b> | 118.1 | Temporary combustible structures will not be built near or around work site.  |
| <b>119 Precautions against fire:</b>         | 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. |
| <b>120 Explosives:</b>                       | 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   |



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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.

**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 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 **“Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, 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


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appears, the provisions of the Special Conditions of Contract shall be deemed to override 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, and 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

Construction water & power shall be provided by TFL at single point on chargeable basis. Further distribution of water and power shall be arranged by contractor itself. Presently @ of Rs 7.20/Cum for Construction Water and Rs 10.00/KVAH for Construction Power is applicable .In case of any escalation by statutory authorities in the unit rates during execution of Contract, the same shall be borne by Contractor

#### 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.

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- 7.6 Schedule of rates submitted by the Tenderer shall be the true copy of the schedule of rates enclosed with the tender documents
- 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 quantity shown against the various items are only approximate and may vary to any extent individually or may be deleted all together, subject to conditions given in General Conditions of Contract in Bidding Document. No claim shall be entertained during currency of this Contract towards any items due to the above.



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.

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## 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:

Sr. No.	Description of Work	Completion Time
1.	<b>“Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”</b>	<b>15 Months</b>

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.

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.



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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. Approved working drawings submitted by the CONTRACTOR progressively during the pendency of the contract, shall be approved/ marked “Good for execution/ construction” by Owner/ Consultant after due diligence. 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



## 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

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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.

#### **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.

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- 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:

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

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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).

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

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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 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

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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**


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.

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- 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 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

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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:

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.



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- 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
  - 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,

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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.

### 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

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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 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.

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- 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.
- 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.

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- 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

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:

- I. 90% 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
- II. Balance 10% shall be treated as retention money and shall be released at the time of settlement of final bill

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**B) Structure Steel Work**

- I. 5% on Finalization of quantities and submission of Approved Fabrication drawings.
- II. 55% on Supply & Acceptance of material at site.
- III. 10% on completion of fabrication.
- IV. 20% on erection, alignment, welding, grouting, painting (as applicable) etc.
- V. 10% shall be treated as retention money and shall be released at the time of settlement of final bill.

**C) Mechanical, Electrical & Instrument Items**

**I. For Supply**

- a) 80% on receipt of material at site.
- b) 10% after installation/ laying.
- c) 10% shall be treated as retention money and shall be released at the time of settlement of final bill.

**II. For Erection/ Installation/ Laying**

- a) 80% on installation/ laying.
- b) 10% after testing.
- c) 10% shall be treated as retention money and shall be released at the time of settlement of final bill.

**D) For items involving both Supply & Erection**

- a) 60% on receipt of material at site.
- b) 30% after erection and alignment including Wrapping & Coating, if applicable.
- c) 10% shall be treated as retention money and shall be released at the time of settlement of final bill.

**E) For all other items**

- a) 90% on completion of work on pro-rata basis as certified in monthly progress bills.
- b) 10% shall be treated as retention money and shall be released at the time of settlement of 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)

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8. Operation & Maintenance manual (wherever applicable)

**Note :**

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 10% (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 10% 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

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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 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.**

40.10 The status of the contractor as L-1 bidder shall be ensured keeping in view the final executed Bill of Quantity. All the valid tenders considered in evaluation at the time of award of work shall be re-evaluated at the respective quoted rate with a view to assess whether L-1 contractor's price of completed works continues to be the lowest. In case after such re-evaluation, final contract value is not the lowest, the contractor shall reimburse to Owner the difference in the amount between the re-evaluated tender and the lowest tendered amount. This difference of amount shall be adjusted from their final bill.

However, 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 10% of contract price in such case where recovery is required to be affected by the encashment as soon as the contractor receives such intimation from the owner / consultant.

#### **41.0 DISPATCH, TRANSPORTATION/SHIPPING**



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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.

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

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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.
- 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).



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- 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.
- 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

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- 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 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 APPROVAL OF MAJOR SUB-CONTRACTOR/VENDOR**

Considering the multidisciplinary scope of work, Post award sub-contracting upto 50% of Contract value should be allowed subject to fulfillment of qualifying criteria of NIT as per Annexure-I to SCC and prior approval of PMC/ OWNER.



- 45.1 CONTRACTOR's entering into any SUB-CONTRACT shall require the prior approval of PMC/ OWNER. Contractor to submit duly filled and signed Format Annexure-I to SCC (APPROVAL OF CONSTRUCTION SUB-CONTRACTOR) for PMC/OWNER/ review and approval. CONTRACTOR shall provide name, address, fax/telex number and name of contact person of major VENDOR/SUB-CONTRACTOR as per Format.
- 45.2 The review, approval and consent by PMC/ OWNER as to the agreed SUB-CONTRACTOR's List or as to CONTRACTOR's entering into any SUB-CONTRACT shall not relieve CONTRACTOR of any of its duties, liabilities or obligations under this CONTRACT and CONTRACTOR shall be liable hereunder to the same extent as if any such Subcontract had not been entered into.
- 45.3 (a) CONTRACTOR shall supervise and direct the work of all SUB-CONTRACTORS and shall be responsible for all design, procurement; manufacturing; transportation; delivery; fabrication; construction; commissioning; start-up and testing means, erection; and for co-coordinating the work of SUB-CONTRACTORS.

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- (b) If CONTRACTOR fails to correct, or commence to correct and execute the correction with due diligence of deficient or defective work performed by any SUB-CONTRACTOR within reasonable time (provided it doesn't materially impact safe operation of plant), after receipt by CONTRACTOR of a notice from OWNER with respect thereto, OWNER may (but shall not be obligated to), after seven days following receipt by CONTRACTOR of an additional notice, and without prejudice to any other right or remedy take all reasonable steps to remedy such defective or deficient work at risk and cost of CONTRACTOR.
- (c) CONTRACTOR shall require all SUB-CONTRACTORS to perform the SUB-CONTRACTS in accordance with the relevant requirements of the CONTRACT including FINAL PROPOSAL, all APPLICABLE LAWS and APPLICABLE PERMITS, Prudent Utility Practice, Good Engineering Practices, the requirements of the NIT, and all Warranties of SUB-CONTRACTORS and Manufacturers and all insurance policies relating to the PLANT or the WORK.
- (d) CONTRACTOR shall be solely responsible for paying each SUB-CONTRACTOR and any other person to whom any amount is due from CONTRACTOR for services, equipment, construction equipment, materials or supplies otherwise related to the PLANT or the WORK. CONTRACTOR shall take all reasonable steps and actions to ensure that such service, equipment, construction equipment materials and supplies and the like have been or will be received, inspected and approved and that such services have been or will be properly performed.
- (e) In performing the duties incidental to its responsibilities hereunder, CONTRACTOR shall issue to the SUB-CONTRACTORS such directives and impose such restrictions as may be required to obtain such compliance herewith and with the terms of the SUBCONTRACTS.

#### **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 Warranty 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.

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- (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/ 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-VENDORS 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

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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 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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**SUBJECT: “Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”.**

**(APPROVAL OF CONSTRUCTION SUB-CONTRACTOR)**

1)	NAME OF MAIN CONTRACTOR	:	_____
2)	NAME OF WORK, LOCATION	:	_____
3)	NAME OF PROPOSED SUB-CONTRACTOR	:	_____
4)	SCOPE OF WORK PROPOSED TO BE SUB-CONTRACTED (BRIEF)	:	_____
5)	ESTIMATED VALUE OF THE PROPOSED WORK TO BE SUB-CONTRACTED (INR)	:	_____
6)	QUALIFYING CRITERIA FOR SUB-CONTRACTOR		
i)	Similar Work experience : 1 Contract of 60% of estimated value of proposed work to be sub-contracted.		
ii)	Annual Turnover : Not less than 125% of estimated value of proposed work to be sub-contracted		
7)	EXPERIENCE AND FINANACIAL DETAILS OF PROPOSED SUB-CONTRACTOR :		
i)	Contract Value of similar work executed (as evidenced by work Order & Completion Certificate) During the last 7 years.		
ii)	Maximum Annual Turnover during last 3 (three) years ( as evidenced by Balance Sheets)		
8)	CRITERIA FOR QUALIFICATION OF SUB-CONTRACTOR		
i)	Sl.No. 7(i) > 6 (i)		YES / NO



	<b>“Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”</b>	PC-150/E-121/S-V Annx-I	0	
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ii)	Sl.No. 7(ii) > 6 (ii)	YES / NO
9)	Based on above information, we M/s. _____ (Name of Main Contractor) propose M/s. _____ for mentioned works. We understand that notwithstanding above approval, we shall remain fully responsible for the performance of the said sub-contractor and any failure of the sub-contractor shall not absolve/relieve us of our responsibility to complete the work as per the terms and conditions of the Contract.	
NOTE :	Bidders to fill all the details in the above proforma. Further, Bidder shall also fill-in the details at Sl.No.5 above based on the estimated value of the proposed work to be sub-contracted.	
10)	QUALIFICATION STATUS ( TO BE STAMPED BY OWNER) :	

**For and on behalf of :** .....

**Stamp & Signature :** .....

**Name :** .....

**Designation :** .....

**Date :** .....

 <b>PROJECTS &amp; DEVELOPMENT INDIA LTD.</b>	PC-183-E-208-HSE	0	
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	SHEET 1 OF 86		

**GENERAL GUIDELINES**  
**FOR**  
**HEALTH, SAFETY & ENVIRONMENT (HSE)**  
**AT**  
**AT TFL TALCHER, ODISHA**

**Abbreviations:**

AERB	:	Atomic Energy Regulatory Board
ANSI	:	American National Standards Institute
BARC	:	Bhabha Atomic Research Centre
BS	:	British Standard
PDIL	:	Projects & development India Limited
ELCB	:	Earth Leakage Circuit Breaker
EPC	:	Engineering, Procurement and Construction
EPCC	:	Engineering, Procurement, Construction and Commissioning
ESI	:	Employee State Insurance
GCC	:	General Conditions of Contract
GM	:	General Manager
GTAW	:	Gas Tungsten Arc Welding
HOD	:	Head of Department
HSE	:	Health, Safety & Environment
HV	:	High Voltage
IS	:	Indian Standard
IE	:	Indian Electricity
JSA	:	Job Safety Analysis
LOTO	:	Lock Out & Tag Out
LPG	:	Liquefied Petroleum Gas
LSTK	:	Lump Sum Turn Key
MV	:	Medium Voltage
PPE	:	Personal Protective Equipment
RCM	:	Resident Construction Manager or Site-in-Charge, as applicable
ROW	:	Right of Way
SCC	:	Special Conditions of Contract
SLI	:	Safe Load Indicator
TBM	:	Tool Box Talks

**Construction Standards Committee**

**Convenor :** Sh.

**Members :** Sh.  
Sh.  
Sh.  
Sh.  
Sh.  
Sh.

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**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

## **1.0 SCOPE**

This specification establishes the Health, Safety and Environment (HSE) management requirement to be complied by Contractors/Vendors including their sub-contractors/sub vendors during construction.

This specification is not intended to replace the necessary professional judgment needed to design & implement an effective HSE system for construction activities and the contractor is expected to fulfill HSE requirements in this specification as a minimum. It is expected that contractor shall implement best HSE practices beyond whatever are mentioned in this specification.

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 (Technical) Specifications. Where different documents stipulate different requirements, the most stringent shall apply.

## **2.0 REFERENCES**

The document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Building and other construction workers Act,
- Indian Factories Act
- Job (Technical) specifications
- Relevant International / National Codes (refer Appendix-A for standards/codes on HSE)
- Relevant State & National Statutory requirements.
- Operating Manuals Recommendation of Manufacturer of various construction Machineries

## **3.0 REQUIREMENTS OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLIED BY BIDDERS**

### **3.1 Management Responsibility**

#### **3.1.1 HSE Policy & Objectives**

The Contractor should have a documented HSE policy duly & objectives to demonstrate commitment of their organization to ensure health, safety and environment aspects in their line of operations.

HSE Policy of the contractor shall be made available to Owner / PDIL at the place of execution of specific contract works, as a valid document.

#### **3.1.2 Management System**

The HSE management system of the Contractor shall cover the HSE requirements & commitments to fulfill them, including but not limited to what are specified under clause 1.0 and 2.0 above. The Contractor shall obtain the approval of its site specific HSE Plan from PDIL / Owner prior to commencement of any site works. Corporate as well as Site management of the Contractor shall ensure compliance of their HSE Plan at work sites in its entirety & in true spirit.

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**3.1.3 Indemnification**

Contractor shall indemnify & hold harmless, Owner/PDIL & their representatives, free from any and all liabilities arising out of non-fulfillment of HSE requirements or its consequences.

**3.1.4 Deployment & qualifications of Safety personnel**

The Contractor shall designate/deploy various categories of HSE personnel at site as indicated below in sufficient number. In no case, deployment of safety Supervisor / Safety Steward shall substitute deployment of Safety Officer / Safety Engr what is indicated in relevant statute of BOCW Act i.e deployment of safety officer/Safety Engineer is compulsory at project site. The Safety supervisors, Safety stewards etc. would facilitate the HSE tasks at grass root level for construction sites and shall assist Safety Officer / Engineers.

a) Safety Steward

For every 250 workmen, one safety steward shall be deployed.

As a minimum, he shall preferably possess School leaving Certificate (of Class XII with Physics & Chemistry etc.) and trained in fire-fighting as well as in safety/occupational health related subjects, with minimum two year of practical experience in construction work environment and preferably have adequate knowledge of the language spoken by majority of the workers at the construction site.

b) Safety Supervisor

For every 500workmen, one safety Supervisor shall be deployed.

As a minimum, he shall possess a recognized Degree in Science (with Physics & Chemistry) or a diploma in Engg. or Tech. with minimum Two years of practical experience in construction work environment and should possess requisite skills to deal with construction safety & fire related day-to-day issues.

c) Safety Officer / Safety Engineer

One for every 1000 workers or part thereof shall be deployed.

Safety officer/Engineer Should Possess following Qualification & Experience :

- (i) Recognized degree in any branch of Engg. or Tech. or Architecture with practical experience of working in a building or other construction work in supervisory capacity for a period of not less than two years, or possessing recognized diploma in any branch of Engg. or Tech with practical experience of building or other construction work in supervisory capacity for a period of not less than five years.
- (ii) Recognized degree or diploma in Industrial safety with one paper in Construction Safety
- (iii) Preferably have adequate knowledge of the language spoken by majority of the workers at the construction site.

Alternately

- (i) Person possessing Graduation Degree in Science with Physics & Chemistry and degree or diploma in Industrial Safety (from any Indian institutes recognized by

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AICTE or State Council of Tech. Education of any Indian State) with practical experience of working in a building, plant or other construction works (as Safety Officer, in line with Indian Factories Act, 1958) for a period of not less than five years, may be considered as Safety Officer, in case Owner/Client of the project agrees for /approves the same.

d) HSE In-Charge

In case there is more than one Safety Officer at any project construction site, one of them, who is senior most by experience (in HSE discipline), may be designated as HSE In-Charge. Duties & responsibilities of such person shall be commensurate with that of relevant statute and primarily to coordinate with top management of Client and contractors.

In case the statutory requirements i.e. State or Central Acts and / or Rules as applicable like the Building and Other Construction Workers' Regulation of Employment and Conditions of Service- Act,1996 or State Rules (wherever notified), the Factories Act, 1948 or Rules (wherever notified), etc. are more stringent than above clarifications, the same shall be followed.

Contractors shall ensure physical availability of safety personnel at the place of specific work location, where Hot Work Permit is required / granted. No work shall be started at any of the project sites until above safety personnel & concerned Site Engineer of Contractor are physically deployed at site. The Contractor shall submit a HSE organogram clearly indicating the lines of responsibility and reporting system and elaborate the responsibilities of safety personnel in their HSE Plan.

The Contractor shall verify & authenticate credentials of such safety personnel and furnish Bio-Data/ Resume/ Curriculum Vitae of the safety personnel as above for PDIL/Owner's approval, at least 1 month before the mobilization. The Contractor, whenever required, shall arrange submission of original testimonials/certificates of their Safety personnel, to PDIL/Owner (for verification/scrutiny, etc.)

Imposition / Realization of penalty shall not absolve the Contractor from his/her responsibility of deploying competent safety officer at site. Adequate planning and deployment of safety personnel shall be ensured by the Contractor so that field activities do not get affected because of non-deployment of competent & qualified safety people in appropriate numbers.

**3.1.5 Implementation, Inspection/Monitoring**

X

The Contractor shall be fully responsible for planning, reporting, implementing and monitoring all HSE requirements and compliance of all laws & statutory requirements.

X

The Contractor shall also ensure that the HSE requirements are clearly understood & implemented conscientiously by their site personnel at all levels at site.

X

The Contractor shall ensure physical presence of their field engineers / supervisors, during the continuation of their contract works / site activities including all material transportation activities. Physical absence of experienced field engineers / supervisors of Contractor at critical work spot during the course of work, may invite severe penalization as per the discretion of EIC, including halting / stoppage of work.

X

Contractor shall furnish their annual Inspection Plan, with regard to project issues /subjects, frequency and performers to PDIL/Owner.

X

The Contractor shall regularly review inspection report internally and implement all practical steps / actions for improving the status continuously.



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- x The Contractor shall ensure important safety checks right from beginning of works at every work site locations and to this effect format No: HSE-10 “Daily Safety Check List” shall be prepared by field engineer & duly checked by safety personnel for conformance.  
The Contractor shall carry out inspection to identify various unsafe conditions of work sites/machinery/equipments as well as unsafe acts on the part of workmen/supervisor/engineer while carrying out different project related works.  
Adequate records for all inspections shall be maintained by the Contractor and the same shall be furnished to PDIL/Owner, whenever sought.
- x The Contractor shall not carry-out work by engaging single worker anywhere without any supervisor anytime during day or night.  
To demonstrate involvement/commitment of site management of Contractor, at least one Safety Walk through in a month shall be carried out by Contractor’s head of site (along with his area manager/field engineers) and a report shall be furnished to PDIL/Owner as per format No: HSE-1” Safety walk through report” followed by compliance for unsatisfactory remarks.
- x As a general practice lifting tools/tackles, machinery, accessories etc. shall be inspected, tested and examined by competent people (approved by concerned State authorities) before being used at site and also at periodical interval (e.g. during replacement, extension, modification, elongation/reduction of machine/parts, etc.) as per relevant statutes. Hydra, cranes, lifting machinery, mobile equipments / machinery / vehicles, etc. shall be inspected regularly by only competent / experienced personnel at site and requisite records for such inspections shall be maintained by every contractor. Contractor shall also maintain records of maintenance of all other site machinery (e.g. generators, rectifiers, compressors, cutters, etc.) & portable tools/equipments being used at project related works (e.g. drills, abrasive wheels, punches, chisels, spanners, etc.). The Contractor shall not make use of arbitrarily fabricated ‘derricks’ at project site for lifting / lowering of construction materials.
- x Site facilities /temporary. installations, e.g. batching plant, cement godown, DG-room, temporary electrical panels/distribution boards, shot-blasting booth, fabrication yards, etc. and site welfare facilities, like labour colonies, canteen/pantry, rest-shelters, motor cycle/bicycle-shed, site washing facilities, First-aid centers, urinals/toilets, etc. should be periodically inspected by Contractor (preferably utilizing HR/Admn. personnel to inspect site welfare facilities) and records to be maintained.

**3.1.6 Behaviour Based Safety**

- x The contractor shall develop a system to implement Behaviour-Based Safety (BBS) through which work groups can identify, measure and change the behaviours of employees and workers
- x The BBS process shall include the following:
  - Identify the behaviours critical to obtaining required safety performance.
  - Communicate the behaviours and how they are performed correctly to all
  - Observe the work force and record safe/at risk behaviours. Intervene with workers to give positive reinforcement when safe behaviours are observed. Provide coaching/correction when at risk behaviours are observed
  - Collect and record observation data
  - Summarize and analyze observation data
  - Communicate observation data and analysis results to all employees
  - Provide recognition or celebrate when safe behaviour improvements occur
  - Change behaviours to be observed or change activators or change consequences as appropriate.
  - Communicate any changes to workforce
- x Contractor through its own HSE committee shall implement the above process.  
The necessary procedures and reporting formats shall be developed by the contractor for approval by PDIL/Owner.

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- x The HSE committee of contractor shall observe individual's behavior for safe practices adapted for utilization/execution of work for following as a minimum:-
  - PPE
  - Tools & equipment
  - Hazard Identification & control
  - House keeping
  - Confined space entry
  - Hot works
  - Excavation
  - Loading & unloading
  - Work At height
  - Stacking & storage
  - Ergonomics
  - Procedures

**3.1.7 Awareness and Motivation**

- x The Contractor shall promote and develop awareness on Health, Safety and Environment protection among all personnel working for the Contractor.
- x Regular awareness programs and fabrication shop / work site meetings at least on monthly basis shall be arranged on HSE activities to cover hazards/risks involved in various operations during construction.
- x Contractor to motivate & encourage the workmen & supervisory staff by issuing / awarding them with tokens/ gifts/ mementos/ monetary incentives / certificates, etc.
- x Contractor shall assess & recognize the behavioral change of its site engineers / supervisors periodically and constantly motivate / encourage them to implement HSE practices at project works

**3.1.8 Fire prevention & First-Aid**

- x The Contractor shall arrange suitable First-aid measures such as First Aid Box (Refer Appendix-B for details), trained personnel/nurse (male) to administer First Aid, stand-by Ambulance vehicle and
- x The Contractor shall arrange installation of fire protection measures such as adequate number of steel buckets with sand & water and adequate number of appropriate portable fire extinguishers (Refer Appendix-C for details) to the satisfaction of PDIL/Owner.
- x The Contractor shall deploy trained supervisory personnel / field engineers to cater to any emergency situation.
- x In case the number of workers exceeds 500, the Contractor shall position an Ambulance / vehicle and nurse on round the clock basis very close to the worksite.
- x The Contractor shall arrange FIRE DRILL at each site at least once in three months, involving site workmen and site supervisory personnel & engineers. The Contractor shall maintain adequate record of such fire drills at project site

**3.1.9 Documentation**

The Contractor shall evolve a comprehensive, planned and documented system covering the following as a minimum for implementation and monitoring of the HSE requirements and the same shall be submitted for approval by owner/PDIL.

- HSE Organogram
- Site specific HSE Plan
- Safety Procedures, forms and Checklist. Indicative list of HSE procedures is attached as Appendix :H
- Inspections and Test Plan
- Risk Assessment & Job Safety Analysis for critical works.

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- x The monitoring for implementation shall be done by regular inspections and compliance of 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 responsibility of the Contractor. Any review/approval by PDIL/Owner shall not absolve contractor of his responsibility/liability in relation to fulfilling all HSE requirements.

**3.1.10 Audit**

The Contractor shall submit an Audit Plan to PDIL/Owner indicating the type of audits and covering following as minimum:

- x Internal HSE audits regularly at least on quarterly basis by engaging internal qualified auditors (viz safety officers/Construction personnel having 5 years experience in construction safety and Lead Auditor Course :OSHA 18001certification).
- x External HSE audits regularly at least on every six months by engaging qualified external auditors (viz safety officers/Construction personnel having 10 years experience in construction safety and Lead Auditor Course :OSHA 18001certification).

All HSE shortfalls/ non-conformances on HSE matters brought out during review/audit, shall be resolved forthwith ( generally within a week) by Contractor & compliance report shall be submitted to PDIL/Owner.

In addition to above audits by contractor, the contractor's work shall be subjected to HSE audit by PDIL/Owner at any point of time during the pendency of contract. The CONTRACTOR shall take all actions required to comply with the findings of the Audit Report and issue regular Compliance Reports for the same to OWNER/ PDIL till all the findings of the Audit Report are fully complied.

Failure to carry-out HSE Audits & its compliance (internal & external) by Contractor, shall invite penalization.

**3.1.11 Meetings**

- x The Contractor shall ensure participation of his top most executive at site (viz. Resident Construction Manager / Resident Engineer / Project Manager / Site-in-Charge) in Safety Committee / HSE Committee meetings arranged by PDIL/Owner usually on monthly basis or as and when called for. In case Contractor's top most executive at site is not in a position to attend such meeting, he shall inform PDIL/Owner in writing before the commencement of such meeting indicating reasons of his absence and nominate his representative – failure to do so may invite very stringent penalization against the specific Contractor, as deemed fit in Contract. The obligation of compliance of any observations during the meeting shall be always time bound. The Contractor shall always assist PDIL/Owner to achieve the targets set by them on HSE management during the project implementation.
- x In addition, the Contractor shall also arrange internal HSE meetings chaired by his top most executive at site on weekly basis and maintain records. Such internal HSE meetings shall essentially be attended by field engineers / supervisors (& not by safety personnel only) of the Contractor and its associates. Records of such internal HSE meetings shall be maintained by the Contractor for review by PDIL/Owner or for any HSE Audits.
- x Agenda of internal HSE meeting should broadly cover: -

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- a) Confirmation of record notes / minutes of previous meeting
- b) Discussion on outstanding subjects of previous points / subjects, if any
- c) Incidents / Accidents (of all types) at project site, if any
- d) Current topics related to site activities / subjects of discussion
- e) House keeping
- f) Behavioral Safety
- g) Information / views / deliberations of members / site sub Contractors
- h) Report from Owner / Client
- i) Status of Safety awareness, Induction programs & Training programs

The time frame for such HSE meeting shall be religiously maintained by one and all.

**3.1.12 Intoxicating drinks & drugs and Smoking**

- x The Contractor shall ensure that his staff members & workers (permanent as well casual) shall not be in a state of intoxication during working hours and shall abide by any law relating to consumption & possession of intoxicating drinks or drugs in force.
- x The Contractor shall not allow any workman to commence any work at any locations of project activity who is/are influenced / effected with the intake of alcohol, drugs or any other intoxicating items being consumed prior to start of work or working day.
- x Awareness about local laws on this issue shall form part of the Induction Training and compulsory work-site discipline.
  
- x The Contractor shall ensure that all personnel working for him comply with “No-Smoking” requirements of the Owner as notified from time to time. Cigarettes, lighters, auto ignition tools or appliances as well as intoxicating drugs, dry tobacco powder, etc. shall not be allowed inside the project / plant complex.
  
- x Smoking shall be permitted only inside smoking booths exclusively designated & authorized by the Owner/PDIL.

**3.1.13 Penalty**

The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliances and also for repeated failure in implementation of any of the HSE provisions, PDIL/Owner may impose stoppage of work without any cost & time implication to the Owner and/or impose a suitable penalty.

The amount of penalty to be levied against defaulted Contractor shall be up to a cumulative limit of

2.0% (Two percent) of the contract value for Item Rate or Composite contracts with an overall cPDILing of 1, 00, 00, 000 (Rupees One crore)

0.5% (Zero decimal five percent) of the contract value for LSTK, OBE, EPC, EPCC or Package contracts with an overall cPDILing of 10, 00.00.000 (Rupees ten crores)

This penalty shall be in addition to all other penalties specified elsewhere in the contract. The decision of imposing stop-work-instruction and imposition of penalty shall rest with PDIL/Owner. The same shall be binding on the Contractor. Imposition of penalty does not make the Contractor eligible to continue the work in unsafe manner.

The amount of penalty applicable for the Contractor on different types of HSE violations is specified below:

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Sl. No.	Violation of HSE norms	Penalty Amount
1.	For not using personal protective equipment (Helmet, Shoes, Goggles, Gloves, Full body harness, Face shield, Boiler suit, etc.)	Rs 500/- per day/ Item / Person.
2.	Working without Work Permit/Clearance	Rs 20000/- per occasion
3.	Execution of work without deployment of requisite field engineer / supervisor at work spot	Rs. 5000/- per violation per day
4.	Unsafe electrical practices (not installing ELCB, using poor joints of cables, using naked wire without top plug into socket, laying wire/cables on the roads, electrical jobs by incompetent person, etc.)	Rs 10000/- per item per day.
5.	Working at height without full body harness, using non-standard/ rejected scaffolding and not arranging fall protection arrangement as required, like hand-rails, life-lines, Safety Nets etc.	Rs. 10000/- per case per day.
6.	Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, and not keeping cylinders vertical during storage/handling, not using safety cap of cylinder)	Rs 500/- per item per day.
7.	Use of domestic LPG for cutting purpose / not using flash back arresters on both the hoses/tubes on both ends.	Rs. 3000/- per occasion.
8.	No fencing/barricading of excavated areas / trenches.	Rs. 3000/- per occasion.
9.	Not providing shoring/strutting/proper slope and not keeping the excavated earth at least 1.5M away from excavated area.	Rs.5, 000/- per occasion.
10.	Non display of scaffold tags, caution boards, list of hospitals, emergency services available at work locations.	Rs.1000/- per occasion per day
11.	Traffic rules violations like over speeding of vehicles, rash driving, talking on mobile phones during vehicle driving, wrong parking, not using seat belts, vehicles not fitted with reverse horn / warning alarms / flicker lamps during foggy weather.	Rs. 2000/- per occasion per day
12.	Absence of Contractor's RCM/SIC or his nominated representative (prior approval must be taken for each meeting for nomination) from site HSE meetings whenever called by PDIL/Owner & failure to nominate his immediate deputy (in the site-organogram) for such HSE meetings.	Rs10000/- per meeting.
13.	Failure to maintain HSE records by Contractor Safety personnel, in line with approved HSE Plan/Procedures/Contract specifications.	Rs 10000/- per month.
14.	Failure to conduct daily site safety inspection (by Contractor's safety engineers/safety officers), internal HSE meeting, internal HSE Awareness/Motivation Program, Site HSE Training and HSE audit at predefined frequencies (as approved in HSE Plan).	Rs.10000/- per occasion.

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Sl. No.	Violation of HSE norms	Penalty Amount
15.	Failure to submit the monthly HSE report by 5 <sup>th</sup> of subsequent month to Project's Engineer-in-Charge / Owner	Rs. 10000/- per occasion and Rs. 1000/- per day of further delay.
16.	Poor House Keeping	Rs. 5000/- per occasion per subject
17.	Failure to report & follow up accident (including Near Miss) reporting system within specific time-frame.	Rs. 20000/- per occasion
18.	Degradation of environment (not confining toxic spills, spilling oil/lubricants onto ground)	Rs10000/- per occasion
19.	Not medically examining the workers before allowing them to work at height / to work in confined space / to work in shot-blasting / to work for painting / to work in bitumen or asphalt works, not providing ear muffs while allowing them to work in noise polluted areas, made them to work in air polluted areas without respiratory protective devices, etc.	Rs 5000/- per occasion per worker
20.	Violation of any other safety condition as per job HSE plan / work permit and HSE conditions of contract (e.g. using crowbar on cable trenches, improper welding booth, not keeping fire extinguisher ready at hot work site, unsafe rigging practices, non-availability of First-Aid box at site, not using hood with respiratory devices by blaster for shot//grit blasting, etc.)	Rs. 5000/- per occasion
21.	Failure to carry-out Safety audit in time (internal & external), close-out of identified shortfalls of Observations of Safety Aspects(OSA),etc.	Rs. 20,000/- per occasion
22.	Carrying out sand blasting instead of grit/shot blasting	Rs. 50,000/- per day
23.	Failure to deploy adequately qualified and competent Safety Officer	Rs. 10000/- per day per Officer
24.	Utilization of hydra/ back-hoe loader for material shifting or any other unauthorized /unsafe lifting works	Rs 25,000/- per occasion
25.	Any incident / accident at project site has been caused because of willful negligence or gross violation of safety measures / provisions on the part of the Contractor or any of its sub-agencies	Rs 10,00,000/-per occasion
26.	Any violation not covered above	To be decided by PDIL/Owner.

X

The Contractor shall make his field engineers/supervisors fully aware of the fact that they keep track with the site workmen for their behavior and compliance of various HSE requirements. Safety lapses / defects of project construction site shall be attributable to the concerned job supervisor / engineer of the Contractor, (who remains directly responsible for safely executing field works). For repeated HSE violations, concerned job supervisor / engineer shall be reprimanded or appropriate action, as deemed fit, shall be initiated (with an information to PDIL & Owner) by the concerned Contractor.

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Contractor shall initiate verbal warning shall be given to the worker/employee during his first HSE violation. A written warning shall be issued on second violation and specific training shall be arranged / provided by the Contractor to enhance HSE awareness/skill including feedback on the mistakes/ flaws. Any further violation of HSE stipulations by the erring individuals shall call for his forthright debar from the specific construction site. A record of warnings for each worker/employee shall be maintained by the Contractor, like by punching their cards / Gate passes or by displaying their names at the Project entry gate. Warnings, penalizations, appreciations etc. shall be discussed in HSE Committee meetings by site Head of the Contractor.

**3.1.14 Accident/ Incident investigation**

All accidents / incidents shall be informed to PDIL/Owner at least telephonically by Contractor immediately and in writing within 24 hours on Format No. HSE-2 as applicable , by Contractor. Thereafter, a Supplementary Accident / Incident investigation Report on Format No. HSE-3 shall be submitted to PDIL/Owner within 72 hours. Near Miss incident(s), Dangerous accidents/incident shall also be reported on Format No. HSE-4 within 24 hours. The accident/ incident shall be investigated by a team of Contractor's senior Site personnel (involving Site-in-Charge or at least by his deputy) for establishing root-cause and recommending corrective & preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to PDIL/Owner. Owner/PDIL shall have the liberty to independently investigate such occurrences and the Contractor shall extend all necessary help and cooperation in this regard. PDIL/Owner shall have the right to share the content of this report with the outside world.

**3.2 House Keeping**

The Contractor shall ensure that a high degree of house keeping is maintained and shall ensure inter alia; the followings:

- a) All surplus earth and debris are removed/disposed off from the working areas to designated location(s).
- b) Unused/surplus cables, steel items and steel scrap lying scattered at different places within the working areas are removed to identify location(s).
- c) All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified 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/ or these materials shall be transported with top surface wet.
- j) The contractor shall ensure that the atmosphere in plant area and on roads is free from particulate matter like dust, sand, etc. by keeping the top surface wet for ease in breathing.
- k) At least two exits for any unit area shall be assured at all times – same arrangement is preferable for digging pits / trench excavation / elevated work platforms / confined spaces etc.
- l) Welding cables and the power cable must be segregated and properly stored and used .The same shall be laid away from the area of movement and shall be free from obstruction.
- m) Schedule for upkeep/cleaning of site to be firmed up and implemented on regular basis

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The Contractor shall carry-out regular checks (minimum one per fortnight) as per format No: HSE-11 for maintaining high standard of housekeeping and maintain records for the same.

### **3.3 HSE Measures**

#### **3.3.1 Construction Hazards**

The Contractor shall ensure identification of all Occupational Health, Safety & Environmental hazards in the type of work he is going to undertake and enlist mitigation measures. Contractor shall carry out Job Safety Analysis (JSA)/Risk Analysis specifically for high risk jobs/critical jobs like

- a) Working at height (+2.0 Mts height) for cold (incl. colour washing, painting, insulation etc.) & hot works.
- b) Work in confined space,
- c) Deep excavations & trench cutting (depth > 2.0 mts.)
- d) Operation & Maintenance of Batching Plant.
- e) Shuttering / concreting (in single or multiple pour) for columns, parapets & roofs.
- f) Erection & maintenance of Tower Crane.
- g) Erection of structural steel members / roof-trusses / pipes at height more than 2.0 Mts. with or without crane.
- h) Erection of pipes (full length or fabricated) at height more than 2.0 Mts. height with Crane of 100T capacity.
- i) All lifts using 100T Crane plus mechanical pulling.
- j) All lifts using two cranes in unison (Tandem Lifting).
- k) Any lift exceeding 80% capacity of the lifting equipments (hydra, crane etc.).
- l) Laying of pipes (isolated or fabricated) in deep narrow trenches – manually or mechanically.
- m) Maintenance of crane / extension or reduction of crane-boom on roads or in yards.
- n) Erection of any item at >2.0 Mts. height using 100T crane or of higher capacity
- o) Hydrostatic test of pipes, vessels & columns and water-flushing.
- p) Radiography jobs (in-plant & open field)
- q) Work in Live Electrical installations / circuits
- r) Handling of explosives & Blasting operations
- s) Demolishing / dismantling activities
- t) Welding / gas cutting jobs at height (+2.0 Mts.)
- u) Lifting / placing roof-girders at height (+2.0 Mts.)
- v) Lifting & laying of metallic / non-metallic sheet over roof/structures.
- w) Lifting of pipes, gratings, equipments/vessels at heights (+2.0 Mts) with & without using cranes
- x) Calibration of equipment, instruments and functional tests at yards / work-sites.
- y) Operability test of Pump, Motors (after coupling) & Compressors.
- z) Cold or Hot works inside Confined Space.
- aa) Transportation & shifting of ODC consignments into project areas.
- bb) Working in “charged/Live” elect. Panels
- cc) Stress Relieving works (Electrically or by Gas-burners).
- dd) Pneumatic Tests
- ee) Card board blasting
- ff) Chemical cleaning

and take feedback from PDIL/Owner. The necessary HSE measures devised shall be put in to place, prior to start of an activity & also shall be maintained during the course of works, by the Contractor. Copies of such JSAs shall be kept available at work sites by the Contractor to enable all concerned carrying out checks / verification.



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A list of typical construction hazards along with their effects & preventive measures is given in **Appendix-E**.

**3.3.2 Accessibility**

X

The Contractor shall provide safe means of access (in sufficient numbers) & efficient exit to any working place including provisions of suitable and sufficient scaffolding at various stages during all operations of the work for the safety of his workmen and PDIL/Owner.

X

The Contractor shall implement use of all measures including use of “life line”, “fall-arresters”, “retractable fall arresters”, “safety nets” etc. during the course of using all safe accesses & exits, so that in no case any individual remains at risk of slip & fall during their travel.

X

The access to operating plant / project complex shall be strictly regulated. Any person or vehicle entering such complex shall undergo identification check, as per the procedures in force / requirement of PDIL/Owner.

X

Accessibility to ‘confined space’ shall be governed by specific system / regulation, as established at project site.

**3.3.3 Personal Protective Equipments (PPEs)**

X

The Contractor shall ensure that all their staff, workers and visitors including their sub-contractor(s) have been issued (records to be kept) & wear appropriate PPEs like nape strap type safety helmets preferably with head & sweat band with ¾” cotton chin strap (made of industrial HDPE), safety shoes with steel toe cap and antiskid sole, full body harness (C<sup>0</sup> marked and conforming to EN361), protective goggles, gloves, ear muffs, respiratory protective devices, etc. All these gadgets shall conform to applicable IS Specifications/CE or other applicable international standards. The Contractor shall implement a regular regime of inspecting physical conditions of the PPEs being issued / used by the workmen of their own & also its sub-agencies and the damaged / unserviceable PPEs shall be replaced forthwith.

X

Owner/PDIL may issue a comprehensive color scheme for helmets to be used by various agencies. The Contractor shall follow the scheme issued by the owner/PDIL and shall choose any colour other than white (for Owner) or blue (for PDIL). All HSE personnel shall preferably wear dark green band on their helmet so that workmen can approach them for guidance during emergencies. HSE personnel shall preferably wear such dresses with fluorescent stripes, which are noticeable during night, when light falls on them.

X

For shot blasting, the usage of protective face shield and helmets, gauntlet and protective clothing is mandatory. Such protective clothing should conform relevant IS Specification.

X

For off-shore jobs/contracts, contractor shall provide PPEs (new) of all types to PDIL & Owner's personnel, at his (contractor's) cost. All personnel shall wear life jacket at all time.

X

An indicative list of HSE standards/codes is given under **Appendix-A**.

X

Contractor shall ensure procurement & usage of following safety equipments/ accessories (conforming to applicable IS mark / CE standard) by their staff, workmen & visitors including their subcontractors all through the span of project construction / pre-commissioning/ Commissioning:-‘

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- a. PPEs (Helmet, Spectacle, Ear-muff, Face shield, Hand gloves, Safety Shoes, Gum boot)
- b. Barricading tape / warning signs
- c. Rechargeable Safety torch (flame-proof)
- d. Safety nets (with tie-chords)
- e. Fall arresters
- f. Portable ladders (varying lengths)
- g. Life-lines (steel wire-rope, dia not less than 8.0 mm)
- h. Full body harness (double lanyard)
- i. Lanyard
- j. Karabiner
- k. Retractable fall arresters (various length)
- l. Portable fire extinguishers (DCP type) – 5 kg capacity
- m. Portable Multi Gas detector
- n. Sound level meter
- o. Digital Lux meter
- p. Fire hoses & flow nozzles
- q. Fire blankets / Fire retardant cloth (with eyelets)

**3.3.4 Working at height**

x

The Contractor shall issue permit for working (PFW) at height after verifying and certifying the checkpoints as specified in the attached permit (Format No. HSE-6). He shall also undertake to ensure compliance to the conditions of the permit during the currency of the permit including adherence of personal protective equipments. Contractor's Safety Officer shall verify compliance status of the items of permit document after implementation of action is completed by Contractor's execution / field engineers at work site. Job Safety Analysis (JSA) for specific works at height duly commented by PDIL/Owner, shall be kept attached with particular Permit for Work (PFW) at site for ready reference & follow-up.

x

Such PFW shall be initially issued for one single shift or expected duration of normal work and extended further for balance duration, if required. PDIL/Owner can devise block-permit system at any specific area, in consultation with project specific HSE Committee to specify the time-period of validity of such PFW or its renewal. This permit shall be applicable in areas where specific clearance from Owner's operation Deptt. /Safety Deptt. is not required. PDIL / Owner's field Engineers/Safety Officers/Area Coordinators may verify and counter sign this permit (as an evidence of verification) during the execution of the job.

x

All personnel shall be medically examined & certified by registered doctor, confirming their 'medical fitness for working at height. The fitness examination shall be done once in six months.

x

In case work is undertaken without taking sufficient precautions as given in the permit, PDIL /Owner Engineers may exercise their authority to cancel such permit and stop the work till satisfactory compliance/rectification is arranged made. Contractors are expected to maintain a register for issuance of permit and extensions thereof including preserving the used permits for verification during audits etc.

x

The Contractor shall arrange (at his cost) and ensure use of Fall Arrester Systems by his workers. Fall arresters are to be used while climbing/descending tall structures or vessels / columns etc. These arresters should lock automatically against the anchorage line, restricting free fall of the user. The device is to be provided with a double security opening system to ensure safe attachment or release of the user at any point of rope. In order to

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avoid shock, the system should be capable of keeping the person in vertical position in case of a fall.

X

The Contractor shall ensure that Full body harnesses conforming EN361 and having authorized C<sup>0</sup> marking is used by all personnel while working at height. The lanyards and life lines should have enough tensile strength to take the load of the worker in case of a fall. One end of the lanyard shall be firmly tied with the harnesses and the other end with life line. The harness should be capable of keeping the workman vertical in case of a fall, enabling him to rescue himself.

X

The Contractor shall provide Roof Top Walk Ladders for carrying out activities on sloping roofs in order to reduce the chances of slippages and falls.

X

The Contractor shall ensure that a proper Safety Net System is used wherever the hazard of fall from height is present. The safety net, preferably a knotted one with mesh ropes conforming to IS 5175/ ISO 1140 shall have a border rope & tie cord of minimum 12mm dia. The Safety Net shall be located not more than 6.0 meters below the working surface extending on either side up to sufficient margin to arrest fall of persons working at different heights.

X

In case of accidental fall of person on such Safety Net, the bottom most portion of Safety Net should not touch any structure, object or ground.

X

The Contractor shall ensure positive isolation while working at different levels like in the pipe rack areas. The working platforms with toe boards & hand rails shall be sufficiently strong & shall have sufficient space to hold the workmen and tools & tackles including the equipments required for executing the job. Such working platforms shall have mid-rails, to enable people work safely in sitting posture.

### 3.3.5 Scaffoldings & Barricading

X

Suitable scaffoldings shall be provided to workmen for all works that cannot be safely done from the ground or from solid construction except such short period work that can be safely done using ladders or certified (by 3<sup>rd</sup> party competent person) man-basket. When a ladder is used, an extra workman shall always be engaged for holding the ladder.

X

The Contractor shall ensure that the scaffolds used during construction activities shall be strong enough to take the designed load. Main Contractor shall always furnish duly approved construction-design details of scaffold & SWL (from competent designers) free of charge, before they are being installed / constructed at site. Owner/PDIL reserves the right to ask the Contractor to submit certification and or design calculations from his Head office / Design/ Engineering expert regarding load carrying capacity of the scaffoldings.

X

All scaffolds shall be inspected by a competent Scaffolding Inspector of the Contractor. He shall paste a GREEN tag (duly signed by competent Scaffolding Inspector) on each scaffold found safe and a RED tag (duly signed by competent Scaffolding Inspector) on each scaffold found unsafe. Scaffolds with GREEN tag only shall be permitted to be used and Scaffolds with RED ones shall immediately be made inaccessible. Work being found continuing on scaffolds with RED tag shall be considered unauthorized work by Contractor and may invite penalization from PDIL/Owner. For every 120-125 m<sup>2</sup>/m<sup>3</sup> area / volume or its parts thereof minimum one TAG shall be provided.

X

The Contractor shall ensure positive barricading (indicative as well as protective) of the excavated, radiography, heavy lift, high pressure hydrostatic & pneumatic testing and other such areas. Sufficient warning signs shall be displayed along the barricading areas.

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X

Scaffolding shall be constructed using foot seals or base plates only.

**3.3.6 Electrical installations**

X

All electrical installations/ connections shall be carried out as per the provisions of latest revision of following codes/standards, in addition to the requirements of Statutory Authorities and IE/applicable international rules & regulations:

- OISD STD 173 : Fire prevention & protection system for electrical installations
- SP 30 (BIS) : National Electric Code

X

All electrical installations shall be approved by the concerned statutory authorities.

X

All temporary electrical installations / facilities shall be regularly checked by the licensed/competent electricians of the Contractor and appropriate records shall be maintained in format no: HSE-12" Inspection of temporary electrical booth/installation at project construction site". Such inspection records are to be made available to PDIL/Owner, whenever asked for.

**3.3.6.1 The Contractor shall meet the following requirements:**

- a. Shall make Single Line Diagram (SLD) for providing connection to each equipments & machinery and the same (duly approved by PDIL/Owner) shall be pasted on the front face of DBs (distribution boards) or JBs (Junction boxes) at every site. ( A typical Switch Board Sketch is attached as Appendix -G )
- b. Ensure that electrical systems and equipment including tools & tackles used during construction phase are properly selected, installed, used and maintained as per provisions of the latest revision of the Indian Electrical/ applicable international regulations.
- c. Shall deploy qualified & licensed electricians for proper & safe installation and for regular inspection of construction power distribution system/points including their earthing. A copy of the license shall be submitted to PDIL / Owner for records. Availability of at least one competent (ITI qualified) / licensed electrician (by State Elec. authorities) shall be ensured at site round the clock to attend to the normal/emergency jobs.
- d. All switchboards / welding machines shall be kept in well-ventilated & covered shed/ with rain shed protection. The shed shall be elevated from the existing ground level to avoid water logging inside the shed . Installation of electrical switch board must be done taking care of the prevention of shock and safety of machine.
- e. No flammable materials shall be used for constructing the shed. Also flammable materials shall not be stored in and around electrical equipment / switchboard. Adequate clearances and operational space shall be provided around the equipment.
- f. Fire extinguishers and insulating mats shall be provided in all power distribution centers.
- g. Temporary electrical equipment shall not be employed in hazardous area without obtaining safety permit.
- h. Proper housekeeping shall be done around the electrical installations.
- i. All temporary installations shall be tested before energizing, to ensure proper earthing, bonding, suitability of protection system, adequacy of feeders/cables etc.

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- j. All welders shall use hand gloves irrespective of holder voltage.
  - k. Multilingual (Hindi, English and local language) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name & telephone No. of contact person in emergency shall be provided in substations and near all distribution boards / local panels.
  - l. Operation of earth leakage device shall be checked regularly by temporarily connecting series test lamp (2 bulbs of equal rating connected in series) between phase and earth. ELCB tester /test meter shall be used for testing ELCBs
  - m. Regular inspection of all installations at least once in a month. (Ref. **Format HSE-12**).
- 3.3.6.2 The following features shall also be ensured for all electrical installations during construction phase by the contractor:
- x Each installation shall have a main switch with a protective device, installed in an enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5 M. The main switch shall be connected to the point of supply by means of armoured cable.
  - x The outgoing feeders shall be double or triple pole switches with fuses / MCBs. Loads in a three phase circuit shall be balanced as far as possible and load on neutral should not exceed 20% of load in the phase.
  - x The installation shall be adequately protected against overload, short circuit and earth leakage by the use of suitable protective devices. Fuses wherever used shall be HRC type. Use of rewirable fuses shall be strictly prohibited. The earth leakage device shall have an operating current not exceeding 30 mA.
  - x All connections to the hand tools / welding receptacles shall be taken through proper switches, sockets and plugs.
  - x All single phase sockets shall be minimum 3 pin type only. All unused sockets shall be provided with socket caps.
  - x Only 3 core (P+N+E) overall sheathed flexible cables with minimum conductor size of 1.5 mm copper shall be used for all single phase hand tools.
  - x Only metallic distribution boxes with double earthing shall be used at site. No wooden boxes shall be used.
  - x All power cables shall be terminated with compression type cable glands. Tinned copper lugs shall be used for multi-strand wires / cables.
  - x Cables shall be free from any insulation damage.
  - x Minimum depth of cable trench shall be 750 mm for MV & control cables and 900 mm for HV cables. These cables shall be laid over a sand layer and covered with sand, brick & soil for ensuring mechanical protection. Cables shall not be laid in waterlogged area as far as practicable. Cable route markers shall be provided at every 25 M of buried trench route. When laid above ground, cables shall be properly cleated or supported on rigid poles of at least 2.1 M high. Minimum head clearance of 6 meters shall be provided at road crossings.

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- X Under ground road crossings for cables shall be avoided to the extent feasible. In any case no under ground power cable shall be allowed to cross the roads without pipe sleeve.
  - X All cable joints shall be done with proper jointing kit. No taped/ temporary joints shall be used.
  - X An independent earthing facility should preferably be established within the temporary installation premises. All appliances and equipment shall be adequately earthed. In case of armoured cables, the armour shall be bonded to the earthing system.
  - X All cables and wire rope used for earth connections shall be terminated through tinned copper lugs.
  - X In case of local earthing, earth electrodes shall be buried 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 earth connection shall have insulation of green colour.
  - X Separate core shall be provided for neutral. Earth / Structures shall not be used as a neutral in any case.
  - X ON/OFF position of all switches shall be clearly designated / painted for easy isolation in emergency.
- 3.3.7 Welding/ Gas cutting**
- X Contractor shall ensure that flash back arrestors conforming to BS: 6158 or equivalent are installed on all gas cylinders as well as at the torch end of the gas hose, while in use.
  - X All cylinders shall be mounted on trolleys and provided with a closing key. Empty & filled-up gas cylinders shall be stored separately with TAG, protecting them from direct sun or rain. Minimum 2 nos. of Portable DCP type fire extinguishers (10 kg) shall be maintained at the gas cylinder stores. Stacking & storing of compressed gas cylinders shall be arranged away from DG set, hot works, Elect. Panels / Elec. boards, etc
  - X The burner and the hose placed downstream of pressure reducer shall be equipped with Flash Back Arrester/Non Return Valve device.
  - X The hoses for acetylene and oxygen cylinders must be of different colours. Their connections to cylinders and burners shall be made with a safety collar.
  - X At end of work, the cylinders in use shall be closed and hoses depressurized.
  - X Cutting of metals using gases, other than oxygen & acetylene, shall require written concurrence from Owner.
  - X All welding machines shall have effective earthing at least at distinctly isolated two points. In order to help maintain good housekeeping, and to reduce fire hazard, live electrode bits shall be contained safely and shall not be thrown directly on the ground.
  - X The hoses of Acetylene and Oxygen shall be kept free from entanglement & away from common pathways / walkways and preferably be hanged overhead in such a manner which can avoid contact with cranes, hydra or other mobile construction machinery.
  - X Hot spatters shall be contained / restricted appropriately (by making use of effective fire-retardant cloth/fabric) and their flying-off as well as chance of contact with near-by flammable materials shall be stopped.
  - X The Contractor shall arrange adequate systems & practices for accumulation / collection of metal & other scraps and remnant electrodes and their safe disposal at regular interval so as to maintain the fabrication and other areas satisfactorily clean & tidy.
  - X All gas cylinders must have a cylinder cap on at all times when not in use.

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**3.3.8 Ergonomics and tools & tackles**

X

The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health.

X

All lifting tools, tackles, equipment, accessories including cranes shall be tested periodically by statutory/competent authority for their condition and load carrying capacity. Valid test & fitness certificates from the applicable authority shall be submitted to Owner/PDIL for their review/acceptance before the lifting tools, tackles, equipment, accessories and cranes are used.

X

The contractor shall not be allowed to use defective equipment or tools not adhering to safety norms.

X

Contractor shall arrange non-sparking tools for project construction works in operating plant areas / hydrocarbon prone areas.

X

Wherever required the Contractor shall make use of Elevated Work Platforms (EWP) or Aerial Work Platforms (mobile or stationary) to avoid ergonomical risks and workmen shall be debarred to board such elevated platform during the course of their shifting / transportation.

X

Contractor shall ensure installation of Safe Load Indicator (SLI) on all cranes (while in use) to minimize overloading risk. SLI shall have capability to continuously monitor and display the load on the hook, and automatically compare it with the rated crane capacity at the operating condition of the crane. The system shall also provide visual and audible warnings at set capacity levels to alert the operator in case of violations.

X

The contractor shall be responsible for safe operations of different equipments mobilized and used by him at the workplace like transport vehicles, engines, cranes, mobile ladders, scaffoldings, work tools, etc.

X

The Contractor shall arrange periodical training for the operators of hydra, crane, excavator, mobile machinery, etc. at site by utilizing services from renowned manufacturers

**3.3.9 Occupational Health**

X

The contractor shall identify all operations that can adversely affect the health of its workers and issue & implement mitigation measures.

X

For surface cleaning operations, sand blasting shall not be permitted even if not explicitly stated elsewhere in the contract.

X

To eliminate radiation hazard, Tungsten electrodes used for Gas Tungsten Arc Welding shall not contain Thorium.

X

Appropriate respiratory protective devices(hood with respiratory devices) shall be used to protect workmen from inhalation of air borne contaminants like silica, asbestos, gases, fumes, etc.

X

Workmen shall be made aware of correct methods for lifting, carrying, pushing & pulling of heavy loads. Wherever possible, manual handling shall be replaced by mechanical lifting equipments.

X

For jobs like drilling/demolishing/dismantling where noise pollution exceeds the specified limit of 85 decibels, ear muffs shall be provided to the workers.

X

To avoid work related upper limb disorders (WRULD) and backaches, Display Screen Equipments' workplace stations shall be carefully designed & used with proper sitting postures. Power driven hand-held tools shall be maintained in good working condition to

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minimize their vibrating effects and personnel using these tools shall be taught how to operate them safely & how to maintain good blood circulation in hands.

x

The Contractor shall arrange health check up (by registered medical practitioner) for all the workers at the time of induction. Health check may have to be repeated if the nature of duty assigned to him is changed necessitating health check or doubt arises about his wellness. PDIL/Owner reserves the right to ask the contractor to submit medical test reports. Regular health check-ups are mandatory for the workers assigned with Welding, Radiography, Blasting, Painting, Heavy Lift and Height (>2m) jobs. All the health check-ups shall be conducted by registered Medical practitioner and records are to be maintained by the Contractor.

x

The Contractor shall ensure vaccination of all the workers including their families, during the course of entire project span.

**3.3.10 Hazardous substances**

x

Hazardous, inflammable and/or toxic materials such as solvent coating, thinners, anti-termite solutions, water proofing materials shall be stored in appropriate containers preferably with lids having spillage catchment trays and shall be stored in a good ventilated area. These containers shall be labeled with the name of the materials highlighting the hazards associated with its use and necessary precautions to be taken. Respective MSDS (Material Safety Data Sheet) shall be made available at site & may be referred whenever problem arises.

x

Where contact or exposure of hazardous materials are likely to exceed the specified limit or otherwise have harmful effects, appropriate personal protective equipments such as gloves, goggles/face-shields, aprons, chemical resistant clothing, respirator, etc. shall be used.

x

The work place shall be checked prior to start of activities to identify the location, type and condition of any asbestos materials which could be disturbed during the work. In case asbestos material is detected, usage of appropriate PPEs by all personnel shall be ensured and the matter shall be reported immediately to PDIL/ Owner.

**3.3.11 Slips, trips & falls**

The contractor shall establish a regular cleaning and basic housekeeping programme that covers all aspects of the workplace to help minimize the risk of slips, trips & falls. The contractor shall take positive measures like keeping the work area tidy, storing waste in suitable containers & harmful items separately, keeping passages, stairways, entrances & exits especially emergency ones clear, cleaning up spillages immediately and replacing damaged carpet/ floor tiles, mats & rugs at once to avoid slips, trips & falls.

**3.3.12 Radiation exposure**

x

All personnel exposed to physical agents such as ionizing & non-ionizing radiation, including ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.

x

For Open Field Radiography works , requirements of Bhabha Atomic Research Centre (BARC)/ Atomic Energy Regulatory Board (AERB) shall be followed.

x

The Contractor shall implement an effective system of control (as described in the AERB regulations) at site for handling radiography-sources & for avoiding its misuse & theft.



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X

The contractor shall generate the Format No: HSE-8 “Permit for radiation work” before start of work.

X

In case the radiography work has to be carried out at day time, suitable methodology to be used so that other works, people are not affected.

**3.3.13 Explosives/Blasting operations**

X

Blasting operations shall be carried out as per latest Explosive Rules (Indian / International) with prior permission. The Contractor shall obtain license from Chief Controller of Explosives (CCoE) for collection, transportation, storage of explosives as well as for carrying out blasting operations.

X

The Contractor shall prepare exclusive method statement (in cognizance with statutory requirements) for diffusing unfired explosives, if any, at project site before carrying out actual task. Nowhere blasting shall be carried out by the Contractor or its agency without the involvement of competent supervisor and licensed blaster / shot blaster.

**3.3.14 Demolition/ Dismantling**

X

The contractor shall adhere to safe demolishing/ dismantling practices at all stages of work to guard against unsafe working practices.

X

The contractor shall disconnect service lines (power, gas supply, water, etc.)/ make alternate arrangements prior to start of work and restore them, if required as directed by PDIL/ Owner at no extra cost.

X

Before carrying out any demolition/ dismantling work, the contractor shall take prior approval of PDIL/Owner and generate the Format No.HSE-9. For revamp jobs in operating plants where location of underground utilities is not known with certainty, the contractor shall depute an experienced engineer for supervision and shall make adequate arrangements for Fire fighting & First-Aid during the execution of these activities.

X

The Contractor shall arrange approved Job Safety Analysis (JSA) / Method Statement for the specific demolition / dismantling task and corresponding action plan commensurate with hazards / risks associated therein. In no case any activity related to demolition / dismantling shall be carried out by the Contractor without engaging own supervision / field engineer.

**3.3.15 Road Safety**

X

X The Contractor shall ensure adequately planned road transport safety management system.

The vehicles shall be fitted with reverse warning alarms & flashing lights / fog-lights and usage of seat belts shall be ensured.

X

The Contractor shall also ensure a separate pedestrian route for safety of the workers and comply with all traffic rules & regulations, including maintaining speed limit of 20 kmph or indicated by owner for all types of vehicles / mobile machinery. The maximum allowable speed shall be adhered to.

X

In case of an alert or emergency, the Contractor must arrange clearance of all the routes, roads, access. The Contractor shall deploy sufficient number of traffic controllers at project site routes / roads/ accesses, to alert reversing movement of vehicles & machinery as well as pedestrians.

X

Dumpers, Tippers, etc. shall not be allowed to carry workers within the plant area and also to & from the labour colony to & from project sites.

X

Hydras shall only be allowed for handling the materials at fabrication/ storage yards and in no case shall be allowed to transport the materials over project / plant roads.

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X

The Contractor shall not deploy any such mobile machinery / equipments, which do not have competent operator and / or experienced banks-man / signal-man. Such machinery / equipments shall have effective limit-switches, reverse-alarm, front & rear-end lights etc. and shall be maintained in good working order.

X

The Contractor shall not carry-out maintenance of vehicles / mobile machinery occupying space on project / plant roads and shall always arrange close supervision for such works.

X

For pipeline jobs, the contractor shall submit a comprehensive plan covering transportation, loading / unloading of pipes, movement of side booms, movement of vehicles on the ROW, etc.

X

Contractor's shall arrange /install visible road signs, diversion boards, caution boards, etc on project roads for safe movement of men and machinery.

### 3.3.16 Welfare measures

Contractor shall, at the minimum, ensure the following facilities at work sites:

X

A crèche at site where 10 or more female workers are having children below the age of 6 years.

X

Adequately ventilated / illuminated rooms at labour camps & its hygienic up-keeping.

X

Reasonable canteen facilities at site and in labour camps at appropriate location depending upon site conditions. Contractor shall make use of "industrial" variety of LPG cylinder & satisfactory illumination at the canteens. Necessary arrangement for efficient disposal of wastes from canteens & urinals /toilets shall also be made and regular review shall be made to maintain the ambience satisfactorily hygienic & shall also comply with all applicable statutory requirements.

X

Adequately lighted & ventilated Rest rooms at site (separate for male workers and female workers).

X

Urinals, Toilets, drinking water, washing facilities, adequate lighting at site and labour camps, commensurate with applicable Laws / Legislation.

### 3.3.17 Environment Protection

Contractor shall ensure proper storage and utilization methodology of materials that are detrimental to the environment. Where required, Contractor shall ensure that only the environment friendly materials are selected and emphasize on recycling of waste materials, such as metals, plastics, glass, paper, oil & solvents. The waste that cannot be minimized, reused or recovered shall be stored and disposed of safely. In no way, toxic spills shall be allowed to percolate into the ground. The contractor shall not use the empty areas for dumping the wastes.

The contractor shall strive to conserve energy and water wherever feasible.

The contractor shall ensure dust free environment at workplace by sprinkling water on the ground at frequent intervals. The air quality parameters for dust, poisonous gases, toxic releases, harmful radiations, etc. shall be checked by the contractor on daily basis and whenever need arises.

The contractor shall not be allowed to discharge chemicals, oil, silt, sewage, sullage and other waste materials directly into the controlled waters like surface drains, streams, rivers, ponds. A discharge plan suggesting the methods of treating the waste before discharging shall be submitted to PDIL/Owner for approval.

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For pipeline jobs, top soil shall be stacked separately while making ROW through fields. This fertile soil shall be placed back on top after backfilling.

For offshore construction barges, arrangements shall be made for safe disposal of human, food & other wastes and applicable laws in this regard shall be followed.

**3.3.18 Rules & Regulations**

All persons deployed at site shall be knowledgeable of and comply with the environmental 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 PDIL/Owner. An indicative list of Statutory Acts & Rules relating to HSE is given under Appendix-D.

**3.3.19 Weather Protection**

Contractor shall take appropriate measures to protect workers from severe storms, rain, solar radiations, poisonous gases, dust, etc. by ensuring proper usage of PPEs like Sun glasses, Sun screen lotions, respirators, dust masks, etc. and rearranging/ planning the construction activities to suit the weather conditions. Effective arrangement (without creating inconvenience to project facilities & permanent installations) for protecting workmen from hailstorm, drizzle in the form of temporary shelter shall be made at site.

**3.3.20 Communication**

All persons deployed at the work site shall have access to effective means of communication so that any untoward incident can be reported immediately and assistance sought by them.

All health & safety information shall be communicated in a simple & clear language easily understood by the local workforce.

For information to all, typical subjects that should be communicated are: -

Inside the company (Top to down)

- a. Quality Policy
- b. HSE Policy contents
- c. Environment Policy
- d. HSE Objectives
- e. Safety Cardinal Rules
- f. HSE Target – reached or missed
- g. Praises & Warnings to personnel for HSE Management
- h. Safety Walk Through Reports and safety defects / shortfalls (by management)
- i. HSE Audit results
- j. Revised Statutory Health & Safety provisions, if any
- k. H & S publicity
- l. Suggestions

Inside the Company (Bottom to up)

- a. Complaints
- b. Compliances on safety defects / shortfalls
- c. Suggestions
- d. Proposals for changes & improvements
- e. HSE Reports (including near-miss reports)

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**3.3.21 Confined Space Entry**

The contractor shall generate a work permit (Format No. HSE -7) before entering a confined space. People, who are permitted to enter into confined space, must be medically examined & certified by registered doctor, confirming their 'medical fitness for working in confined space'. All necessary precautions mentioned therein shall be adhered to. An attendant shall be positioned outside a confined space for extending help during an emergency. All appropriate PPEs and air quality parameters shall be checked before entering a confined space. It shall be ensured that the piping of the equipment which has to be opened is pressure- free by checking that blinds are in place, vents are open and volume is drained. Inside confined space works, only electrical facilities / installations of 24V shall be permitted. Contractor shall ensure usage of safe & suitable arrangement of oxygen supply for individual workmen (during the course of work in confined space), if oxygen concentration is found to be less than 19.5% (v/v) there.

**3.3.22 Heavy Lifts**

X

The contractor shall submit detailed rigging studies plan for PDIL/ Owner approval prior to lifting equipment which cannot be erected with a crane of approx. 100 MT capacity due to constraints of its dimensions, location of foundation height, approach & weight.

X

Contractor shall generate the format no:HSE-15 "Permit for heavy lift/critical erection"

X

Prior to actual lifting activities, contractor shall check the validity of the crane inspection certificate issued by statutory/ competent authority. This requirement shall also apply to all rigging equipments utilized for the job.

X

The contractor shall, at all times, be responsible for all rigging activities.

X

The Contractor shall ensure medical fitness of all workmen who are engaged / involved in erection of equipments, vessels etc. and such fitness checks shall be carried-out every six months interval with the help of a registered medical practitioner & record shall be maintained

X

Adequate safety measures such as positive barricading, usage of appropriate PPEs, permit to work, etc. shall be taken during all heavy or critical lifts.

X

For lifting any material (irrespective of shape, size or volume), at any height, it is always advisable to prepare a Plan of Erection (PoE) taking into consideration hazards & risks associated therein – this can enable people to put their own experiences of various natures & side-by-side establish a practical method for risk-free erection / lifts. The contractor shall prepare PoE & shall document the same, when risks are identified as "medium" or "high" and the same shall be approved by its competent / qualified engineer.

**3.3.23 Key Performance Indicators**

The contractor shall measure an activity in both leading & trailing indicators for statistical and performance measurement. The activities pertaining to key performance indicators are covered in Monthly HSE Report (Format No. HSE-5). The contractor shall try to achieve a statistically fair record and strive for its continual improvement.

Leading Indicators viz:-:

- Number of Safety Inductions carried-out at site (for workmen & staff members)
- Number of HSE inspections carried out
- Number of "Safety Walk Through" carried-out by site-head.

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- Number of HSE shortfalls / lapses identified per contractor & closed-out in time.
- Number of Safety Meetings conducted (in-house / with contractors)
- Number of HSE Audits made (internal & external) vis-à-vis non conformances raised
- Number of HSE Awareness / Motivational program conducted by contractors
- Number of HSE Trainings conducted at site for supervisors & workmen
- Study of Near miss case reported
- Encouragements / Awards / Recognitions to workmen, job supervisors & field engineers.
- Suggestions for improvement

Trailing Indicators viz:-:

- Calculation of HSE statistics viz frequency rate, severity rate, LTA free manhours, etc
- Analysis of incidents / accidents (nature, severity, types etc.)
- Study of Incident / Accident with respect to :-
  - f* Variety
  - f* Period of the year / project span
  - f* Timings of the incident / accident
  - f* Age profile of victims
  - f* Body parts involved
  - Penalty levied for causing incident / accident

#### 3.3.24 Unsuitable Land Conditions

Contractor shall take appropriate measures and necessary work permits/clearances if work is to be done in or around marshy areas, river crossings, mountains, monuments, etc. The Contractor shall make right assessment and take all necessary action for developing work areas to make them safe & suitable for crane operations or other vehicular movement before carrying out any project related activity / operation. Contractor shall take all necessary actions to make the surroundings of its site establishments (site office, stores, lay-down area etc.) work-worthy safe and secure.

#### 3.3.25 Under Water Inspection

Contractor shall ensure that boats and other means used for transportation, surveying & investigation works shall be certified seaworthy by a recognized classification society. It shall be equipped with all life saving devices like life jackets, adequate fire protection arrangements and shall possess communication facilities like cellular phones, wireless, walkie-talkie. All divers used for seabed surveys, underwater inspections shall have required authorized license, suitable life saving kit. Number of hours of work by divers shall be limited as per regulations. PDIL/ Owner shall have the right to inspect the boat and scrutinize documents in this regard.

#### 3.3.26 Excavation

The Contractor shall obtain permission from competent authorities prior to excavation wherever required.

The Contractor shall locate the position of buried utilities (water line, cable route, etc.) by referring to project / plant drawing / in consultation with PDIL/Owner. The Contractor shall start digging manually to locate the exact position of buried utilities & thereafter use mechanical means.

The Contractor shall keep soil heaps at least 1.5 M away from edge or a distance equal to depth of pit (whichever is more)

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The Contractor shall maintain sufficient “angle of repose” during excavation – shall also provide slope or suitable bench as decided by PDIL / Owner.

The Contractor shall arrange “battering” or “benching” wherever required for preventing collapse of edge of excavations.

The Contractor shall identify & arrange de-watering pump or well-point system to prevent earth collapse due to heavy rain / influx of underground water.

The Contractor shall arrange protective fencing / barricading with warning signal around excavated pits, trenches, etc. along with minimum 2 (two) entries, exits / escape ladders.

The Contractor must avoid “underpinning” / under-cutting to prevent collapse of chunk of earth during excavation

The Contractor shall use “stoppers” to prevent over-run of vehicle wheels at the edge of excavated pits / trenches.

The Contractor shall arrange strengthening of “shoring” & “strutting” proactively to avoid collapse of earth / edges due to vehicular movement in close proximity of excavated areas / pits / trenches, etc.

**3.4 Tool Box Talks (TBT)**

Contractor shall conduct daily TBT with workers prior to start of work and shall maintain proper record of the meeting. A suggested format is given below. The TBT is to be conducted by the immediate supervisor of the workers

The Contractor shall conduct TBT before start of every morning or evening shift or night shift activities, for alerting the workers on specific hazards and their appropriate dos & don'ts. The Contractor shall provide sufficient rests to the site workmen and their foremen to avert fatigue & thereby endangering their lives during the course of site works.

TOOL BOX TALK RECORDING SHEET		
Date & Time		
Work Location		
Subject (Nature of work)		
Presenter		
Hazards involved		
Precautions to be taken		
Worker's Name	Signature	Section
Remarks, in any		

The topics during TBT shall include

- Hazards related to work assigned on that day and precautions to be taken.
- Any forthcoming HSE hazards/events/instruction/orders, etc.

The above record can be kept in local language, which workers can read. These records shall be made available to PDIL/ Owner whenever demanded.

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**3.5 Training & Induction Programme**

X

Initial induction of workers into Construction oriented activities and appraising them about the methodology of works and how to carry-out safely and the same should not be inter mixed with Tool Box Talks or HSE Training. In this regard careful action should be made & maintained for imparting HSE induction to every individual, irrespective of his task/designation/level of employment, whereas, HSE Training should be imparted to specific person/group of people who are to carry-out that specific task more than once – for example, Riggers must be trained for working at heights, welders must be trained for work in confined space, fitters/carpenters, masons must be trained for work at heights, etc.

X

Contractor shall conduct Safety induction programme on HSE for all his workers and maintain records. The Gate Pass shall be issued only to those workers who successfully qualify the Safety induction programme.

X

The Contractor shall brief the visitors about the HSE precautions which are required to be taken before their proceeding to site and make necessary arrangements to issue appropriate PPEs like Aprons, hard hats, ear-plugs, goggles & safety shoes etc., to his visitors. The Contractor shall always maintain relevant acknowledgement from visitor on providing him brief information on HSE actions.

X

Contractor shall ensure that all his personnel possess appropriate training to carry out the assigned job safely. The training should be imparted in a language understood by them and should specifically be trained about

- Potential hazards to which they may be exposed at their workplace
- Measures available for prevention and elimination of these hazards

The topics during training shall cover, at the minimum: -

- Why safety should be considered during work - explanation
- Education about hazards and precautions required
- Employees' duties & responsibilities
- Emergency and evacuation plan
- HSE requirements during project activities
- Fire fighting and First-Aid
- Use of PPEs
- Occupational health issues – dos & don'ts
- Local laws on intoxicating drinks, drugs, smoking in force
- Common environmental subjects – lighting, ventilation, vibration, smoke/fumes etc.

X

Records of the training shall be kept and submitted to PDIL/ Owner.

X

The Contractor shall make regular program for conducting Safety Training on various topics related to various activities & their safe-guarding utilizing experienced persons / outside agency / faculty. A program for Safety Training (indicative list as per Appendix –F) shall be furnished by the Contractor in its HSE Plan .

X

For offshore and jetty jobs, contractor shall ensure that all personnel deployed have undergone a structured sea survival training including use of lifeboats, basket landing, use of radio communication etc. from an agency acceptable to Owner/PDIL.

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**3.6 ADDITIONAL SAFETY REQUIREMENTS FOR WORKING INSIDE A RUNNING PLANT**

As a minimum, the contractor shall ensure adherence to following safety requirements while working in or in the close vicinity of an operating plant:

- a) Contractor shall obtain permits for Hot work, Cold work, Excavation and Confined Space from Owner in the prescribed format.
- b) The contractor shall monitor record and compile list of his workers entering the operational plant/unit each day and ensure & record their return after completing the job.
- c) Contractor's workers and staff members shall use designated entrances and proceed by designated routes to work areas only assigned to them. The workers shall not be allowed to enter units' area, tanks area, pump rooms, etc. without work authorization permit.
- d) Work activities shall be planned in such a way so as to minimize the disruption of other activities being carried out in an operational plant/unit and activities of other contractors.
- e) The contractor shall submit a list of all chemicals/toxic substances that are intended to be used at site and shall take prior approval of the Owner.
- f) Specific training on working in a hydrocarbon plant shall be imparted to the work force and mock drills shall be carried out for Rescue operations/First-Aid measures.
- g) Proper barricading/cordoning of the operational units/plants shall be done before starting the construction activities. No unauthorized person shall be allowed to trespass. The height and overall design of the barricading structure shall be finalized in consultation with the Owner and shall be got approved from the Owner.
- h) Care shall be taken to prevent hitting underground facilities such as electrical cables, hydrocarbon piping during execution of work.
- i) Barricading with water curtain shall be arranged in specific/critical areas where hydrocarbon vapors are likely to be present such as near horton spheres or tanks. Positioning of fire tenders (from owner) shall also be ensured during execution of critical activities.
- j) Emergency evacuation plan shall be worked out and all workmen shall be apprised about evacuation routes. Mock drill operations may also be conducted.
- k) Flammable gas test shall be conducted prior to any hot work using appropriate measuring instruments. Sewers, drains, vents or any other gas escaping points shall be covered with flame retardant tarpaulin.
- l) Respiratory devices shall be kept handy while working in confined zones where there is a danger of inhalation of poisonous gases. Constant monitoring of presence of Gas/ Hydrocarbon shall be done.
- m) Clearance shall be obtained from all parties before starting hot tapping, patchwork on live lines and work on corroded tank roof.
- n) Positive isolation of line/equipment by blinding for welding/cutting/grinding shall be done. Closing of valve will not be considered sufficient for isolation.



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- o) Welding spatters shall be contained properly and in no case shall be allowed to fall on the ground containing oil. Similar care shall be taken during cutting operations.
- p) The vehicles, cranes, engines, etc. shall be fitted with spark arresters on the exhaust pipe and got it approved from Safety Department of the Owner.
- q) Plant air should not be used to clean any part of the body or clothing or use to blow off dirt on the floor.
- r) Gas detectors should be installed in gas leakage prone areas as per requirement of Owner's plant operation personnel.
- s) Experienced full time safety personnel shall be exclusively deployed to monitor safety aspects in running plants.

### **3.7 Self Assessment And Enhancement**

The contractor shall develop a method of check & balance through self assessment & enhancement techniques and shall explore the opportunities for continual improvement in the HSE system.

### **3.8 HSE Promotion**

The contractor shall encourage his workforce to promote HSE efforts at workplace by way of organizing workshops/seminars/training programmes, celebrating HSE awareness weeks & National Safety Day, conducting quizzes & essay competitions, distributing pamphlets, posters & material on HSE, providing incentives for maintaining good HSE practices and granting incentives / bonus for completing the job without any lost time accident.

### **3.9 Lock Out and Tag Out (LOTO) for isolation of energy source**

x

Contractor shall follow the LOTO/Isolation procedure of owner for all energy source

x isolations installed/under purview by /of owner ie. "Brown field"

For all the other energy source (not under purview of client/owner) i.e "Green field"

Contractor shall develop a system to ensure the isolation of equipments, pipelines, Vessel, electrical panels from the energy source covering following as minimum:-

- Identification of all energy source viz electrical, mechanical, hydraulic, pneumatic, chemical, thermal, gravitational, radiation and other forms of stored or kinetic energy.
- Establishing the energy isolation devices viz: manually operated electrical circuit breakers, disconnection switches, blind flanges, etc
- Installation of Lock Out devices for preventing the inadvertent release of stored energy and Tag Out devices ( "Danger", "Do Not operate" or Do not Remove" tags) to indicate that testing, maintenance or servicing is underway and the device cannot be operated until the tag out device is removed.
- Lock Out and Tag out log book
- Permit for isolation and de-isolation of energy source as per format NO: HSE-16
- Availability of competent persons like experienced operators at substations, pump

x house, units, etc. ; supervisors,etc.

Contractor shall ensure that all the sources are locked out and tagged properly before giving

x clearance to start the job.

After the completion of job, contractor shall ensure all tools and tackles are removed and nobody is present in the working area and signing on LOTO log book.

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x

Only on confirmation of above the contractor will remove their lock and tag from the isolation points and give instructions for energizing the same. Only the person carrying out the task shall himself carry the key for the lock in /Lock out.

#### **4.0 DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR**

##### **4.1 On Award Of Contract**

The Contractor shall submit a comprehensive Health, Safety and Environment Plan or programme for approval by PDIL/Owner prior to start of work. The Contractor shall participate in the pre-start meeting with PDIL/Owner to finalize HSE Plans which shall including the following:

- HSE policy & Objectives
- Job procedure to be followed by the Contractor for construction activities including handling of equipments, scaffolding, electric installations, etc. describing the risks involved, actions to be taken and methodology for monitoring each activity. Indicative list of procedures is enclosed as Annexure-H
- PDIL/Owner review/audit requirement.
- Organization structure along with responsibility and authority, on HSE activities.
- Administrative & disciplinary steps involving implementation of HSE requirements
- Emergency evacuation plan/ procedures for site and labour camps
- Job Safety Analysis for high risk jobs
- Procedures for reporting & investigation of accidents and near misses.
- HSE Inspection
- HSE Training programmes at project site
- HSE Awareness programmes, at project site
- Reference to Rules, Regulations and statutory requirements.
- HSE documentation viz reporting, analysis & record keeping.

##### **4.2 During Job Execution**

Contractor shall implement approved Health, Safety and Environment management programme including but not limited to as brought out under para 3.0. Contractor shall also ensure:

- x to arrange workmen compensation insurance, registration under ESI Act, third party liability insurance, registration under BOCW Act, etc, as applicable.
- x to arrange all HSE permits before start of activities (as applicable), like permits for hot work, working at heights (Refer Format No. HSE-6), confined space (Refer Format No. HSE-7), Radiation Work Permit (Refer Format No. HSE-8), Demolishing/ Dismantling Work Permit (Refer Format No. HSE-9), Permit for erection/modification & dismantling of scaffolding (Refer Format No: HSE-14), Permit for heavy lift/critical erection (Refer Format No: HSE-15), Permit for energy Isolation & De-isolation" (HSE-16), storage of chemical / explosive materials & its use and implement all precautions mentioned therein. In this regard, requirements of *Oil industry Safety Directorate Standard No. Std -105 "Work Permit Systems"* shall be complied with while working in existing Oil or Gas processing plants. List of the persons involved shall be maintained as annexure to the work permit issued for a particular activity.
- x to submit, timely, the completed checklist on HSE activities in Format No. HSE-1, Monthly HSE report in Format No. HSE-5 (use of web based package ([www.PDIL.co.in/conthse](http://www.PDIL.co.in/conthse)) is compulsory wherever the facility is available else a hard copy is to be submitted), accident/incident reports, investigation reports etc. as per PDIL/Owner requirements. Compliance of instructions on HSE shall be done by Contractor and informed urgently to PDIL/Owner.

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- x that his top most executive at site attends all the Safety Committee/HSE meetings arranged by PDIL/Owner and carries out safety walk through regularly. Only in case of his absence from site that a second senior most person shall be nominated by him, in advance, and communicated to PDIL/Owner for performing the above tasks.
- x display at site office and at prominent locations HSE Policy, caution boards, list of hospitals, emergency services available, safety signs like Men at work, Speed Limits, Hazardous Area, various do's & don'ts, etc.
- x provide posters, banners for safe working to promote safety consciousness.
- x identify, assess, analyze & mitigate the construction hazards & incorporate relevant control measures before actually executing site works. (HIRAC = Hazard Identification, Risk Analysis and Control).
- x arrange testing, examination, inspection of own as well as borrowed construction equipments / machinery (stationary & mobile) before being used at site and also at periodical interval, through own resources and also by 3<sup>rd</sup> party competent agencies (as deemed fit in statutes). Records of such test, examination etc. shall be maintained & shall be submitted to PDIL/Owner as & when asked for.
- x carryout audits/inspection (internal & external) at his works as well as sub contractor works as per approved HSE plan/procedure/programme & submit the compliance reports of identified shortfalls for PDIL/Owner review.
- x arranging HSE training for site workmen (of his own & sub contractors) through internal or external faculty at periodical intervals.
- x assistance & cooperate during HSE audits by PDIL/Owner or any other 3<sup>rd</sup> party and submit compliance report.  
generate & submit of HSE records/report as per this specification.
- x apprise PDIL/Owner on HSE activities at site regularly.
- x carry-out all dismantling activities safely, with prior approval of PDIL/Owner representative.
- x The Contractor shall ensure that "Hot works" and painting works do not continue at the same place / location at project site for which chance or probability of "fire" incident exists.

#### **4.3 During Short Listing Of The Sub-Contractors**

The contractor shall review the HSE management system of the sub-contractors in line with the requirements given in this specification. The contractor shall be held responsible for the shortcomings observed in the HSE management system of the sub-contractor(s) during execution of the job.

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**5.0 RECORDS**

At the minimum, the contractor shall maintain/ submit HSE records in the following reporting formats/:

Safety Walk Through Report	HSE-1
Accident/ Incident Report	HSE-2
Supplementary Accident/ Incident Investigation report	HSE-3
Near Miss Incident Report	HSE-4
Monthly HSE Report	HSE-5
Permit for working at height	HSE-5
Permit for working in confined space	HSE-7
Permit for radiation work	HSE-8
Permit for demolishing/ dismantling	HSE-9
Daily Safety checklist	HSE-10
House keeping Assessment & compliance	HSE-11
Inspection of temporary electrical booth/installation	HSE-12
Inspection for scaffolding	HSE-13
Permit for erection/modification & dismantling of scaffolding	HSE-14
Permit for heavy lift/critical erection.	HSE-15
Permit for Energy isolation and de-isolation.	HSE-16
Permit for Excavation	HSE-17
Inspection reports of Equipment/tools/tackles	*
Report of Toolbox talks	As indicated in specification
PPE issue report/register	*
Site inspection reports	*
Training records	*

(\* The formats shall be developed in consultation with PDIL/Owner

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**APPENDIX-A  
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**A. IS CODES ON HSE**

SP: 53	Safety code for the use, Care and protection of hand operated tools.
IS: 838	Code of practice for safety & health requirements in electric and gas welding and cutting operations
IS: 1179	Eye & Face precautions during welding, equipment etc.
IS: 1860	Safety requirements for use, care and protection of abrasive grinding wheels.
IS: 1989 (Pt -II)	Leather safety boots and shoes
IS: 2925	Industrial Safety Helmets
IS: 3016	Code of practice for fire safety precautions in welding & cutting operation.
IS: 3043	Code of practice for earthing
IS: 3764	Code of safety for excavation work
IS: 3786	Methods for computation of frequency and severity rates for industrial injuries and classification of industrial accidents
IS: 3696	Safety Code of scaffolds and ladders
IS: 4083	Recommendations on stacking and storage of construction materials and components at site
IS: 4770	Rubber gloves for electrical purposes
IS: 5121	Safety code for piling and other deep foundations
IS: 5216 (Pt-I)	Recommendations on Safety procedures and practices in electrical works
IS: 5557	Industrial and Safety rubber lined boots
IS: 5983	Eye protectors
IS: 6519	Selection, care and repair of Safety footwear
IS: 6994 (Pt-I)	Industrial Safety Gloves (Leather & Cotton Gloves)
IS: 7293	Safety Code for working with construction Machinery
IS: 8519	Guide for selection of industrial safety equipment for body protection
IS: 9167	Ear protectors
IS: 11006	Flash back arrestor (Flame arrestor)
IS: 11016	General and safety requirements for machine tools and their operation
IS: 11057	Specification for Industrial safety nets
IS: 11226	Leather safety footwear having direct moulded rubber sole
IS: 11972	Code of practice for safety precaution to be taken when entering a sewerage system
IS: 13367	Code of practice-safe use of cranes
IS: 13416	Recommendations for preventive measures against hazards at working place

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**B. INTERNATIONAL STANDARDS ON HSE**

Safety Glasses	:	ANSI Z 87.1, ANSI ZZ 87.1, AS 1337, BS 2092, BS 1542, BS 679, DIN 4646/ 58311
Safety Shoes	:	ANSI Z 41.1, AS 2210, EN 345
Hand Gloves	:	BS 1651
Ear Muffs	:	BS 6344, ANSI S 31.9
Hard Hat	:	ANSI Z 89.1/89.2, AS 1808 , BS 5240, DIN 4840
Goggles	:	ANSI Z 87.1
Face Shield	:	ANSI Z 89.1
Breathing Apparatus	:	BS 4667, NIOSH
Welding & Cutting	:	ANSI Z 49.1
Safe handling of compressed: P-1		(Compressed Gas Association Gases in cylinders 1235 Jefferson Davis Highway, Arlington VA 22202 - USA)
Full body harness	:	EN-361
Lanyard	:	EN-354
Karabiner	:	EN-362 and EN-12275

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**APPENDIX-B**

**DETAILS OF FIRST AID BOX**

<b>SL. NO.</b>	<b>DESCRIPTION</b>	<b>QUANTITY</b>
1.	Small size Roller Bandages, 1 Inch Wide (Finger Dressing small)	6 Pcs.
2.	Medium size Roller Bandages, 2 Inches Wide (Hand & Foot Dressing)	6 Pcs.
3.	Large size Roller Bandages, 4 Inches Wide (Body Dressing Large)	6 Pcs.
4.	Large size Burn Dressing (Burn Dressing Large)	4 Pkts.
5.	Cotton Wool (20 gms packing)	4 Pkts.
6.	Antiseptic Solution Dettol (100 ml.) or Savlon	1 Bottle
7.	Mercurochrome Solution (100 ml.) 2% in water	1 Bottle
8.	Ammonia Solution (20 ml.)	1 Bottle
9.	A Pair of Scissors	1 Piece
10.	Adhesive Plaster (1.25 cm X 5 m)	1 Spool
11.	Eye pads in Separate Sealed Pkt.	4 pcs.
12.	Tourniquet	1 No.
13.	Safety Pins	1 Dozen
14.	Tinc. Iodine/ Betadin (100 ml.)	1 Bottle
15.	Polythene Wash cup for washing eyes	1 No.
16.	Potassium Permanganate (20 gms.)	1 Pkt.
17.	Tinc. Benzoine (100 ml.)	1 Bottle
18.	Triangular Bandages	2 Nos.
19.	Band Aid Dressing	5 Pcs.
20.	Iodex/Moov (25 gms.)	1 Bottle
21.	Tongue Depressor	1 No.
22.	Boric Acid Powder (20 gms.)	2 Pkt.
23.	Sodium Bicarbonate (20 gms.)	1 Pkt.
24.	Dressing Powder (Nebasulf) (10 gms.)	1 Bottle
25.	Medicinal Glass	1 No.
26.	Duster	1 No.
27.	Booklet (English & Local Language)	1 No. each
28.	Soap	1 No.
29.	Toothache Solution	1 No.
30.	Vicks (22 gms.)	1 Bottle
31.	Forceps	1 No.
32.	Note Book	1 No.
33.	Splints	4 Nos.
34.	Lock	1 Piece
35.	Life Saving/Emergency/Over-the counter Drugs	As decided at site

Box size: 14" x 12" x 4"

Note : The medicines prescribed above are only indicative. Equivalent medicines can also be used.  
A prescription, in this regard, shall be required from a qualified Physician.

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**APPENDIX-C**

**TYPE OF FIRES VIS-À-VIS FIRE EXTINGUISHERS**

Fire ↓ Extinguisher →	Water	Foam	CO <sub>2</sub>	Dry Powder	Multi purpose (ABC)
Originated from paper, clothes, wood	D	D	can control minor surface fires	can control minor surface fires	D
Inflammable liquids like alcohol, diesel, petrol, edible oils, bitumen	2	D	D	D	D
Originated from gases like LPG, CNG, H <sub>2</sub>	2	2	D	D	D
Electrical fires	2	2	D	D	D

LEGEND :                    D                    : CAN BE USED  
   2                    : NOT TO BE USED

**Note:** Fire extinguishing equipment must be checked at least once a year and after every use by an authorized person. The equipment must have an inspection label on which the next inspection date is given. Type of extinguisher shall clearly be marked on it.



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**APPENDIX-D**

**List of Statutory Acts & Rules Relating to HSE**

- The Indian Explosives Act and Rules
- The Motor Vehicle Act and Central Motor Vehicle Rules
- The Factories Act and concerned Factory Rules
- The Petroleum Act and Petroleum Rules
- The Workmen Compensation Act
- The Gas Cylinder Rules and the Static & Mobile Pressure Vessels Rules
- The Indian Electricity Act and Rules
- The Indian Boiler Act and Regulations
- The Water (Prevention & Control & Pollution) Act
- The Water (Prevention & Control of Pollution) Cess Act
- The Mines & Minerals (Regulation & Development) Act
- The Air (Prevention & Control of Pollution) Act
- The Atomic Energy Act
- The Radiation Protection Rules
- The Indian Fisheries Act
- The Indian Forest Act
- The Wild Life (Protection) Act
- The Environment (Protection) Act and Rules
- The Hazardous Wastes (Management & Handling) Rules
- The Manufacturing, Storage & import of Hazardous Chemicals Rules
- The Public Liability Act
- The Building and Other Construction Workers (Regulation of Employment and Condition of service) Act
- Other statutory acts Like EPF, ESIS, Minimum Wage Act.

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**APPENDIX-E (Sheet 1 of 12)**

**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
(A) EXCAVATION  Pit Excavation upto 3.0m	Falling into pit	Personal injury	Provide guard rails/ barricade with warning signal Provide at least two entries/ exits. <u>Provide escape ladders.</u>
	Earth Collapse	Suffocation/ Breathlessness Buried	Provide suitable size of shoring and strutting, if required. Keep soil heaps away from the edge equivalent to 1.5m or depth of pit whichever is more. Don't allow vehicles to operate too close to excavated areas. Maintain at least 2m distance from edge of cut. Maintain sufficient angle of repose. Provide slope not less than 1:1 and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock. <u>Battering/benching the sides.</u>
	Contact with buried electric cables  Gas/ Oil  Pipelines	Electrocution Explosion	Obtain permission from competent authorities, prior to excavation, if required. Locate the position of buried utilities by referring to plant drawings. Start digging manually to locate the exact position of buried utilities and thereafter use <u>mechanical means.</u>
Pit Excavation beyond 3.0m	Same as above plus Flooding due to excessive rain/ underground water	Can cause drowning situation	Prevent ingress of water Provide ring buoys Identify and provide suitable size dewatering pump or well point system
	Digging in the vicinity of existing Building/ Structure	Building/Structure may collapse Loss of health & wealth	Obtain prior approval of excavation method from local authorities. Use under-pining method <u>Construct retaining wall side by side.</u>
	Movement of vehicles/ equipments close to the edge of cut.	May cause cave-in or slides. Persons may get buried.	Barricade the excavated area with proper lighting arrangements Maintain at least 2m distance from edge of cut and use stop blocks to prevent over-run <u>Strengthen shoring and strutting</u>

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
Narrow deep excavations for pipelines, etc.	Same as above plus Frequent cave-in or slides	May cause severe injuries or prove fatal	Battering/benching of sides Provide escape ladders
	Flooding due to Hydro- static testing	May arise drowning situation	Same as above plus Bail out accumulated water Maintain adequate ventilation.
Rock by excavation blasting	Improper handling of explosives	May prove fatal	Ensure proper storage, handling & carrying of explosives by trained personnel. Comply with the applicable explosive acts & rules.
	Uncontrolled explosion	May cause severe injuries or prove fatal	Allow only authorized persons to perform blasting operations. Smoking and open flames are to be strictly prohibited
	Scattering of stone pieces in atmosphere	Can hurt people	Use PPE like goggles, face mask, helmets etc.
Rock excavation by blasting (Contd)	Entrapping of persons/ animals.	May cause severe injuries or prove fatal	Barricade the area with red flags and blow siren before blasting.
	Misfire	May explode suddenly	Do not return to site for at least 20 minutes or unless announced safe by designated person.
Piling Work	Failure of pile-driving equipment	Can hurt people	Inspect Piling rigs and pulley blocks before the beginning of each shift.
	Noise pollution	Can cause deafness and psychological imbalance.	Use personal protective equipments like ear plugs, muffs, etc.
	Extruding rods/casing	Can hurt people	Barricade the area and install sign boards Provide first-aid
	Working in the vicinity of 'Live-Electricity'	Can cause electrocution/ Asphyxiation	Keep sufficient distance from Live-Electricity as per IS code. Shut off the supply, if possible Provide artificial/rescue breathing to the injured
(B) CONCRETING	Air pollution by cement	May affect Respiratory System	Wear respirators or cover mouth and nose with wet cloth.
	Handling of ingredients	Hands may get injured	Use gloves & other PPE.
	Protruding reinforcement rods.	Feet may get injured	Use Provide platform above reinforcement for movement of workers.

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APPENDIX-E : (Sheet 3 of 12)

**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Earthing of electrical mixers, vibrators, etc. <del>not done.</del>	Can cause electrocution/ asphyxiation	Ensure earthing of equipments and proper functioning of electrical circuit before commencement of work.
	Falling of materials from height	Persons may get injured	Use hard hats Remove surplus material immediately from work place. <del>Ensure lighting arrangements during night hours</del>
	Continuous pouring by same gang	Cause tiredness of workers and may lead to accident.	Insist on shift pattern Provide adequate rest to workers between subsequent pours.
	Revolving of concrete mixer/ vibrators	Parts of body or clothes may get entrapped.	Allow only mixers with hopper Provide safety cages around moving motors <del>Ensure proper mechanical locking of vibrator</del>
Super-structure	Same as above plus Deflection in props or shuttering material	Shuttering/props may collapse and prove fatal	Avoid excessive stacking on shuttering material Check the design and strength of shuttering material before commencement of work Rectify immediately the deflection noted during concreting.
	Passage to work place	Improperly tied and designed props/planks may collapse	Ensure the stability and strength of passage before commencement of work. Do not overload and stand under the passage.
(C) REINFOR- CEMENT	Curtailment and binding of rods	Persons may get injured	Use PPE like gloves, shoes, helmets, etc. <del>Avoid usage of shift tools</del>
	Carrying of rods for short distances/at heights	Workers may get injured their hands and shoulders.	Provide suitable pads on shoulders and use safety gloves. Tie up rods in easily liftable bundles <del>Ensure proper staging.</del>
	Checking of clear distance/ cover with hands	Rods may cut or injure the fingers	Use measuring devices like tape, measuring rods, etc.
	Hitting projected rods and standing on cantilever rods.	Persons may get injured and fell down	Use safety shoes and avoid standing unnecessarily on cantilever rods Avoid wearing of loose clothes

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
	Falling of material from height	May prove fatal	Use helmets Provide safety nets
	Transportation of rods by trucks/ trailers	Protruded rods may hit the persons	Use red flags/lights at the ends Do not protrude the rods in front of or by the side of driver's cabin. Do not extend the rods 1/3 <sup>rd</sup> of deck length or 1.5m whichever is less
(D)WELDING AND GAS CUTTING	Welding radiates invisible ultraviolet and infra-red rays	Radiation can damage eyes and skin.	Use specified shielding devices and other PPE of correct specifications. Avoid thoriated tungsten electrodes for GTAW
	Improper placement of oxygen and acetylene cylinders	Explosion may occur	Move out any leaking cylinder Keep cylinders in vertical position Use trolley for transportation of cylinders and chain them Use flashback arrestors
	Leakage/ cuts in hoses	May cause fire	Purge regulators immediately and then turn off Never use grease or oil on oxygen line connections and copper fittings on acetylene lines Inspect regularly gas carrying hoses Always use red hose for acetylene & other fuel gases and black for oxygen
	Opening-up of cylinder	Cylinder may burst	Always stand back from the regulator while opening the cylinder Turn valve slowly to avoid bursting Cover the lug terminals to prevent short circuiting
	Welding of tanks, container or pipes storing flammable liquids	Explosion may occur	Empty & purge them before welding Never attach the ground cable to tanks, container or pipe storing flammable liquids Never use LPG for gas cutting

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES ...(Contd.)**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
(E) RADIOGRAPHY	Ionizing radiation	Radiations may react with the skin and can cause cancer, skin irritation, dermatitis, etc.	Ensure Safety regulations as per BARC/AERB before commencement of job. Cordon off the area and install Radiation warning symbols Restrict the entry of unauthorized persons Wear appropriate PPE and film badges issued by BARC/AERB
	Transportation and Storage of Radiography source	Same as above	Never touch or handle radiography source with hands Store radiography source inside a pit in an exclusive isolated storage room with lock and key arrangement. The pit should be approved by BARC/AERB. Radiography source should never be carried either in passenger bus or in a passenger compartment of trains. BARC/AERB has to be informed before source movement. Permission from Director General of Civil Aviation is required for booking radio isotopes with airlines.
	Loss of Radio isotope	Same as above	Try to locate with the help of Survey Meter. Inform BARC/AERB (*)
(F) ELECTRICAL INSTALLATION AND USAGE	Short circuiting	Can cause Electrocutation or Fire	Use rubberized hand gloves and other PPE Don't lay wires under carpets, mats or door ways. Allow only licensed electricians to perform on electrical facilities Use one socket for one appliance Ensure usage of only fully insulated wires or cables Don't place bare wire ends in a socket Ensure earthing of machineries and equipments Do not use damaged cords and avoid temporary connections Use spark-proof/flame proof type field distribution boxes.

(\*) Atomic Energy Regulatory Board (AERB),  
Bhabha Atomic Research Centre (BARC)  
Anushaktinagar, Mumbai – 400 094

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>Do not allow open/bare connections Provide all connections through ELCB Protect electrical cables/equipment's from water and naked flames <u>Check all connections before energizing</u></p>
	Overloading of Electrical System	Bursting of system can occur which leads to fire	<p>Display voltage and current ratings prominently with 'Danger' signs. Ensure approved cable size, voltage grade and type Switch off the electrical utilities when not in use Do not allow unauthorized connections. <u>Ensure proper grid wise distribution of Power</u></p>
	Improper laying of overhead and underground transmission lines/cables	Can cause electrocution and prove fatal	<p>Do not lay unarmoured cable directly on ground, wall, roof of trees Maintain at least 3m distance from HT cables All temporary cables should be laid at least 750 mm below ground on 100 mm fine sand overlying by brick soling Provide proper sleeves at crossings/ inter-sections Provide cable route markers indicating the type and depth of cables at intervals not exceeding 30m and at the diversions/termination</p>
(G) FIRE PREVENTION AND PROTECTION	Small fires can become big ones and may spread to the surrounding areas	Cause burn injuries and may prove fatal	<p>In case a fire breaks out, press fire alarm system and shout "Fire, Fire" Keep buckets full of sand &amp; water/ fire extinguishing equipment near hazardous locations Confine smoking to 'Smoking Zones' only. Train people for using specific type of fire fighting equipments under different classes of fire Keep fire doors/shutters, passages and exit doors unobstructed Maintain good housekeeping and first-aid boxes (for details refer Appendix-B) Don't obstruct access to Fire extinguishers. Do not use elevators for evacuation during fire. Maintain lightning arrestors for elevated structures Stop all electrical motors with internal combustion</p>

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APPENDIX-E : (Sheet 7 of 12)

**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			Move the vehicles from dangerous locations Remove the load hanging from the crane booms <u>Remain out of the danger areas.</u>
	Improper selection of Fire extinguisher	It may not extinguish the fire	Ensure usage of correct fire extinguisher meant for the specified fire (for details refer Appendix-C). Do not attempt to extinguish Oil and electric fires with water. Use foam cylinders/CO <sub>2</sub> /sand or earth.
	Improper storage of highly inflammable substances	Same as above	Maintain safe distance of flammable substances from source of ignition Restrict the distribution of flammable materials to only min. necessary amount Construct specifically designed fuel storage facilities Keep chemicals in cool and dry place away from heat. Ensure adequate ventilation Before welding operation, remove or shield the flammable material properly Store flammable materials in stable racks, correctly labeled preferably with catchment trays. <u>Wipe off the spills immediately</u>
	Short circuiting of electrical system	Same as above Can cause Electrocutation	Don't lay wires under carpets, mats or door ways Use one socket for one appliance. Use only fully insulated wires or cables Do not allow open/bare connections Provide all connections through ELCB <u>Ensure earthing of machineries and equipments</u>
(H) VEHICULAR MOVEMENT	Crossing the Speed Limits (Rash driving)	Personal injury	Obey speed limits and traffic rules strictly Always expect the unexpected and be a defensive driver Use seat belts/helmets Blow horn at intersections and during overtaking operations. Maintain the vehicle in good condition <u>Do not overtake on curves, bridges and slopes</u>
	Adverse weather condition	Same as Above	Read the road ahead and ride to the left Keep the wind screen and lights clean Do not turn at speed. Recognize the hazard, understand the defense and act correctly in time.



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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	Consuming alcohol before and during the driving operation	Same as above	Alcohol and driving do not mix well. Either choose alcohol or driving. If you have a choice between hitting a fixed object or an on-coming vehicle, hit the fixed object Quit the steering at once and become a passenger. Otherwise take sufficient rest and then drive. Do not force the driver to drive fast and round the clock. <u>Do not day dream while driving</u>
	Falling objects/ Mechanical failure	May prove fatal	Ensure effective braking system, adequate visibility for the drives, reverse warning alarm.. Proper maintenance of the vehicle as per <u>manufacturer instructions</u>
(I) PROOF TESTING (HYDROSTATIC /PNEUMATIC TESTING)	Bursting of piping Collapse of tanks Tanks flying off	May cause injury and prove fatal	Prepare test procedure & obtain PDIL/owner's approval Provide separate gauge for pressurizing pump and piping/equipment Check the calibration status of all pressure gauges, dead weight testers and temperature recorders Take dial readings at suitable defined intervals and ensure most of them fall between 40-60% of the gauge scale range Provide safety relief valve (set at pressure slightly higher than test pressure) while testing with air/ nitrogen Ensure necessary precautions, stepwise increase in pressure, tightening of bolts/nuts, grouting, etc. before and during testing Keep the vents open before opening any valve while draining out of water used for hydro-testing of tanks. Pneumatic testing involves the hazard of released energy stored in compressed gas. Specific care must therefore be taken to minimize the chance of brittle failure during a pneumatic leak test. Test temperature is important in this regard and must be considered when the designer chooses the material of construction.

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>A pressure relief device shall be provided, having a set pressure not higher than the test pressure plus the lesser of 345 KPa (50 psi) or 10% of the test pressure.</p> <p>The gas used as test fluid, if not air, shall be <u>nonflammable and nontoxic</u>.</p>
(J) WORKING AT HEIGHTS	Person can fall down	May sustain severe injuries or prove fatal	<p>Provide guard rails/barricade at the work place</p> <p>Use PPE like full body harness, life line, helmets, safety shoes, etc.</p> <p>Obtain a permit before starting the work at height above 3 meters</p> <p>Fall arrest and safety nets, etc. must be installed</p> <p>Provide adequate working space (min. 0.6 m)</p> <p>Tie/weld working platform with fixed support</p> <p>Use roof top walk ladder while working on a sloping roofs</p> <p><u>Avoid movement on beams</u></p>
		May hit the scrap/material stacked at the ground or in between	<p>Keep the work place neat and clean</p> <p>Remove the scrap immediately</p>
	Material can fall down	May hit the workers working at lower levels and prove fatal	<p>Same as above plus</p> <p>Do not throw or drop materials or equipment from height. I.e. do not <i>bomb</i> materials</p> <p>All tools to be carried in a tool-kit</p> <p>Bag or on working uniform</p> <p>Remove scrap from the planks</p> <p>Ensure wearing of helmet by the workers <u>working at lower levels</u></p>
(K) CONFINED SPACES	Suffocation/drowning	Unconsciousness, death	<p>Use respiratory devices, if reqd.</p> <p>Avoid over crowding inside a confined space</p> <p>Provide Exhaust fans for ventilation</p> <p>Do not wear loose clothes, neck ties, etc</p> <p>Fulfill conditions of the permit</p>

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>Check for presence of hydrocarbons, O<sub>2</sub> level Obtain work permit before entering a confined space Ensure that the connected piping of the equipment which is to be opened is pressure free, fluid has been drained, vents are open and piping is positively isolated by a blind flange</p>
	Presence of foul smell and toxic substances	Inhalation can pose threat to life	<p>Same as above plus Check for hydrocarbon and Aromatic compounds before entering a confined space Depute one person outside the confined space for continuous monitoring and for extending help in case of an emergency</p>
	Ignition/ flame can cause fire	Person may sustain burn injuries or explosion may occur	<p>Keep fire extinguishers at a hand distance Remove surplus material and scrap immediately Do not smoke inside a confined space Do not allow gas cylinders inside a confined space Use low voltage (24V) lamps for lighting Use tools with air motors or electric tools with max. voltage of 24V Remove all equipments at the end of the day</p>
(L) HANDLING AND LIFTING EQUIPMENTS	Failure of load lifting and moving equipments	Can cause accident and prove fatal	<p>Avoid standing under the lifted load and within the operating radius of cranes Check periodically oil, brakes, gears, horns and tyre pressure of all moving machinery Check quality, size and condition of all chain pulley blocks, slings, U-clamps, D-shackles, wire ropes, etc. Allow crane to move only on hard, firm and leveled ground. Allow lifting slings as short as possible and check gunny packings at the friction points Do not allow crane to tilt its boom while moving Install Safe Load Indicator Ensure certification by applicable authority</p>

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
	Overloading of lifting equipments	Same as above	Safe lifting capacity of derricks and winches written on them shall be got verified The max. safe working load shall be marked on all lifting equipments Check the weight of columns and other heavy items painted on them and accordingly decide about the crane capacity, boom and angle of erection Allow only trained operators and riggers during crane operation.
	Overhead electrical wires	Can cause electrocution and fire	Do not allow boom or other parts of crane to come within 3m reach of overhead HT cables Hook and load being lifted shall preferably remain in full visibility of crane operators.
(M) SCAFFOLDING, FORMWORK AND LADDERS	Person can fall down	Person May sustain severe injuries and prove fatal	Provide guard rails for working at height Face ladder while climbing and use both hands. Ladders shall extend about 1m above landing for easy access and tying up purpose Do not place ladders against movable objects and maintain base at 1/4 unit of the working length of the ladder. Suspended scaffolds shall not be less than 500 mm wide and tied properly with ropes No loose planks shall be allowed Use PPE, like helmets, safety shoes, etc
	Failure of scaffolding material	Same as above	Inspect visually all scaffolding materials for stability and anchoring with permanent structures. Design scaffolding for max. load carrying capacity. Scaffolding planks shall not be less than 50X250 mm full thickness lumber or equivalent. These shall be cleated or secured and must extend over the end supports by at least 150mm and not more than 300mm Don't overload the scaffolds Do not splice short ladders to make a longer one. Vertical ladders shall not exceed 6m.
	Material can fall down	Persons working at lower level gets injured	Remove excess material and scrap immediately Carry the tools in a tool-kit bag only Provide safety nets

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**CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES (...Contd.)**

<b>ACTIVITY</b>	<b>TYPE OF HAZARD</b>	<b>EFFECT OF HAZARD</b>	<b>PREVENTIVE MEASURES</b>
(N) STRUCTURAL WORKS	Personal negligence and danger of fall	Can cause injury or casualty	Do not take rest inside rooms built for welding machines or electrical distribution system. Avoid walking on beams at height Wear helmet with chin strap and full body harness while working at height. Use hand gloves and goggles during grinding operations Cover or mark the sharp and projected edges Do not stand within the operating radius of cranes
	Lifting/ slipping of material	Same as above	Do not stand under the lifted load Stack properly all the materials. Avoid slippage during handling Control longer pieces lifted up by cranes from both ends Remove loose materials from height Ensure tightening of all nuts & bolts
(O) PIPELINE WORKS	Erection/ lowering failure	Can cause injury	Do not stand under the lifted load Do not allow any person to come within the radii of the side boom handling pipes Check the load carrying capacity of the lifting tools & tackles Use safe Load Indicators Use appropriate PPEs
	Other	Same as above	Wear gum boots in marshy areas Allow only one person to perform signaling operations while lowering of pipes Provide night caps on pipes Provide end covers on pipes for stoppage of pigs while testing/ cleaning operations
(P) GRIT BLASTING	Pollution in neighboring area, hit by grits and high pressure air	Can cause personal injury	Ensure the blasting is done in enclosed shed. Keep safe distance while blasting operations. Wear positive pressure blast hood or helmet with view –window, ear-muff/plug, gloves, overall or leather coat /apron, rubber shoes.

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**APPENDIX-F**

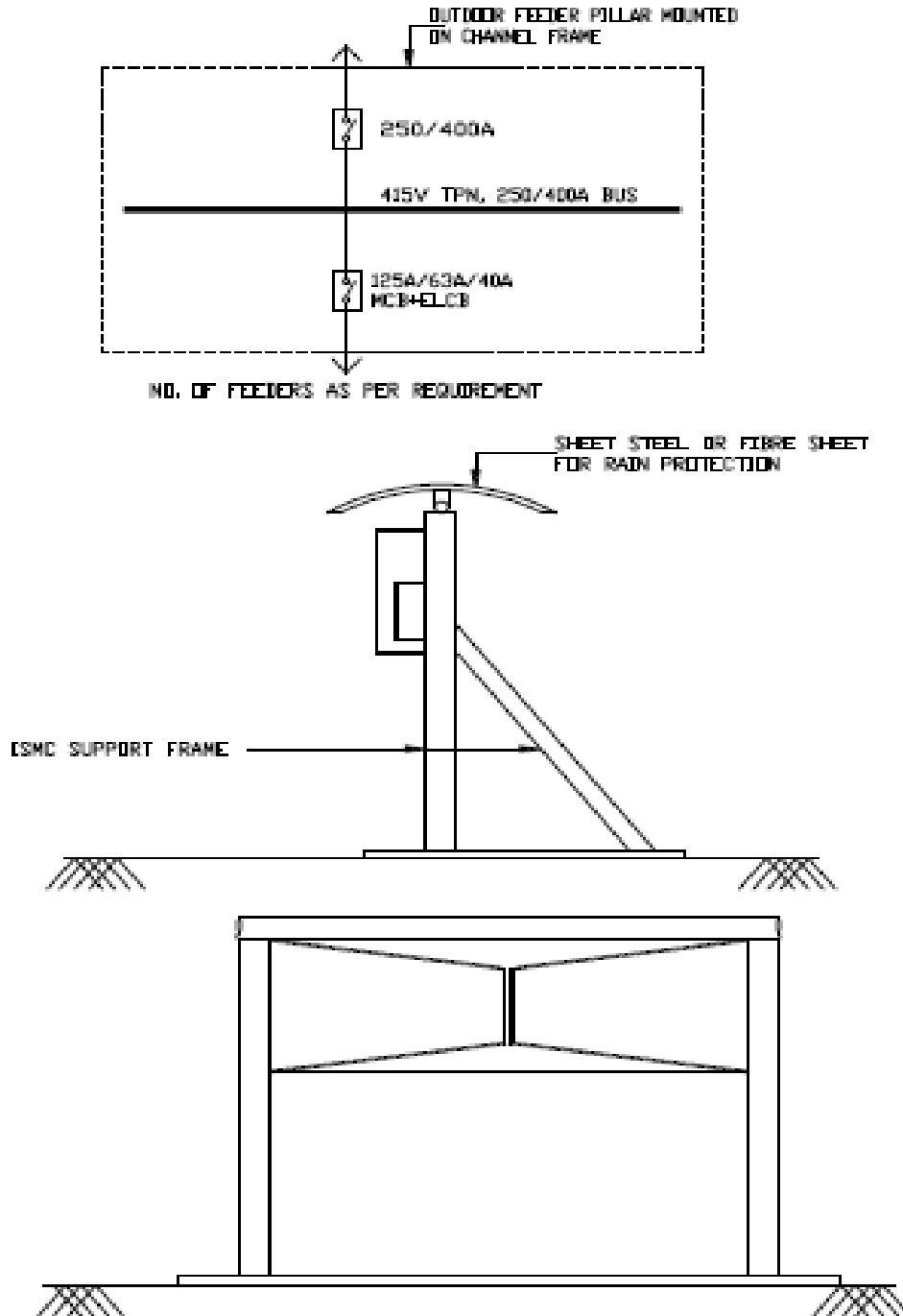
**TRAINING SUBJECTS / TOPICS**  
(For contractors' personnel)

1. The Law & Safety – Statutory Requirement / Applicable statutes / Duties of employer / employee
2. Policy & Administration – Why HSE? / Duties & Responsibilities of Safety Personnel at project site / Effect of incentive on accident prevention
3. HSE & Supervision – Duties of Supervisor / HSE integrated supervision / Who should be held responsible for site accidents?
4. Safety Budget / Cost of Accidents – Direct costs / Indirect costs
5. Hazard Identification / Type of hazards / HIRAC
6. Behavioural Safety & Motivation
7. Housekeeping – Storage / Stacking / Handling of materials / Hydra handling
8. Occupational Health in Construction sector
9. Personal Protective Equipments – Respiratory & Non- respiratory
10. Electricity & Safety – ELCB / Fuse / Powered tools / Project illumination
11. Handling of Compressed Gas – Transportation / Storage / FBAs / Fire prevention
12. Machine Safety – Machine guarding / Maintenance
13. Transportation – Hazards & risks in transp. of materials / ODC consignments
14. Cranes & Other Lifting machinery – Legal requirements vis-à-vis essential safety requirements.
15. Communication – HSE Induction / TBTs / Safety Committee / Safety meeting / Safety propaganda / Publicity.
16. Excavation – Risks & Dangers / Safety measures
17. Working at Heights – Use of ladder / Work on roofs / Scaffolds / Double harness lanyards / Life-line / Fall arrester / Safety Nets / Floor openings
18. Hazards in Welding & important safety precautions
19. Gas Cutting – Hazards & safety measures
20. Fire prevention & fire protection

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**APPENDIX - G**

**CONSTRUCTION POWER BOARD( typ)**



**NOTES:-**

1. CONTRACTOR TO INSTALL TEMPORARY CONST. POWER BOARD AS SHOWN IN THE DRG. ITS LOCATION SHALL BE EASILY ACCESSABLE.
2. POWER DISTRIBUTION BOARD SHALL BE EARTHED AT TWO POINTS BY MINIMUM 40X5MM GI STRIP FROM THE AVILABLE GRID OR DIRECTLY CONNECTED TO TWO DIRECTLY DRIVEN EARTH ELECTRODES.
3. DISTRIBUTION BOARD SHALL BE FABRICATED BY USING 14MM CRCA SHEET STEEL WITH HINGED DOORS AND ALL COMPONENT MOUNTED IN IT.
4. ALL INCOMING AND OUTGOING CABLES SHALL HAVE BOTTOM ENTRY.

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**APPENDIX-H**

**LIST OF PROCEDURES (MINIMUM) TO BE FORMING PART OF HSE PLAN:-**

- A. HSE Management Procedures:
- X
  - X HSE Risk Management (including JSA/HIRA)
  - X HSE Legal Compliance and Other Requirements
  - X HSE Objectives & Performance
  - X HSE Training and Competence (including Induction)
  - X HSE Motivation & Award Scheme
  - X HSE Audits
  - X HSE Meetings
  - X HSE Sub Contractor Management
  - X HSE Emergency Management
  - X HSE Incidents Reporting and Management
  - X HSE Reports
  - X HSE Management System Review
  - X HSE Change Management
  - X HSE procedure for Behaviour based Safety
  - X First Aid & Management
  - Roles, Responsibility, accountabilities and Authorities
- B. Job procedures/Safe Operating procedures
- X
  - X Setting Up Site & Signage's
  - X Handling of Electrical Appliances
  - X Working at Height
  - X Confined Space Entry
  - X Permit to Work (including hot works)
  - X Housekeeping
  - X Lifting Operations
  - X Transportation of materials including Manual Handling
  - X Compressed Air Tools and Units
  - X Earthmoving Operations & excavation
  - X Scaffolding
  - X Fire Prevention/Protection
  - X Hazardous Substance handling & Storage
  - X Radiation Hazard
  - Personal Protective Equipment



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**SAFETY WALK-THROUGH REPORT**

(Name & signature of walk through performer to be inserted at the bottom of each page)

Project : \_\_\_\_\_ Report no. : \_\_\_\_\_  
 Date : \_\_\_\_\_ Contractor : \_\_\_\_\_  
 Inspection by : \_\_\_\_\_ Owner : \_\_\_\_\_  
 Frequency : Monthly Job no. : \_\_\_\_\_

Note : Write 'NA' wherever the item is not applicable

SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory/ No	Remarks	Action
1.	HOUSEKEEPING				
a)	Waste containers provided and used				
b)	Sanitary facilities adequate and Clean				
c)	Passageways and Walkways Clear				
d)	General neatness of working areas				
e)	Other				
2.	PERSONNEL PROTECTIVE EQUIPMENT				
a)	Goggles; Shields				
b)	Face protection				
	Hearing protection				
	Foot protection				
e)	Hand protection				
f)	Respiratory Masks etc.				
g)	Full body harness conforming to C <sup>2</sup> , EN 361				
h)	Hard hat (HDPE)				
i)	Other				
3.	EXCAVATIONS/OPENINGS				
a)	Openings properly covered or barricaded				
b)	Excavations shored				
c)	Excavations barricaded				
d)	Overnight lighting provided				
e)	Other				

Safety walk-through performer (Name & Signature).....

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SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory/ No	Remarks	Action
4.	WELDING & GAS CUTTING				
a)	Gas cylinders chained upright				
b)	Cables and hoses not obstructing				
c)	Screens or shields used				
d)	Flammable materials protected				
e)	Live electrode bits contained properly				
f)	Fire extinguisher (s) accessible				
g)	Other				
5.	SCAFFOLDING & BARRICADING				
a)	Fully decked platforms				
b)	Guard and intermediate rails in place				
c)	Toe boards in place				
d)	Adequate shoring				
e)	Adequate access				
f)	Positive barricading for critical activities				
g)	Installation of warning signs				
h)	Other				
6.	LADDERS				
a)	Extension side rails 1 m above				
b)	Top of landing				
c)	Properly secured				
d)	Angle + 70 <sup>0</sup> from horizontal				
e)	Other				

Safety walk-through performer (Name & Signature).....

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SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory /No	Remarks	Action
7.	HOISTS, CRANES AND DERRICKS				
a)	Condition of cables and sheaves OK				
b)	Condition of slings, chains, hooks and eyes O.K.				
c)	Inspection and maintenance log-books maintained				
d)	Outriggers used				
e)	Reverse horn installed / active / coupled with gear				
f)	Signs/barricades provided				
g)	Signals observed and understood				
h)	Qualified operators				
i)	Other				
8.	MACHINERY, TOOLS AND EQUIPMENT				
a)	Proper instruction				
b)	Safety devices				
c)	Proper cords				
d)	Inspection and maintenance				
e)	Other				
9.	VEHICLE AND TRAFFIC				
a)	Rules and regulations observed				
b)	Inspection and maintenance				
c)	Licensed drivers				
d)	Other				

Safety walk-through performer (Name & Signature).....

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SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory /No	Remarks	Action
10.	TEMPORARY FACILITIES				
a)	Emergency instructions posted				
b)	Fire extinguishers provided				
c)	Fire-aid equipment available				
d)	Secured against storm damage				
e)	General neatness				
f)	In accordance with electrical requirements				
g)	Other				
11.	FIRE PREVENTION				
a)	Personnel trained & instructed to make use of facility				
b)	Fire extinguishers checked periodically & record maintained				
c)	No smoking in Prohibited areas.				
d)	Fire Hydrants not obstructed <del>Clear</del>				
e)	<del>Other</del> Regular fire drill conducted				
12.	ELECTRICAL				
a)	Use of 3-core armored cables everywhere				
b)	Usage of 'All insulated' or 'double-insulated' electrical tools				
c)	All electrical connection are routed through ELCB				
d)	Natural Earthing at the source of power (Main DB)				
e)	Continuity and tightness of earth conductor				
f)	Effective covering of junction boxes, panels and other energized wiring places				
g)	Ground fault circuit interrupters provided				
h)	Prevention of tripping hazards maintained				
f)	DCP extinguishers arranged & licensed electrician engaged at site				

Safety walk-through performer (Name & Signature).....

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-1 REV 0**

(Sheet 5 of 6)

SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory /No	Remarks	Action
14.	HANDLING AND STORAGE OF MATERIALS				
a)	Safely stored or stacked				
b)	Passageways clear / free from obstructions				
c)	Fire fighting facility in place				
15.	FLAMMABLE GASES AND LIQUIDS				
a)	Containers clearly identified / protected from fire				
b)	Safe storage & transportation arrangement made				
c)	Fire extinguishers positioned nearby				
d)	Facilities kept away from electric spark, hot spatters & ignition source.				
16.	WORKING AT HEIGHT				
a)	Approved Erection plan and work permit in place				
b)	Safe access, Safe work platform & Safety nets provided				
c)	Life lines, Fall arrester, Full body harness and with double lanyards used;				
d)	Health Check record available for workers going up?				
e)	Protective handrails arranged around floor openings				
17.	CONFINED SPACE				
a)	Work Permit obtained from requisite authority				
b)	Test for toxic gas and sufficient availability of oxygen conducted & status				
c)	Supervisor present at site & at least one person outside the confined space for monitoring deputed				
d)	Availability of safe means of entry, exit and ventilation (register for entry & exit maintained)				
e)	Fire extinguisher and first-aid facility ensured				
f)	Lighting provision made by using 24V Lamp				
g)	Proper usage of PPEs ensured				
18.	RADIOGRAPHY				
a)	Proper storage and handling of source as per BARC/ AERB guidelines (authorized radiographer available)				
b)	Work permit obtained				

Safety walk-through performer (Name & Signature).....

**STANDARD SPECIFICATION FOR  
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ENVIRONMENT MANAGEMENT  
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**FORMAT NO. : HSE-1 REV 0**

**(Sheet 6 of 6)**

SL. NO.	ITEM	Satisfactory / Yes	Non satisfactory /No	Remarks	Action
c)	Cordoning of the area done				
d)	Use of appropriate PPE's ensured				
e)	HSE training to workers/supervisors imparted during the fortnight (indicate topic)				
f)	Minimum occupancy of workplace ensured				
19.	<b>HEALTH CHECKS</b>				
a)	All Workers medically examined and found be fit for working at heights (slinging, rigging, painting etc.) in confined space in excavation / trenching in shot blasting				
b)	Availability of First Aid box with contents				
c)	Proper sanitation at site, office and labour camps				
d)	Arrangement of medical facilities.				
e)	Measures for dealing with illness at site & labour camps.				
f)	Availability of Potable drinking water for workmen & staff.				
g)	Provision of crèches for children.				
h)	Stand by vehicle / ambulance available for evacuation of injured				
20.	<b>ENVIRONMENT</b>				
a)	Chemical and Other Effluents properly disposed				
b)	Cleaning liquid of pipes disposed off properly				
c)	Seawater used for hydro-testing disposed off as per agreed procedure				
d)	Lubricant Waste/Engine oils properly disposed				
e)	Waste from Canteen, offices, sanitation etc disposed properly				
f)	Disposal of surplus earth, stripping materials, Oily rags and combustible materials done properly				
g)	Green belt protection				

Safety walk-through performer (Name & Signature).....

**STANDARD SPECIFICATION FOR  
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AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-2 REV 0**

(Sheet 1 of 3)

**ACCIDENT / INCIDENT REPORT**

(To be submitted by Contractor after every Incident / Accident within 24 hours to PDIL/ Owner)

**Report No.:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Project site:** \_\_\_\_\_ **Name of work:** \_\_\_\_\_

**Contractor's name:** \_\_\_\_\_ **Contractor's Job Engineer (name)** \_\_\_\_\_

<b>Non-disabling injury (Non-LTA)</b>	Hospitalized but resumed duty before end of 48 hrs	
<b>Disabling injury (other LTA)</b>	Hospitalized & failed to resume duty within next 48 hrs	
<b>Fatal (LTA):</b>	Death / Expiry	
<b>First Aid case (non LTA)</b>	Resume duty after first aid	

Name of the injured: \_\_\_\_\_ Father's name of victim: \_\_\_\_\_

Sub Contractor's Name: .....

Gate Pass No.:..... Age: \_\_\_\_ Yrs. Victim's medical fitness exam. (Pre-empl.) date: - \_\_\_\_\_

**Date & time of Accident / Incident:** \_\_\_\_\_

Names of Witnesses: (1) \_\_\_\_\_ (2) \_\_\_\_\_ (3) \_\_\_\_\_

**Profession of victim:**

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c.operator	
Engineer		Manager		Other/specify	

**Qualification**

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

**Job Experience**

NIL		Less than 2 yrs		2-5 yrs	
5-10 yrs		11-15 yrs		15 years and above	

**Location where the incident happened:** \_\_\_\_\_

\_\_\_\_\_

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
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AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-2 REV 0**

**(Sheet 2 of 3)**

**Activity / Works that was continuing during incident / accident: -**

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

**What exactly the victim was doing just before the incident / accident? .....**

.....  
.....

**Nature of injury:**

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

**Parts of body involved in incident / accident**

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Trunk (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

**Accident type:**

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./ extremes)		Contact with chemicals or oils		Vehicle accident	
Other/specify					



**STANDARD SPECIFICATION FOR  
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**FORMAT NO. : HSE-2 REV 0**

**(Sheet 3 of 3)**

**Medical Aid provided:** - (indicate specific aids / treatment etc.)-

.....  
.....  
-----

**Actions taken to prevent recurrence of similar incident / accident:** .....

.....  
.....  
.....  
.....  
.....  
.....  
.....

**Intimation to local authorities** (Dist Collector / Local Police Station / ESI authority): Yes / No / NA.

If yes, to whom .....

Safety Officer  
(Signature and Name)

Site Head / Resident Construction Manager  
(Signature and Name)  
Stamp of Contractor

To : Owner  
: RCM/Site-in-charge PDIL (3 copies)  
    ├─> Divisional Head (Constn) through RCM  
    └─> Project Manager, PDIL, through RCM

**STANDARD SPECIFICATION FOR  
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AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-3 REV 0**

(Sheet 1 of 5)

**SUPPLEMENTARY INCIDENT / ACCIDENT INVESTIGATION REPORT  
TICK THE APPROPRIATE ONE AS APPLICABLE (furnish within 72 hours)**

Supplementary to Incident / Accident Report No: \_\_\_\_\_ (Copy enclosed)

**Report No.:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Project site:** \_\_\_\_\_ **Name of work:** \_\_\_\_\_

Contractor's name: \_\_\_\_\_ Contractor's Job Engineer (name) \_\_\_\_\_

<b>Non-disabling injury (Non-LTA)</b>	Hospitalized but resumed duty before end of 48 hrs	
<b>Disabling injury (other LTA)</b>	Hospitalized & failed to resume duty within next 48 hrs	
<b>Fatal (LTA):</b>	Death / Expiry	
<b>First Aid case (non LTA)</b>	Resume duty after first aid	

Name of the injured: \_\_\_\_\_ Father's name of victim: \_\_\_\_\_

Sub Contractor's Name: .....

Gate Pass No.: ..... Age: \_\_\_\_\_ Yrs. Victim's medical fitness exam. (Pre-empl.) date: - \_\_\_\_\_

**Date & time of Accident / Incident:** \_\_\_\_\_

Names of Witnesses: (1) \_\_\_\_\_ (2) \_\_\_\_\_ (3) \_\_\_\_\_

**Profession of victim:**

Bar bender		Carpenter		Meson	
Fitter		Helper		Gas cutter	
Grinder		Welder		Electrician	
Driver		Rigger		M/c.operator	
Engineer		Manager		Other/specify	

**Qualification**

No formal education		Non-Matriculate		Matriculate	
Graduate		Post- grad		Other/specify	

**Job Experience**

NIL		Less than 2 yrs		2-5 yrs	
5-10 yrs		11-15 yrs		15 years and above	

**Location where the incident happened:** \_\_\_\_\_

\_\_\_\_\_

**STANDARD SPECIFICATION FOR  
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**FORMAT NO. : HSE-3 REV 0**

**(Sheet 2 of 5)**

**Activity / Works that was continuing during incident / accident: -**

Excavation		Demolition		Concrete carrying	
Concrete pouring		Transportation of materials (manually)		Transportation of materials (mechanically)	
Work on or adjacent to water		Work at height (+2.0 mts)		Scaffold preparation	
Scaffold dismantling		Piling works		Welding	
Grinding		Gas-cutting		Pipe fit-ups & fabrication	
Structural fabrications		Machine works		Hydro-testing works	
Electrical works		Erection activities		Other/specify	

**What exactly the victim was doing just before the incident / accident? .....**

.....  
.....

**Particular of tools & tackles being used and condition of the same after incident/accident:**

.....  
.....

**Description of Incident/Accident (How the incident was caused):**

.....  
.....

**Nature of injury:**

Bruise or Contusion		Abrasion (superficial wound)		Sprains or strains	
Cut or Laceration		Puncture or Open wound		Burn	
Inhalation of toxic or Poisonous fumes or gases		Absorption		Amputation	
Fracture		Other/specify			

**Parts of body involved in incident / accident**

Head		Face		Eyes	
Throat		Arm (above wrist)		Hand (including wrist)	
Fingers		Trunk (Abdomen / Back / Chest / Shoulder)		Throat	
Leg (above ankle)		Foot (incl. ankle)		Toes	
Multiple				Other/specify	

**STANDARD SPECIFICATION FOR  
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AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-3 REV 0**

(Sheet 3 of 5)

**Accident type:**

Struck against		Struck by		Fall from Elevation	
Fall on same level		caught in		caught under	
caught in between		Rubbed or abraded		Contact with (Electricity)	
Contact with (Temp./ extremes)		Contact with chemicals or oils		Vehicle accident	
Other/specify					

Name & Designation of person who provided First-Aid to the victim: -----

Name & Telephone number of Hospital where the victim was treated\_\_\_\_\_

Mode of transport used for transporting victim – Ambulance / Private car / Tempo / Truck / Others

How much time taken to shift the injured person to Hospital\_\_\_\_\_

In case of FATAL incident, indicate clearly the BOCW Registration No. of the victim /Company.....

Comments of Medical Practitioner, who treated / attended the victim/injured (attached / described here)\_\_\_\_\_

What actions are taken for investigation of the incident, please indicate clearly – (Video film / Photography / Measurements taken etc.....)

**Immediate cause** (Please tick the right applicable) –

Hazardous methods or procedures inadequately guarded		Poor housekeeping		Inadequate or improper PPE	
Environmental hazards (excess noise/ space constraint/ inadequate ventilation)		improper illumination/Moving on oval surface		Working on dangerous equipment	

**STANDARD SPECIFICATION FOR  
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**FORMAT NO. : HSE-3 REV 0**

**(Sheet 4 of 5)**

Failure to secure		Horse-play		Failure to use PPE	
Inattention to surroundings		Improper use of hands & body-parts		By-passing safety devices	
Unsafe mixing or placement of tools & tackles		Bypassing standard procedures		Failure in communication	
Operating without authority		Improper use of equipment or tools & tackles		drug or alcoholic influence	
excessive haste		Others(specify)			

**Basic cause**

Over confidence		Impulsiveness		over-exertion	
Faulty judgement or poor understanding		Failing to keep attention constantly		Nervousness & Fear	
Fatigue		Defective vision		Ill health or sickness	
Slow reaction		Others(specify)			

**Root cause**

Inadequate Engg		Improper Design		Inadequate Planning & organization	
Inadequate knowledge		Inadequate skill		Inadequate training	
Inadequate supervision		Improper work procedure		Inadequate compliance with standard	
Substandard performance		Inadequate maintenance		Improper inspection	
Others(specify)					

Loss of man days and impact on site works, (if any) –

---

**Remarks from Contractor's Safety Officer / Engineer –**

Was the victim performing relevant tasks for which he was engaged /employed? Yes / No  
 Was the Supervisor present on work-site during the incident? Yes / No  
 Have the causes of incident rightly identified? Yes / No  
 Cause of Accident was \_\_\_\_\_

**STANDARD SPECIFICATION FOR  
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**FORMAT NO. : HSE-3 REV 0**

**(Sheet 5 of 5)**

Remedial measures recommended by **Safety Officer of Contractor** for avoiding similar incident in future

: .....

.....

.....

.....

.....

.....

.....

**Intimation to local authorities** (Dist Collector / Local Police Station / ESI authority): Yes / No / NA.  
If yes, to whom .....

---

Safety Officer  
(Signature and Name)

Site Head / Resident Construction Manager  
(Signature and Name)  
Stamp of Contractor

- To : Owner
- : RCM// Site-in-charge of PDIL (3 copies)
  - Divisional Head (Constn) through RCM
  - Project Manager PDIL, through RCM

**STANDARD SPECIFICATION FOR  
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**FORMAT NO. : HSE-4 REV 0**

**NEAR MISS INCIDENT/ DANGEROUS OCCURRENCE SUGGESTED PROFORMA**

(to be submitted within 24 hours)

X

**Near Miss :** Human injury escaped & no damage to property, equipment

X or interruption to work.

**Dangerous Occurrence:** Damage to property, equipment or interruption of work, but not resulting in personal injury/illness, e.g. Fire incident, collapse of structure, crane failure, etc

Report No.: \_\_\_\_\_

Name of Site: \_\_\_\_\_

Date: \_\_\_\_\_

Name of work: \_\_\_\_\_

Contractor: \_\_\_\_\_

Incident reported by :

Date & Time of Incident :

Location :

Brief description of incident

Probable cause of incident

Suggested corrective action

Steps taken to avoid recurrence

Yes

No

To : Owner  
: RCM/Site-in-charge PDIL (3 copies)

└─> Divisional Head (Constn) through RCM  
└─> Project Manager PDIL, through RCM

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-5 REV 0**  
**MONTHLY HEALTH, SAFETY & ENVIRONMENT (HSE) REPORT**

(To be submitted by each Contractor)

Actual work start Date: \_\_\_\_\_ For the Month of: \_\_\_\_\_

Project: \_\_\_\_\_ Report No: \_\_\_\_\_

Name of the Contractor: \_\_\_\_\_ Status as on : \_\_\_\_\_

Name of Work : \_\_\_\_\_ Job No : \_\_\_\_\_

(Contractor in consultation with PDIL shall generate the reports through web based package(www.PDIL.co.in/conthse) only.

ITEM	UPTO PREVIOUS MONTH	THIS MONTH	CUMULATIVE
1) Average number of Staff & Workmen (average daily headcount, not man days)			
2) Man-hours worked			
3) Number of Induction programmes conducted			
4) Number of HSE meetings organized at site			
5) Number of HSE awareness programmes conducted at site			
6) Number of Tool Box Talks conducted			
7) Number of Lost Time Accidents (LTA)	Fatal		
	Other LTA		
8) Number of Loss Time Injuries (LTI)	Fatalities		
	Other LTI		
9) Number of Non-Loss Time Accidents			
10) Number of First Aid Cases			
11) Number of Near Miss Incidents			
12) No. of unsafe acts/ practices detected			
13) No. of disciplinary actions taken against staff/ workmen			
14) Man-days lost due to accidents			
15) LTA Free man-hours i.e. LTA free man-hours counted from the Last LTA (enter date: .....)			
16) Frequency Rate (No. of LTA per 2 lacs man-hours worked)			
17) Severity Rate (No. of man days lost per 2 lacs man-hours worked)			
18) Loss Time Injury Frequency (No. of LTI per 2 lacs man-hours worked)			
19) No. of activities for which Job Safety Analysis (JSA) completed			
20) No. of incentives/ awards given			
21) No. of occasions on which penalty imposed by PDIL/ Owner			
22) No. of Audits conducted			
23) No. of pending NCs in above Audits			
24) Compensation cases raised with Insurance			
25) Compensation cases resolved and paid to workmen			
26) Whether workmen compensation policy taken		Yes	No
27) Whether workmen compensation policy is valid		Yes	No
28) Whether workmen registered under ESI Act, as applicable		Yes	No
<b>Remarks, if any</b>			

Date:

Prepared by Safety Officer  
(Signature and Name)

Approved by Site Head / Resident Construction Manager  
(Signature and Name)

To : - OWNER

- RCM PDIL (2 copies)



**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-6 REV 0  
PERMIT FOR WORKING AT HEIGHTS (ABOVE 2.0 METER)**

(In duplicate to be issued daily for site and for office)

Permit No..... Name of Main Contractor.....  
 Name of work executing agency / sub agency / vendor:.....  
 Date..... Exact Location of work.....  
 Nature of work .....Duration of work (from) ..... (to) .....  
 Number of workers covered within this permit.....  
 (List enclosed with name & gate pass numbers.)

Sl. No.	Items / Subjects	Status of compliance (Yes / No)	
1	Work areas / Equipments inspected		
2	Work area cordoned off		
3	Adequate lighting is provided		
4	Precautions against public traffic taken		
5	Concerned persons in & around have been alerted & cautioned		
6	Hazards / risks involved in routine / non-routine task assessed and control measures have been implemented at specific task		
7	ELCB provided for electrical connection & found working		
8	Ladder safely attached / fixed		
9	Scaffoldings are checked and TAGs are found used correctly		
10	Working platforms are provided and are found sound /safe for use		
11	Safe access & egress arrangements (e.g. ladders, fall arresters, life-lines etc.) are satisfactorily incorporated		
12	a. Openings on platform / floors are effectively cordoned / covered		
	b. Safety Nets are provided wherever required		
13	Use of following safety gadgets by people working at area under this permit, is checked and found satisfactory -		
	Safety helmet		
	Safety harness (full body) with double lanyard		
	Safety Shoes		
	Safety gloves		
14	Housekeeping of work area found satisfactorily tidy / clean & clear		
15	Adequate measures have been taken for works being continued at the ground level, when simultaneous works are permitted overhead at that very location.		
16	Materials are not thrown from heights on to ground		
17	Medical examination of workers are made & found satisfactory		
18	Responsible job engineer / supervisor found physically present at work spot for overall administration of work as well as safety of people.		

Above items have been checked & compliance has been found in place. Hence work is permitted to start / continue at the above-mentioned location. Work shall not start till identified lapses are rectified.

Additional Precautions, if any .....

Work Permit issued by  
Contractor Engineer/RCM

Verification By  
Contractor Safety Officer

**AT THE END OF THE DAY/WORK:**

All works at height are completed & workmen have returned safely from work location at (time)..... (date).....

(Sig. Contractor Engineer)

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-7 REV 0**

**CONFINED SPACE ENTRY PERMIT**

Project site \_\_\_\_\_ Sr.No. \_\_\_\_\_  
 Name of the work \_\_\_\_\_ Date \_\_\_\_\_  
 Name of Contractor \_\_\_\_\_ Nature of work \_\_\_\_\_  
 Exact location of work \_\_\_\_\_

**Safety Requirements: POSITIVE ISOLATION OF THE VESSEL IS MANDATORY**

**(A) Has the equipment been ?**

Y	NR		Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	Isolated from	<input type="checkbox"/>	<input type="checkbox"/>	water flushed &/or steamed	<input type="checkbox"/>	<input type="checkbox"/>	radiation sources removed
<input type="checkbox"/>	<input type="checkbox"/>	power/steam/air isolated from liquid or gases	<input type="checkbox"/>	<input type="checkbox"/>	Man ways open & ventilated	<input type="checkbox"/>	<input type="checkbox"/>	proper lighting provided
<input type="checkbox"/>	<input type="checkbox"/>	depressurized &/or drained	<input type="checkbox"/>	<input type="checkbox"/>	cont. inert gas flow arranged	<input type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input type="checkbox"/>	blanked/ blinded/ disconnected	<input type="checkbox"/>	<input type="checkbox"/>	adequately cooled	<input type="checkbox"/>	<input type="checkbox"/>	

**(B) Expected Residual Hazards:**

<input type="checkbox"/>	<input type="checkbox"/>	lack of O <sub>2</sub>	<input type="checkbox"/>	<input type="checkbox"/>	combustible gas/ liquid	<input type="checkbox"/>	<input type="checkbox"/>	H <sub>2</sub> S / toxic gases
<input type="checkbox"/>	<input type="checkbox"/>	corrosive chemicals	<input type="checkbox"/>	<input type="checkbox"/>	pyrophoric iron / scales	<input type="checkbox"/>	<input type="checkbox"/>	electricity / static
<input type="checkbox"/>	<input type="checkbox"/>	heat/ steam / frost	<input type="checkbox"/>	<input type="checkbox"/>	high humidity	<input type="checkbox"/>	<input type="checkbox"/>	ionizing radiation
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	

**(C) Protection Measures:**

<input type="checkbox"/>	<input type="checkbox"/>	gloves	<input type="checkbox"/>	<input type="checkbox"/>	ear plug / muff	<input type="checkbox"/>	<input type="checkbox"/>	goggles / face shield
<input type="checkbox"/>	<input type="checkbox"/>	protective clothing	<input type="checkbox"/>	<input type="checkbox"/>	dust / gas / air line mask	<input type="checkbox"/>	<input type="checkbox"/>	personal gas alarm
<input type="checkbox"/>	<input type="checkbox"/>	grounded air duct/blower /AC	<input type="checkbox"/>	<input type="checkbox"/>	attendant with SCBA/air mask	<input type="checkbox"/>	<input type="checkbox"/>	rescue equipment/team
<input type="checkbox"/>	<input type="checkbox"/>	Fire fighting arrangements	<input type="checkbox"/>	<input type="checkbox"/>	safety harness & lifeline	<input type="checkbox"/>	<input type="checkbox"/>	communication equipment
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	

**Authorization / Renewal (It is safe to enter the confined space)**

	No. of persons allowed	Name of persons allowed	Signature		Time		Signature
			Contractor's Supervisor	Contractor's Safety Officer	From	To	Workman

**Permit Closure :**

- (A) Entry       was closed       stopped       will continue on ...
- (B)       Site left in a safe condition       Housekeeping done
- (C) Multilock       removed       key transferred  
 Ensured all men have come out       Man-ways barricaded

Remarks, if any:

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-8 REV 0**

**RADIATION WORK PERMIT**

Project : Sr.No. :  
Name of the work : Date :  
Name of site contractor : Job No.:

Location of work :

Source strength :

Cordoned distance (m) :

Name of Radiography agency : Approved by Owner/PDIL

No. of workers engaged :  
(List enclosed with name & gate pass numbers.)

The following items have been checked & compliance shall be ensured during currency of the permit:

S. No.	Item description	Done
	Safety regulations as per BARC/AERB ensured while source in use/in transit & during storage	<input type="checkbox"/>
	Area cordoned off / safe working platform provided	<input type="checkbox"/>
	Lighting arrangements for working during nights ensured	<input type="checkbox"/>
	Warning signs/ flash lights installed	<input type="checkbox"/>
	Cold work permit taken (if applicable)	<input type="checkbox"/>
	PPEs like film badges, dosimeters used	<input type="checkbox"/>

Additional precautions, if any \_\_\_\_\_

(Radiography Agency's BARC/AERB authorized Supervisor)

Permission is granted.

Permit is valid from \_\_\_\_\_ AM/PM \_\_\_\_\_ Date to \_\_\_\_\_ AM/PM \_\_\_\_\_  
Date

(Signature of permit issuing authority of site contractor)

Name : Designation: Date:

Permit renewal:

Permit extended up to		Additional precautions required, if any	Sign of issuing authority with date (of site contractor)
Date	Time		

Work completed/ stopped/ area cleared at \_\_\_\_\_ Hrs of Date \_\_\_\_\_

(Sign. of permit issuing authority)

Name & Signature of site contractor:

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-9 REV 0**  
**DEMOLISHING/DISMANTLING WORK PERMIT**

Project : Sr.No. :  
Name of the work : Date :  
Name of contractor : Job No. :

Name of sub-contractor : No. of workers to be engaged:  
*(List enclosed with name & gate pass numbers.)*

Line No./ Equipment No./ Structure to be dismantled :

Location details of dismantling/ demolition with sketch : (clearly indicate the area)

The following items have been checked & compliance shall be ensured during currency of the permit:

S. No.	Item description	Done	Not Applicable
	Services like power, gas supply, water, etc. disconnected	<input type="checkbox"/>	<input type="checkbox"/>
	Dismantling/ Demolishing method reviewed & approved	<input type="checkbox"/>	<input type="checkbox"/>
	Usage of appropriate PPEs ensured	<input type="checkbox"/>	<input type="checkbox"/>
	Precautions taken for neighbouring structures	<input type="checkbox"/>	<input type="checkbox"/>
	First-Aid arrangements made	<input type="checkbox"/>	<input type="checkbox"/>
	Fire fighting arrangements ensured	<input type="checkbox"/>	<input type="checkbox"/>
	Precautions taken for blasting	<input type="checkbox"/>	<input type="checkbox"/>

(Contractor's Supervisor)

(Contractor's Safety Officer)

Permission is granted.

(Permit issuing authority)

Name :  
Date :

Completion report :

Dismantling/ Demolishing is completed on \_\_\_\_\_ Date at \_\_\_\_\_ Hrs.

Materials/ debris transported to identified location  Tagging completed (as applicable)

Services like power, gas supply, water, etc. restored

(Permit issuing authority)

CONTRACTOR'S NAME

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-10 REV 0**

**DAILY SAFETY CHECKLIST**

(To make use of before start of day's work)

Project : Sr.No. :  
Name of the work : Date :  
Name of contractor : Job No. :

**Description of Job decided to perform : -**

×

**Use of PPE / Safety Gadgets**

Sl. No	PPEs	Compliance (Yes / No)	Sl. No	PPEs	Compliance (Yes / No)
1	Safety Helmets		6	Face Shield	
2	Safety Shoes		7	Full body harness	
3	Hand Gloves		8	Fall Arrest System	
4	Dust Musk		9	Safety net	
5	Safety Goggles		10	Horizontal life-line made of steel wire, (dia not less than 8.0 mm.)	

(Serial No. 1 & 2 are compulsory for everyone. Specify & ensure use of other safety gadgets as required for the job)

x

**Identify following important unsafe conditions: -**

SL No	Conditions	Yes / No
1	Access to work site / emergency escape clear	
2	Soil / Loose earth kept away from excavated pit / slope / ladder provided	
3	Electrical wire / welding lead lying entangled on ground / welding m/c. booth accessible	
4	Elevated work platform / open ends are protected	
5	Ground area cordoned off before lifting works or erection at height / ground area checked & cordoned-off before start of height works	
6	Structural members / erected pipes / wooden boards/pieces etc. are safely anchored at heights and are not likely to fall down on people when working beneath	
7	Rope ladders tied-up on tall steel structures, long before are removed to get rid of their use	
8x	Any Other	

Indicate actions taken, if status of any of the above items is found "No"

x

**Specific Safety guidelines / precautions, if any** (communicated thro' TBT)

x

**Above conditions and PPE compliances are checked by undersigned and correct status are indicated after verification**

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-11 REV 0**

(Sheet 1 of 2)

**HOUSEKEEPING ASSESSMENT & COMPLIANCE**

Project : Sr.No. :  
Name of the work : Date :  
Name of contractor : Job No. :  
Name of contractor : Fortnightly

Sl No.	Subjects of Review	Satisfactory/ Yes	Non satisfactory/No	Remarks	Action
1.	Cleanliness at the Main entry / access of site				
2.	Ground condition / floor areas free from water-logging / oil spillage				
3.	Ground & elevated floors free from rubbish / wastes / accumulated debris / scraps.				
4.	Manholes / openings are covered / fenced				
5.	Trenches are barricaded / walkways are in place				
6.	Drains are cleaned / not choked / not occupied by dumped materials				
7.	Sufficient CAUTION boards / instructions displayed				
8.	Construction machinery are maintained & parked in orderly manner.				
9.	Movement of site people are not obstructed because of dumping / storing of construction materials				
10.	Access / egress to Electrical Distribution Boards / Panels clear from wires / cables / earth-strips etc.				
11.	Electrical panel rooms / sheds / MCC / Control rooms / Substations etc. are clean & tidy and not used for storing dress / clothes, tiffin-box or bicycles.				
12.	Passage behind Elec. panels are free for access				
13.	Fire extinguishers / fire-buckets are accessible without any difficulty.				
14.	Stair-steps, platforms & landings are clear & tidy				
15.	Sheds / rooms & work areas have got sufficient illumination as well as ventilation				
16.	Cables / Wires / welding leads are routed / hanged appropriately & are not creating unsafe condition.				
17.	Stacking / storing of insulation materials or their packing.				
18.	Removal or cleanliness of left-over sand, concrete, brick-bats, insulation-materials, excess earth, wastes etc.				
19.	Storing / stacking of sand, metal chips, re-bars, steel pipes, valves, fittings etc.				
20.	One escape route at ground & minimum two escape routes at elevation available.				

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
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AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-11 REV 0**

(Sheet 2 of 2)

Sl No.	Subjects of Review	Satisfactory/ Yes	Non satisfactory/No	Remarks	Action
21.	Captions / Posters / Slogans on various safety instructions are displayed legibly in local language				
22.	Cable trenches are water-free or regular arrangement for taking out accumulated water exists.				
23.	Windows of rooms / offices are regularly cleaned				
24.	Facilities for cycle sheds, drinking water, washing, rest-rooms etc. are maintained in tidy manner.				
25.	Toilet, Urinals, Canteen / kitchen / pantry etc. are maintained & free from obnoxious smell.				
26.	Construction tools / tackles are stored systematically - the items are tagged / tested / certified by competent third party.				
27.	Sufficient numbers of Dust-bins / Waste-bins found at site and are regularly emptied.				

Additional remarks, if any -

.....  
 .....  
 .....

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-12 REV 0**

**INSPECTION OF TEMPORARY ELECTRICAL BOOTH / INSTALLATION**

Project : Sr.No. :  
Name of the work : Date :  
Name of contractor : Job No. :  
Sub Station No:/Booth No Location:

SL NO	SUBJECTS	OBSERVATION (YES /NO)	ACTION TAKEN
1	Switchboards installed properly are in order and protected from rain & water-logging.		
2	Adequate illumination provided for switchboard operation during night hours & the lamps are protected from direct human contact.		
3	Voltage ratings, DANGER signs, Shock-Treatment-Chart displayed in the installation / booth		
4	Fire extinguisher (DCP or CO 2) & Sand Bucket kept in close vicinity of Switchboards		
5	Valid License & Competent Electrician / Wireman available & name/ license no. displayed at booth / installation.		
6	General housekeeping in & around booth / installation found in order.		
7	Cable-route-markers for U/G cables provided.		
8	Monthly inspection report of Electrical hand tools available in booth / installation.		
9	Insulated Mat provided in front of Elec. Panels.		
10	Rubber hand gloves available/ used by Electricians		
11	Availability of CAUTION boards for shutdown & / or repairing works.		
12	All incoming & outgoing feeders have proper MCCB / HRC fuses / Switches.		
13	Switchboards "earthed" at two distinctly isolated locations.		
14	Switchboards have adequate operating space at the front face & at the rear face too.		
15	All connections provided through 30mA ELCB.		
16	Testing records of all ELCBs available at site		
17	Only industrial type plugs & sockets are used.		
18	Temporary connections are 3-core double insulated & free from cuts & joints and 3 <sup>rd</sup> core is earthed at both ends		
19	Socket boards are properly mounted on stand & protected from water ingress.		
20	Electrical equipments operating above 250V have two earthing / double earthing.		
21	All incoming / outgoing cables are properly glanded & terminated with "lugs".		
22	Switch-boards are of industrial variety / type.		
23	Sketch for installation / connection (SLD) made & pasted & other safety labels/display boards		
24	Labeling of incoming / outgoing feeders made.		
25	All hand lamps are protected from direct contact.		
26	All electrical cable / joints are in safe condition		

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer



**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-13 REV 0**

(Sheet 1 of 2)

**INSPECTION FOR SCAFFOLDING**

Project : Sr.No. :  
Name of the work : Date :  
Name of contractor : Job No. :

Sl. No	Description	Yes	No	N.A	Actions taken
1	Whether work permit is obtained to take up work at height above 1.5 Mts?				
2	Whether atmospheric condition is "stormy" or "raining" and works at heights have been permitted?				
3	Whether steel pipes scaffoldings are used for units /off-site areas?				
4	Whether scaffolding has been erected on rigid/firm/leveled surfaces / ground? Whether "foot-seals" or "base-plates" are used beneath the up-rights (vertical steel pipes)				
5	Whether scaffold construction is as per IS specification with toe-board and hand-rails (top-rail as well as mid-rail)?				
6	Whether distance between two successive up-rights are less than 2.5 Mts (height of scaffold & load carrying capacity governs the distance between two uprights)				
7	Whether all uprights are extended at least 900 mm above the top most working platform (to enable fitting of handrails)?				
8	Whether vertical distance of two successive ledgers is satisfactory? (varying between 1.3 Mts. To 2.1 Mts)				
9	Whether the peripheral areas of working at height are cordoned-off? (for avoiding accident to people arising out of dropped / deflected materials)				
10	Whether platform is provided? Is it safely approachable?				
11	Whether end of scaffold platform / board are extended beyond transoms? (125mm to 150 mm)				
12	Whether CE / IS approved quality and worthy conditioned full-body safety harness (with double lanyard & karabiners) are used while working at heights?				
13	Whether life-line of safety harness is anchored to an independent secured support capable of withstanding load of a falling person?				
14	Whether the area around the scaffold is cordoned off to prohibit the entry of unauthorized person / vehicle?				
15	Whether clamps used are of good condition, of adequate strength and free from defects?				
16	Whether ladder is placed at secured and leveled surface?				
17	Whether water-pass and oil-spills are avoided around the scaffold structure?				
18	Whether ladder is extended 1.5mts. above the landing point at height?				
19	Whether more than one access/egress provided to the scaffold?				
20	Whether ladder used are of adequate length and overlapping of short ladders avoided?				
21	Whether metallic ladders are placed much away from near-by electrical transmission line?				
22	Whether rungs of ladder are inspected and found in good order?				
23	Whether fall-arresters provided on both the access/egress routes?				
24	Whether diagonal (cross) bracings are provided at regular interval on the scaffold?				
25	Whether working platform on the scaffold has been made free from "jolt" or "gap"?				
26	Whether tools or materials are removed after completion of the day's job at heights?				
27	Whether a valid Permit for Work (PFW) is obtained before taking up work over asbestos or fragile roof?				
28	Whether sufficient precaution is taken while working on fragile roof?				

**STANDARD SPECIFICATION FOR  
HEALTH, SAFETY &  
ENVIRONMENT MANAGEMENT  
AT CONSTRUCTION SITES**

**FORMAT NO. : HSE-14 REV 0**

(sheet 1 of 2)

**PERMIT FOR ERECTION / MODIFICATION & DISMANTLING OF SCAFFOLDING**

Project : Sr.No. :  
 Name of the work : Date :  
 Name of contractor : Job No. :  
 Nature of activities : Duration: From.....To.....

SL. No.	SUBJECTS / ITEMS	DONE	NOT DONE	REMARKS
1	Specific task of Erection / Modification / Dismantling of scaffolds, identified & TAGGED accordingly (before as well as after carrying-out jobs).			
2	People engaged in doing the job are identified & are certified by Job Engineer of Main Contractor as experienced / trained.			Names to be noted
3	Concerned persons are alerted by the Job Engineer of Main Contractor in connection with possible hazards & what the workmen MUST do / MUST not do.			
4	Verification by Job Engineer of Main Contractor made for confirming that all persons permitted to carry-out the jobs are making use of Helmet, Safety Shoes, Goggles, Gloves & Double lanyard safety harness and other relevant PPEs.			
5	Area of work is effectively cordoned-off / barricaded / illuminated.			
6	For taking-up / lowering down Scaffolding members / clamps / couplings etc. appropriate ropes / pulleys/ chains etc. have been arranged for use (not to throw any item) & the same have been verified as "fit for purpose".			
7	Items / members of scaffold, being lowered are removed from the area & stacked correctly.			
8	Ropes, chains, pulley blocks etc. being used for lifting or lowering scaffold items, are inspected by the Job Engineer & their certifications as well as physical conditions have been found O.K, before signing this PERMIT.			
9	Safety Net / Life-line / Fall Arresters etc. are arranged in position and Job Engineer has found working conditions favourable for activities to start.			
10	Scaffold erection or dismantling tasks are being supervised by Experienced Engineer / Competent person.			
11	Only competent & experienced people have been selected / engaged in Scaffolding erection, modification or dismantling tasks.			
12	Adequate & effective actions for traffic and movement of people around the cordoned-off area taken to avoid inadvertent incident			
13	Working platforms are protected with handrails & toe-boards.			
14	Access & Exit (for reach & escape) are safe for use by people.			
15	Tools, tackles to be used for above jobs are verified by job Engineers of Main contractor as genuinely good and tied-up at height (to prevent their fall).			
16	Site important Telephone Nos. are made known to everyone			
17	SOP (Safe Operating Procedure) for the specific task is made & followed too.			
18	Emergency vehicle has been arranged at work locations.			

- X
- X This permit for work shall be available at specific work location all the time.
- X After completion of work, permit shall be returned to safety cell of main contractor, without fail.
- X This Permit shall be issued maximum upto (Monday to Sunday).
- X Additional Precautions, if any
- X .....

**ACCORD OF PERMISSION** (to be ticked) - YES ( ) / NO ( )

Inspected by  
Contractor Engineer

Verification By  
Contractor Safety Officer]



**FORMAT NO. : HSE-15 REV 0**

**PERMIT FOR HEAVY LIFT/CRITICAL ERECTION**

Project :	Sr.No. :
Name of the work :	Date :
Name of contractor :	Job No. :
Nature of activities :	Duration: From.....To.....
Location of work :	Name /Type of crane :
Equipment/Structure to be erected:	Wt. of equipment/ structure to be erected :

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1)	Is the crane type suitable for lift or as per erection procedure?				
2)	Is the crane have the correct number of counterweights fitted?				
3)	Availability of Load Certification of crane from authorized agency.				
4)	Is the load chart of crane available in crane cabin/or with Crane operator?				
5)	Is the device to check the Wind speed in crane is working? Is the safety features in crane are working?				
6)	Availability of Load certification of slings and other accessories from authorized agency				
7)	Availability of Licensee/certificate for crane operator from authorized agency.				
8)	Availability of approved JSA for the subject activities.				
9)	Availability of approved erection/rigging procedures.				
10)	Availability of temporary gratings/ platforms for critical lifting(as applicable)				
11)	Tool Box conducted before erection?				
12)	Has the area been cordoned off?				
13)	Are the authorized persons during erection are identified?				
14)	Does each person identified for erection understand their roles and responsibilities?				
15)	Is the ground on which crane will rest or outrigger support are correct?				
16)	Is hard stand requirement (if any) complied?				
17)	Is the communication system (viz walkie talkies,etc are working properly?				
18)	If more than one crane is lifting the load, is an Intermediate rigger will supervise the lift?				
19)	If there is other obstruction within the operating radius of the crane, have correct precautions been taken to prevent collision?				
20)	All the persons are wearing the requisite PPE?				

Inspected & Issued by  
Contractor Engineer/RCM

Verification By  
Contractor Safety Officer

FORMAT NO. : HSE-16 REV 0

**PERMIT FOR ENERGY ISOLATION & DE-ISOLATION**

Project : Sr.No. :  
 Name of the work : Date :  
 Name of contractor : Job No. :

<b>X ENERGY ISOLATION PERMIT</b>	
X Clearance required from:.....Hrs .....Date	To .....Hrs ....Date
X Name of equipment/ energy source etc .....	
X Nature of job to be done: .....	
Area.....Location:.....	

<b>PERMIT VALIDATION</b>	<b>PERFORMING AUTHORITY</b>
I hereby authorize the .....personnel(performer) to isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for maintenance/repair.	The work and precautions will be carried out under my overall responsibility.(Testing/execution engineer)
Issuing authority Area –Incharge/RCM Signature: _____ Date: _____ Name: _____	Signature: _____ Date: _____ Name: _____

<b>SAFETY PRECAUTIONS FOR CLEARANCE</b>	<b>NORMALISING AFTER CLEARANCE</b>
1. Notify workers of intent to de- energize <input type="checkbox"/> 2. Obtain lock,tag or locking/tagging devices <input type="checkbox"/> 3. Shut down ,de energize, dissipate any residual energies. <input type="checkbox"/> 4. Apply lock ,tag and locking and/or tagging devices <input type="checkbox"/> 5. *Any other job specific precautions <input type="checkbox"/> 6. Verify effectiveness of lockout by attempting to restart. <input type="checkbox"/> 7. Proper PPE is ensured <input type="checkbox"/>	1. Notify workers of intent to re- energize <input type="checkbox"/> 2. Conduct visual inspection to confirm that the danger zone is clear of workers <input type="checkbox"/> 3. Conduct visual inspection to confirm that tools ,equipments danger zone is clear of workers <input type="checkbox"/> 4. Reposition the safety devices(interlocks, valves, guards, covers ,sensors, as applicable, etc) <input type="checkbox"/> 5. *Any other job specific normalizing details <input type="checkbox"/> 6. Remove lock, tag and locking and/or tagging devices. <input type="checkbox"/> 7. Re energize. <input type="checkbox"/> 8. Confirm system is operating properly& safely
I certify that the energy source mentioned above is isolated from all sources and is safe to start the work.	I certify that the energy source mentioned above is isolated from all sources and is safe to start the work.
Tag No:..... Lock No:.....	Tag No:..... Lock No:.....
Issuing authority Area –Incharge/RCM Signature: _____ Date: _____ Name: _____ <b>(*to be included by contractor in consultation with PDIL/owner)</b>	Issuing authority Area –Incharge/RCM Signature: _____ Date: _____ Name: _____ <b>(*to be included by contractor in consultation with PDIL/owner)</b>

<b>ENERGY DE-ISOLATION PERMIT</b>	
<b>PERMIT VALIDATION</b>	<b>PERFORMING AUTHORITY</b>
I hereby authorize the .....personnel(performer) to de- isolate the above equipment/energy source from all sources of power and handover the equipment/energy source for normal operation..	I herby certify that the equipment/energy source mentioned above has been de-isolated and is ready for normal operation.(Testing/execution engineer)
Issuing authority Area –Incharge/RCM Signature: _____ Date: _____ Name: _____	Signature: _____ Date: _____ Name: _____ <b>Countersigned by Issuing authority</b>

**FORMAT NO. : HSE-17 REV 0**

**PERMIT FOR EXCAVATION (depth 2m and above)**

**(Sheet 1 of 2)**

Project :	Sr.No. :
Name of the work :	Date :
Name of contractor :	Job No. :
Job Description :	Location:
Size of excavation :	

SL. NO.	Description of Item	COMPLIANCE STATUS			Remarks
		Yes	No	Not applicable	
1)	Suitable and sufficient risk assessments and method statements has been carried to ensure that the work shall be undertaken in accordance with specification and standard.				
2)	Are plans/details of underground services available and the same has been reviewed?				
3)	Has survey done to locate the services/obstacles, etc.				
4)	Has the live services (electrical, water line, air line, telephone line etc) has been disabled for carrying out the job.				
5)	Is adequate barriers/fences to protect the excavation are in place?				
6)	Is Adequate warning signs are in place?				
7)	Is Assessment of ground conditions done and remedial action (if any) taken?				
8)	Safe access / egress (e.g. ramp / steps / ladders etc.) provided for site workmen & supervisors.				
9)	Is the excavation work being undertaken in proximity of structure, etc ? If Yes, it's effect is considered?				
10)	Availability of competent person for supervising the excavation work?				
11)	Adequate safe arrangement to prevent collapse of edges (e.g. shoring / strutting / benching / sloping etc.) made at site.				
12)	Hard barricades (at least 1.0M away from edge & for excavation near site access roads) with warning signs/caution boards are provided				
13)	Accumulation / passage-ways of water at periphery of excavation / trench stopped/ restricted.				
14)	Is the equipment being used for excavation has been checked for adequacy and is in good working condition having all the safety features?				
15)	Age & fitness of workmen ensured by medical test before engagement in job ?				
16)	Arrangement of Monitoring of possible oxygen deficiency or obnoxious gases done & action taken?				

**PERMIT GRANTED - Yes / No**

*(List enclosed with name & gate pass numbers.)*

Name & Signature of Site Engr  
Contractor (Initiator)

Name & Signature of Safety Officer  
Contractor (Issuing authority)

**FORMAT NO. : HSE-17 REV 0**

**PERMIT FOR EXCAVATION**

**(Sheet 2of 2)**

**NOTES: -**

1. Slopes or benches for excavation beyond 2.0M depth shall be designed & approved by Contractor's site head.
2. Excavated earth to be kept at least 1.5M away from edges
3. Safety helmets, Safety shoes or gum-boots, gloves, goggles, Face shield, Safety Harness shall be essential PPEs.
4. Permit shall be made in **duplicate** and original shall be available at site of work.
5. Permit shall be issued for maximum **one week** only (Monday to Sunday)
6. After completion of works, permit shall be closed & preserved for record purpose

**GRANT OF PERMIT AND EXTENSIONS**

Sl. No.	Validity period From ____To ____	Working Time From ____To ____	Initiator (site Engr. of Main Contractor)	Issuing authority (Safety Officer of Main Contractor)	Review by PDIL / Owner (Remarks with date)
1.					
2.					
3.					
4.					
5.					
6.					
7.					

Additional safety instructions if any: -

- 1.
- 2.
- 3.

APPENDIX-II (COMMERCIAL BID ANALYSIS (CBA) - WORKS)		
TENDER SUBJECT		
TENDER DOCUMENT NUMBER & DESCRIPTION::		
S.NO.	NAME OF BIDDER	M/s. ....
<b>1.0 PARTICULARS</b>		
1.1	ADDRESS OF REGISTERED OFFICE	
1.2	ADDRESS WHERE CONTRACT TO BE PLACED	
1.3	ADDRESS FROM WHERE SERVICES ARE TO BE RENDRED ALONG WITH GST REGISTRATION NO.	ADDRESS: GST NO:
1.4	PHONE NO.	
1.5	E-MAIL	
1.6	NAME, DESIGNATION & CONTACT DETAILS OF CONTACT PERSON AS PER FORM F-3 (LETTER OF AUTHORITY)	
1.7	OFFER NUMBER & DATE	
1.8.1	STATUS OF BIDDER (MSE or Others) In case of MSE, specify the type of MSE i.e. Micro-SC/ST/WOMEN/others OR Small-SC/ST/WOMEN/others	
1.8.2	In case of MSE, submitted Udyam Registration Certificate duly certified by Chartered Accountant and Notary Public with Legible stamp	Submitted/ Not Submitted
1.9.1	STATUS OF BIDDER (Start-Up / Non-Start-up) Specify the type of bidder along with documents submitted.	
1.9.2	In case of Start-Up, submitted relevant documents duly certified by Chartered Accountant and Notary Public with Legible stamp	Submitted/ Not Submitted
<b>2.0 EMD DETAILS (WHEREVER APPLICABLE )</b>		
2.1	Item/ Section/ Group / Part Quoted	
2.2	Required EMD for Quoted Items	
2.3	EMD Amount submitted by the bidder	
2.4	Details of EMD / Bid Security	specify DD/ BG No, DD/BG date, issuing bank, DD/BG validity
2.5	Net Worth Letter for Bank regarding Net Worth >100 Crores (If Applicable)	Submitted/ Not Submitted with appropriate comments (if any)
<b>3.0 BEC FINANCIAL</b>		
3.1	<b>The Minimum Average Annual Turnover:</b> of the Bidder as per their audited financial results in any one of the immediately three preceding financial years.	
3.1.1	Item/ Section/ Group / Part Quoted	
3.1.2	Required Turnover for Quoted Item/ Section/ Group / Part	
3.1.3	Turnover of the bidder	FY ____ = INR/USD/Euro ____ FY ____ = INR/USD/Euro ____ FY ____ = INR/USD/Euro ____
3.2	<b>2. Net worth :</b> Net worth of the Bidder shall be positive as per the last audited financial statement.	Positive/ Negative (Enter the net worth as per Form F-10.)
3.3	<b>3. Working capital :</b> The minimum working capital of the Bidder as per the last audited financial statement shall be as under:  <b>Note:</b> If the bidder's working capital is inadequate, the bidder should supplement this with a letter from the bidder's bank, having net worth not less than Rs.100 Crores (or equivalent in USD), as per provisions of Tender Document.	
3.3.1	Item/ Section/ Group / Part Quoted	
3.3.2	Required Working Capital for Quoted Items	
3.3.3	Working capital of the bidder as per the last audited financial year	INR /US \$/ Euro/ home currency _____ as per FY _____ (refer Form F-10)
3.3.4	Deficiency of Working Capital Amount, if any	Yes/No (Specify amount (if any))
3.3.5	Working Capital letter from the bank as per Format F-9	Details of the letter (Amount, Bank, date etc.)
3.4	Submitted copy of Audited Annual Financial Statement [including Auditor's Report, Balance Sheets, Profit and Loss Accounts statements, Notes & schedules etc.] of three (3) preceding Financial Year(s) . Copy of the audited annual financial statements shall be duly certified / attested by Notary Public with legible stamp.	Submitted / Not Submitted with appropriate remarks (if any)
<b>4.0 FORMS &amp; FORMATS</b>		
4.1	FORMAT F-1: BIDDER'S GENERAL INFORMATION	Submitted/ Not Submitted
4.1.1	Status of Firm/ Company: Proprietorship Firm / Partnership Firm/ Company (Private or public) (As per Format F-1)	
4.1.2	Name of Proprietor/Partners/Directors (As per Format F-1)	
4.1.3	PAN No. (As per Format F-1)	
4.1.4	GST Registration No. (As per Format F-1)	

(PREPARED BY: )

(CHECKED BY: )

(VETTED BY: )



TENDER DOCUMENT NUMBER & DESCRIPTION::		
S.NO.	NAME OF BIDDER	M/s. ....
<b>1.0</b>	<b>PARTICULARS</b>	
4.1.5	EPF Registration No.	
4.1.6	ESI code No.	
4.2	FORMAT F-2B:DECLARATION FOR BID SECURITY [applicable for bidders who are exempted from submission of EMD/Bid Security]	Submitted/ Not Submitted with appropriate comments (if any)
4.3	FORMAT F-3:LETTER OF AUTHORITY (ON LETTER HEAD)	Submitted/ Not Submitted
4.4.	FORMAT-F-5: AGREED TERMS & CONDITIONS (ATC)	Submitted/ Not Submitted
4.4.1	Acceptance of Bid validity	Accepted/ Not Accepted
4.4.2	Acceptance of payment terms	Accepted/ Not Accepted
4.4.3	Acceptance of Contract Performance Security	Accepted/ Not Accepted
4.4.4	Acceptance of Completion Schedule	Accepted/ Not Accepted
4.4.5	Acceptance of Price Reduction Schedule	Accepted/ Not Accepted
4.4.6	Whether bidder is liable to raise E-Invoice as per GST Act.	Yes/No
4.4.7	If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.	Accepted/ Not Accepted
4.4.8	Whether in the instant tender services/works are covered in reverse charge rule of GST (CGST & SGST/UTGST or IGST)	Yes/No
4.4.9	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	Confirmed / Not Confirmed
4.5	FORMAT F-9: CERTIFICATE FROM BANK IF BIDDER'S WORKING CAPITAL IS INADEQUATE/NEGATIVE	Submitted/ Not Submitted with appropriate comments (if any)
4.6	FORMAT F-10: FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE FOR FINANCIAL CAPABILITY OF THE BIDDER	Submitted/ Not Submitted
4.7	FORMAT F-13: E-BANKING MANDATE FORM	Submitted/ Not Submitted with appropriate comments (if any)
4.8	FORMAT-F-14: [IF APPLICABLE] INTEGRITY PACT (ON PLAIN PAPER)	Submitted/ Not Submitted
4.9	ANNEXURE-1 to APPENDIX -I: [IF APPLICABLE] SELF-CERTIFICATE TOWARDS POLICY FOR PROVIDING PREFERENCE TO DOMESTICALLY MANUFACTURED IRON & STEEL PRODUCTS IN GOVERNMENT PROCUREMENT	Submitted/ Not Submitted with appropriate comments (if any)
5.0	POWER OF ATTORNEY & NAME OF PERSON	Specify the complete details of the Power of Attorney [like POA is submitted in the name of Mr.....authorized through Board Resolution dated.....]
5.1	NAME OF DIGITAL SIGNATORY	
6.0	<b>IBID DOCUMENT / GCC / REPLY TO BIDDERS QUERIES / PRICE SCHEDULE (WITH PRICES BLANKED OUT)</b>	
6.1	ACCEPTANCE & SUBMISSION OF COMPLETE BID DOCUMENT WITH IFB, ITB, FORMS & FORMATS, GCC, VENDOE PERFORMANCE ETC.	Accepted/ Not Accepted AND Submitted/Not Submitted
6.2	ACCEPTANCE & SUBMISSION OF REPLY TO BIDDER QUERIES	Accepted/ Not Accepted AND Submitted/Not Submitted
6.3	ACCEPTANCE & SUBMISSION OF CORRIGENDUM	Accepted/ Not Accepted AND Submitted/Not Submitted
6.4	SUBMISSION OF COPY OF 'SCHEDULE OF RATES' WITH PRICES BLANKED OUT	Submitted/Not Submitted
6.5	Name of the bidder is not appearing in Holiday/ Banning list as per provisions of tender	Yes/No
7.0	<b>LAND BORDER SHARING</b>	
7.1	submission of certificate as Form-I to Annexure-VII of Section-III w.r.t Provisions of 'Procurement from a Bidder which shares a land border with India'	Submitted/Not Submitted Not from such Country OR from such country
8.0	<b>PPP-III POLICY</b>	
8.1	Undertaking as per FORM - II of ANNEXURE - V to Section-III and certificate from Statutory Auditor or Cost Auditor (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 of ANNEXURE -V to Section-III have been submitted.	Submitted/Not Submitted
8.2	Class-I Local supplier or Class-II Local Supplier	
9.0	<b>ADDITIONAL CLAUSES, IF ANY (*)</b>	
9.1	.....	
9.2	.....	
9.3	.....	
9.4	.....	
9.5	.....	
10.0	REMARKS	
	(*) Dealing Officers may add additional clauses, if any, based on requirement of specific tender document.	

TENDER DOCUMENT NUMBER & DESCRIPTION::	
S.NO.	NAME OF BIDDER
1.0	M/s. ....
PARTICULARS	
<u>Note:</u> In case of contradiction between the confirmations provided in this format and to confirmations provided in the bid, the confirmations provided in the bid shall prevail.	



**NIT**

**(SECTION-VI)**

**Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities**

**AT**

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

**(NIT NO.: PNP/PC-150/E/121/NCB)**

**(PART-II, TECHNICAL)**

**ISSUED BY:**



**PROJECTS & DEVELOPMENT INDIA LTD. NOIDA**



**(A GOVT. OF INDIA UNDERTAKING)  
PDIL BHAWAN, A-14, SECTOR-01  
NOIDA-201301  
DISTT. GAUTAM BUDH NAGAR  
UTTER PRADESH, INDIA**

 <b>पी डी आई एल PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LTD.</b>	PNPM/PC150/E/121/P-II/SEC-VI	0	
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**TECHNICAL SPECIFICATIONS, SCOPE OF WORKS AND DRAWING**

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	<p>NIT FOR BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</p> <p>AT TALCHER FERTILIZERS LTD.</p>	PNPM/PC150/E/121/P- II/SEC-VI	0	
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1.0	PREAMBLE TO SOR
2.0	SCHEDULE OF RATES FOR BALANCE JOB FOR 36 "FOR RAW WATER PIPELINE

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## **PART II: TECHNICAL**

### **SECTION: VI - 1.0**

#### **SYNOPSIS**



**NIT FOR BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES**

**AT**

**TALCHER FERTILIZERS LTD.**

**TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX, AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

	<p align="center"><b>NIT FOR BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b></p> <p align="center"><b>AT TALCHER FERTILIZERS LTD. SYNOPSIS</b></p>	PNPM/PC150/E/121- SEC.VI-1.0	0	
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## 1.0 INTRODUCTION

This NIT is issued for selecting an experienced Contractor for executing permanent raw water supply system at TALCHER FERTILIZERS LTD for up-coming Coal Gasification based Ammonia-Urea Plant at Talcher, Angul, Odisha.

M/s Talcher Fertilizers Limited a Joint Venture of four major Public Sector Units – i.e. M/s Rashtriya Chemicals & Fertilisers Ltd. (RCF), M/s GAIL (India) Ltd. (GAIL), M/s Coal India Ltd. (CIL) and M/s Fertilizers Corporation of India Ltd. (FCIL), are constructing a world class Coal based fertilizer complex.

The brief description of Joint Venture Members is as under:

- 1.1 Rashtriya Chemicals & Fertilizers Limited (RCF)**, a leading Public Sector Undertaking in the field of fertilizers, is engaged in manufacture and marketing of Fertilizers and Industrial chemicals. The company was carved out of the erstwhile Fertilizer Corporation of India Ltd at the time of reorganization way back in the year 1978. Presently, Rashtriya Chemicals & Fertilizers Ltd. (RCF) is a leading fertilizer manufacturer in India having two production facilities, one at Trombay in Mumbai and the other at Thal in Alibag city, which is 100 kilometers from Mumbai. Thal unit of RCF comprises of Ammonia and Urea Plants and Trombay unit comprises of Ammonia Urea Plants along with chemical plants like Methanol, Nitric Acid, Sulphuric Acid, Phosphoric Acid and Nitro Phosphate fertilizers of different composition.
- 1.2 GAIL (India) Limited (GAIL)**, India's flagship Natural Gas Company, is integrating all aspects of the Natural Gas value chain (including Exploration & Production, Processing, Transmission, Distribution and Marketing) and its related services.
- 1.3 Coal India limited (CIL)** was formed as a holding company with five subsidiaries on 21-10-1975. The company, wholly owned by Government of India is world's largest hard coal producing company. It has core competence across entire gamut of coal business value chain. Business domain includes exploration, planning and design of mines, mines operation, coal beneficiation and marketing. CIL meets 48% of Nation's primary energy demand and caters 85% of Nation's coal requirement. Indian coal at the pithead is the cheapest coal in the world. With low sulphur content, it is eco friendly. CIL's business plan, therefore, aims primarily to translate these strong economic fundamentals of coal into prosperity of the company and the country as a whole.
- 1.4 Fertilizer Corporation of India Limited (FCIL)** is a Central Government undertaking under the administrative control of Ministry of Chemicals and Fertilizers. Due to non-viability of the

	<b>NIT FOR BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b>	PNPM/PC150/E/121- SEC.VI-1.0	0	
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<b>AT TALCHER FERTILIZERS LTD. SYNOPSIS</b>				

operation of fertilizer unit, Government of India has decided to close the fertilizer plants. The net worth of the company has become negative and the corporation was referred to BIFR in April 1992 under the sick Industrial Companies (Special provision under Act 1985).



**To cater the requirement of Raw Water for the Project, Talcher Fertilizers Limited intends to set up a Raw Water supply arrangement from Brahmini river through dedicated underground 36"NB pipeline via pumps to be installed in existing intake well. The Estimated Raw Water requirement for the complex is ~2400 m<sup>3</sup>/hr.**

- 1.5** CONTRACTOR is advised to visit and examine the site conditions and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into the Contract. Claims of any kind due to variation or ignorance of site conditions and environmental conditions will not be eligible in any circumstances.
- 1.6** **M/s Projects & Development India Limited (PDIL)** has been retained as Project management Consultant by Talcher Fertilizers Limited (TFL) for this project.

**In this enquiry the following Philosophy has been considered:-**

1. Supply, Laying & Commissioning of a new underground (UG)/above ground(A/G) Balance 36" pipeline of approx. 12.0 Km (from Brahmani River Intake Facility point to raw water reservoir & fire water reservoir B/L inside TFL Plant premises alongside the existing abandoned Water supply lines in the same ROU).
2. Fabrication and erection of aboveground /Under ground Piping/Pipeline works including crossing of pipeline under rail, roads, water channels etc,
3. Pipeline stress analysis and remedial measures shall be in contractor scope.
4. Supply & Application of Field wrapping coating (3LPE).
5. Unloading and transportation of items (Equipments & Piping).
6. Construction of anchor blocks supports etc .for the Pipeline
7. Erection of Equipments such as Pumps, EOT cranes, Transformer, Electric panel, 04 nos Sluice Gate ,valves, fittings, gaskets & Nut Bolts etc.
8. Supply & Installation of Butterfly/Gate/Check Valves as per requirement.
9. Design, Supply, Installation & Commissioning of Cathodic Protection System for Water Pipeline.
10. Supply & Installation of Field Instruments
11. **Removal of existing Hume pipes (900mm dia.) along approx. 07 km pipeline route.**
12. Supply & Application of Painting of Piping & Equipments.
13. Supply of Pipeline & its materials i.e. it's fitting, Valve, GASKET, STUDS & NUTS FOR ALL SIZES as per Technical specification & insulation joint to complete the work related to this projects
14. Pre-commissioning and commissioning activities.



	<b>NIT FOR BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b>	PNPM/PC150/E/121- SEC.VI-1.0	0	
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15. It is an essential requirement that Bidder must visit to M/S TFL, Talcher plant site for assessment and quantum of work involved and facilities available at site at their own cost without any commercial implications to Owner before submitting the techno-commercial bid.
16. Bidder shall quote for the entire works as per the SOR (Schedule of rates) enclose in this tender documents.
17. Bidder's Scope of work shall cover procurement of items/materials whatsoever required along with consumables including transportation to site, safe storage at site, erection, inspection, testing, painting, commissioning, guarantees etc. as per the technical specifications and other reference documents / standards & codes referred/enclosed along with this Tender Document.
18. For other documents, refer individual attachments related to Technical specifications and scope of works for Equipments and A/G Piping/Pipeline erection works U/G Piping/Pipeline erection works, Painting works & Schedule of Rates.
19. **Successful Bidder shall submit** Procedure, Job Method Statement (JMS) and job Safety Analysis (JSA) **for approval before starting the work and incorporate all comments/modifications suggested by Owner/PMC.**
20. Laisoning work for getting permissions from statutory bodies/statutory approval for pipeline crossing etc. to be included in the scope.
21. Supply & Application of Casing pipe for crossing as per NIT.
22. Repair/Modification if, required in 6" existing construction water line during construction phase then same has to be carried out.
23. Third party inspection for all bought out items shall be in the scope of Contractors. BVIS/DNV/TUV/LLOYD are approved TPIA to carryout inspection.
24. Fabrication, erection and laying of 36" Pipeline for client's free issue material approx. 1 KM as per SOR.

## 2.0 Plant Site

A brief status of infrastructure at Talcher Fertiliser Plant Site is furnished below:

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 Paradip, 200 km by rail/road from the site. Talcher is situated at 21° 10" N Latitude and 82° 5" E Longitude.

## 3.0 Basis for fulfilling the requirement of raw water for TFL Project:

Philosophy/configuration for fulfilling the **raw water** requirement shall be as mentioned below:  
**RAW WATER PUMP DETAILS WHICH WILL BE INSTALLED AT THE INTAKE WELL AT BRAHMNI RIVER.**



Fluid Type of Pump =Water

Vertical Turbine Pump (suitable strainer to be provided)

No. Of Pumps = 3W+1S

Pump Flow-rate/ pump = 1200 M3/Hr

Pump Discharge pressure = 15 Kg/cm<sup>2</sup>g (Pump discharge pressure may vary up to

	<p align="center"><b>NIT FOR BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b></p> <p align="center"><b>AT TALCHER FERTILIZERS LTD. SYNOPSIS</b></p>	PNPM/PC150/E/121- SEC.VI-1.0	0	
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+20% and shall be finalized after route survey finalization)

Pump NPSHa = Flooded

Estimated absorbed power = 655 Kwh/h per pump (Considering 75% efficiency of pump)  
(However, Final shall be as per ROU)

**Fluid Property:**-Density=990 kg/m<sup>3</sup> at Amb. Temp.

Viscosity = 0.653 CP at Amb. Temp.

Vapour Pressure = 0.07 Kg/cm<sup>2</sup>a at Amb. Temp.

#### 4.0 Temporary Construction Facilities

The CONTRACTOR shall arrange following facilities at his own cost for Construction, Erection ,pre-commissioning and commissioning purpose.

1. Construction Power Supply facilities: Bidder shall make their own arrangement for construction power supply.
2. Construction Water Supply facilities: Bidder shall make their own arrangement for construction water supply.
3. Construction sheds
4. Construction offices
5. Temporary Communication facilities
6. Office furniture
7. Labour colony during construction

 <b>पी डी आई एल PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT</b>	PC150-E-121-SEC.VI-1.1	0	 <b>Talcher Fertilizers</b>
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## SECTION: VI - 1.1



### DESIGN PHILOSOPHY – PROCESS & INSTRUMENT

### SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM

AT

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

0	23.02.2022	23.02.2022	ISSUED FOR TENDER	SKK	SKK	AV
<b>REV</b>	<b>REV DATE</b>	<b>EFF DATE</b>	<b>PURPOSE</b>	<b>PREPD</b>	<b>REVWD</b>	<b>APPD</b>

	<b>DESIGN PHILOSOPHY – PROCESS &amp; INSTRUMENT</b> <b>PERMANENT RAW WATER SUPPLY SYSTEM</b> <b>TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b>	PC150-E-121-SEC.VI-1.1	0	
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## 1. DESIGN PHILOSOPHY PROCESS

Raw Water from Brahmni River shall be routed through intake channel to Jack well. Intake channel shall be provided with isolation gates and bar screens to avoid debris to enter into Jack Well.

One Jack Well shall be provided to install four numbers (3W+1S) of Vertical Turbine type raw water pumps. The Jack Well shall be provided with EOT for maintenance of the pumps.

The power supply to the Raw Water Pumping Substation is de-energised. Therefore, a new electrical substation shall be provided to feed electric power to the raw water pumps.

The raw water shall be pumped by raw water pumps through single raw water pipeline of 36 inches size. The raw water pipeline shall be laid underground from Jack Well to plant site. However, Pipeline shall run also above ground wherever required as per ROU (Right of Use). The route of raw water pipeline laying shall be as per available ROU (Right of Use). Raw water shall be collected in a Raw Water Storage at plant site to meet plant requirement.

Further, after reaching the raw water pipeline (36") inside TFL Plant B.L., a branch pipeline of 20" size from Raw water Pipeline (36") shall be tapped and routed to Fire water storage tank. **Refer Page 5 of PC150-PNPR-DD-02\_REV.1.**

### RAW WATER PUMP DETAILS WHICH WILL BE MOUNTED AT BRAHMNI RIVER.

Fluid	=	Water
Type of Pump	=	Vertical Turbine Pump (suitable strainer to be provided)
No. Of Pumps	=	3W+1S
Pump Flow-rate/ pump	=	1200 m <sup>3</sup> /hr
Pump Discharge pressure	=	14 Kg/cm <sup>2</sup> g
Pump NPSHa	=	Flooded
Estimated absorbed power	=	611 Kwh/h per pump (Considering 75% efficiency of pump)



#### Fluid Property:-

Density	=	990 kg/m <sup>3</sup> at Amb. Temp.
Viscosity	=	0.653 CP at Amb. Temp.
Vapour Pressure	=	0.07 Kg/cm <sup>2</sup> a at Amb. Temp.

**Note: - Please refer attached pump datasheet (PC150-PNPR-DD-02\_REV.0).**

#### SYNOPSIS:



1. Raw Water supply line/ header (Buried/ underground/ Above Ground) to be considered with cathodic protection. MOC of the pipe lines to be considered CS.
2. 3W+1S=4 Numbers Pumps to be considered for supplying raw water from Brahmni River. The capacity of each pump shall be 1200 m<sup>3</sup>/h. estimated absorbed power of each pump is 611 Kwh/h considering 75% pump efficiency. **Provision for 1 nos. pump of similar capacity shall be kept in the pump house for future requirement.**

	<b>DESIGN PHILOSOPHY – PROCESS &amp; INSTRUMENT</b> <b>PERMANENT RAW WATER SUPPLY SYSTEM</b> <b>TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b>	PC150-E-121-SEC.VI-1.1	0	
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3. Raw Water Pipe line specification: Dia. - 36 inches
4. Branch Pipe line specification: Dia. – 20 inches
5. Air breather to be provided as per requirement.

## 2. DESIGN PHILOSOPHY INSTRUMENT

1. Final water Flow (final discharge) measurement shall be selected very carefully for Accuracy and Reliability as water flow measurement may be having direct financial implications. Vendor to provide Clamp-on type ultrasonic flow meter. Upstream and downstream straight lengths shall be as per standard. Accuracy +/-1% or better to be used. Make Flexim/ GE/ E&H/ Krohne/ Siemens.
2. Flow totalizer considered shall not be Mechanical type, instead it should be Electronics type, capable of retaining long term data and gives Report for daily/ weekly/ fortnightly/ monthly/ quarterly/ six monthly and Yearly.
3. Pressure gauges shall be industrial SS316 Bourdon gauge/diaphragm or spring bellows type as per process requirement with the case in SS316. 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%.
4. 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). In case of multi-transmitter installation from a single orifice, a separate identical pair of tapping to be provided with a separate transmitter i.e. no branching from a single tapping is allowed.
5. Swagelok/ Parker/ Hoke compression fittings shall be used for the entire Plant.
6. Execution type for all field transmitters in hazardous/safe area shall be intrinsic safe. Flame/ex. proof enclosures shall be provided where intrinsic certifications are not available.
7. Flow Transmitter output cable shall be connected to a field JB (Cable and JB shall be in bidder's scope). Signal cables shall be as per BS-5308//IEC/eqiv, FRLS PVC, GI armoured mutual capacitance <60 pf/m, L/R ratio of < 25 microhenry /ohm for 0.5 mm<sup>2</sup> cable and < 40 microhenry /ohm for 1.5 mm<sup>2</sup> cables (shall meet the loop entity values for intrinsic safety class). Cable size shall be min 1P x 1.5mm<sup>2</sup>.

	<b>DESIGN PHILOSOPHY – PROCESS &amp; INSTRUMENT</b> <b>PERMANENT RAW WATER SUPPLY SYSTEM</b> <b>TALCHER FERTILIZERS LTD., ANGUL, ODISHA</b>	PC150-E-121-SEC.VI-1.1	0	
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8. Bidder shall supply junction boxes (12 In x 2 Out) of die cast aluminum alloy (LM-6) body, flameproof with Ex (d) certification and weather proof as a minimum. Junction Box shall be CCOE/CMRS approved, for specified hazardous area class based on gas group service. All the JB terminals (phoenix make) shall be stud and nut type (CBT) mounted on rails in the junction box. All spare entries shall be provided with SS plugs. All the cable entries shall be from bottom only. SS316 Double compression Cable Gland shall be considered for cable entry.
9. Flange connection size shall be as follows:

Thermo-well ( Min. Rating ANSI 300#)	1 ½" Flanged	1 ½" Flanged
Press. Gauge	½" NPT (M)	½" NPT

**List of Attachments:-**

1. Intake well Pump Specification along with P&ID PC150-PNPR-DD-02\_Rev.1



 <b>पी डी आई एल</b> <b>PDIL</b> <b>PDIL NOIDA</b>	<b>PROJECT :</b> Integrated Coal Based Fertilizer Complex <b>PLANT :</b> Permanent Raw Water Supply System	<b>PC150-PNPR-DD-02</b> DOCUMENT NO.	<b>0</b> REV	
	<b>CENTRIFUGAL PUMP SPECIFICATION SHEET</b>	Sheet      Page 3 of 5		
<b>JOB NO.-PC-150</b>	<b>ITEM:</b> Intake well Raw Water Pump	<b>ITEM NO.</b>		
Project: <b>Integrated Coal Based Fertilizer Complex</b>		Plant/Section : <b>Permanent Raw Water Supply System</b>		Reqn./P.O No.

NOTE:

1. Driver motor to be designed for discharge valve full open condition.
2. Tentative , Discharge Pressure shall be confirmed during detail engineering by the vendor after finalization of route survey.
3. Vendor to Provide following:-
  - (i) Minimum level of liquid in reservoir at which pump can operate.
  - (ii) Minimum distance of impeller from reservoir bottom.
  - (iii) Min. distance between pumps for trouble free operation.
4. Vendor to provide the suitable strainer for pump suction.
5. Max. Shut off head shall not exceed 120% of the normal differential pressure.
6. NPSHr and Power calculation to be submitted by pump vendor.
7. All material of construction should be suitable for fluids at specified operating parameters.
8. Discharge pressure is at normal flow.
9. Drain and vent connection as applicable shall be with flanged valve connection, companion flanges, gaskets, fasteners.
10. Pump operation shall be parallel.
11. Companion flange, reducer/expander with flange (to match pump discharge Pipeline of 18”) shall be in Pump Vendor Scope. Refer P&ID at Page-5 of 5
12. Pump Discharge Line Size is 18”.





**PROJECT :** Integrated Coal Based Fertilizer Complex  
**PLANT :** Permanent Raw Water Supply System

PC150-PNPR-DD-02

0

DOCUMENT NO.

REV



**PDIL NOIDA**

**CENTRIFUGAL PUMP SPECIFICATION SHEET**

Sheet Page 4 of 5

**JOB NO.-PC-150**

**ITEM:** Intake well Raw Water Pump

**ITEM NO.**

Project: Integrated Coal Based Fertilizer Complex

Plant/Section : Permanent Raw Water Supply System

Reqn./P.O No.

### DRIVER SPECIFICATIONS

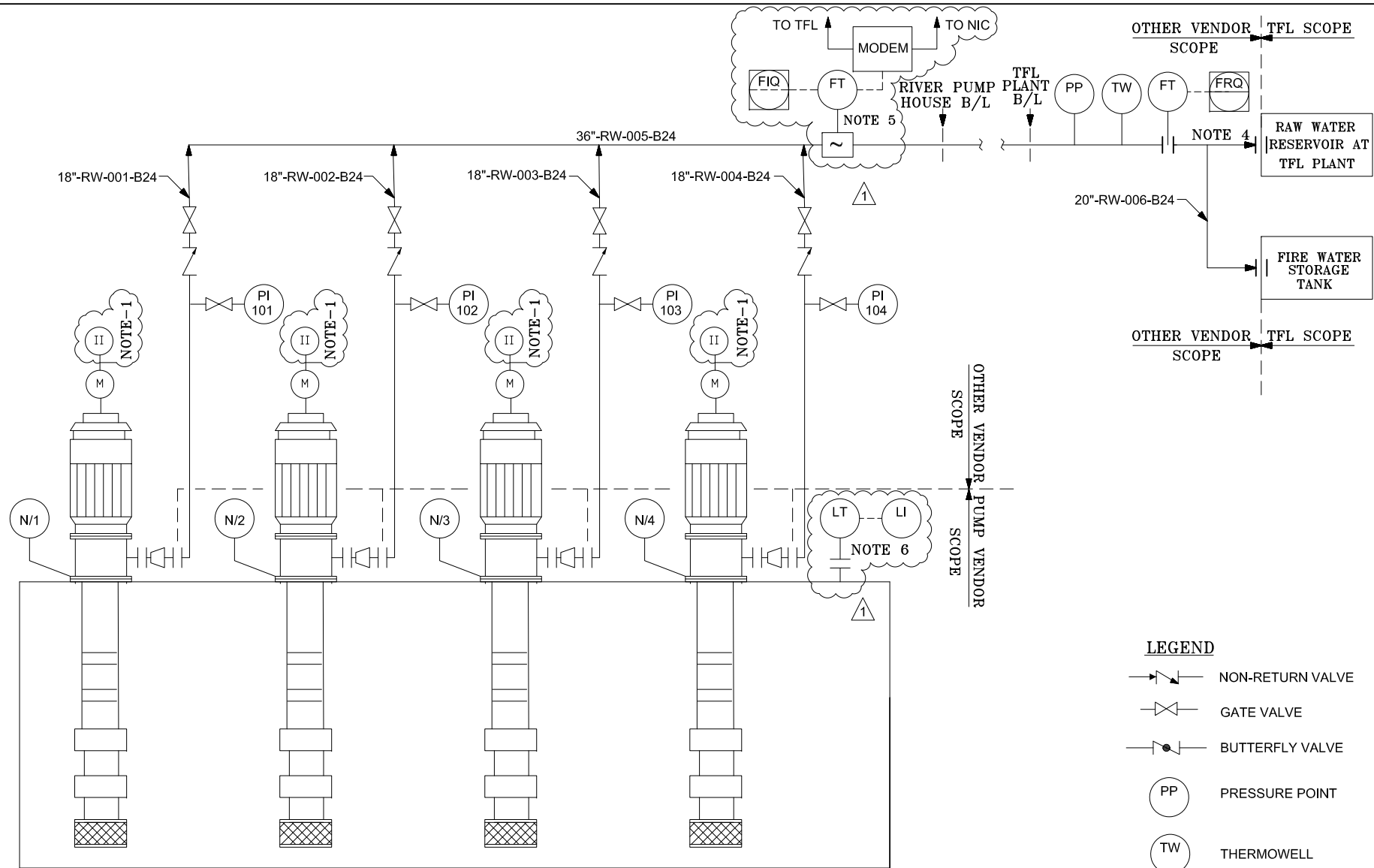
Driver :MOTOR (Note-1)

Type :ELECTRIC

Nos. Required :3W + 1S (Note-1)

Driving Fluid :NA

Steam Conditions :NA



**P-103A** CAP.=1200m<sup>3</sup>/hr HEAD=140m  
**P-103B** CAP.=1200m<sup>3</sup>/hr HEAD=140m  
**P-103C** CAP.=1200m<sup>3</sup>/hr HEAD=140m  
**P-103D** CAP.=1200m<sup>3</sup>/hr HEAD=140m

**PUMP INTAKE WELL**

- NOTE :-**
1. P-103A/B/C/D SHALL BE USED FOR RAW WATER. CONFIGURATION WILL BE (3W+1S). CURRENT INDICATION SHALL BE PROVIDED FOR ALL PUMP'S DRIVERS.
  2. MINIMUM LEVEL REQUIRED FOR PUMP OPERATION SHALL BE CONFIRMED BY PUMP VENDOR
  3. REFER INTAKE WELL DRAWING (CIVIL DEPTT. PHILOSOPHY) FOR THE DEPTH OF INTAKE WELL
  4. SIGNAL TO BE REFLECTED IN C.C.R. FLOW METER SHALL BE ORIFICE TYPE.
  5. CENSORED FLOW METER AS PER WATER RESOURCE DEPTT. ODISHA. CALIBRATION OF FLOW METER SHALL BE DONE IN THE PRESENCE OF WATER RESOURCE DEPTT. AND WEIGHTS & MEASUREMENT DEPTT. FLOW DATA SHALL BE TRANSMITTED TO NIC (NATIONAL INFOMATICS CENTRE) & TFL THROUGH GPRS. FLOW METER SHALL BE ULTRASONIC CLAMPON TYPE.
  6. NON CONTACT RADAR TYPE LEVEL TRANSMITTER.

1	03.03.2020	AMENDMENT	SKK	SK	SCK
0	14.01.2020	ISSUED FOR TENDER	SKK	SK	SCK
REV NO.	DATE	DESCRIPTION	PPD. BY	CHKD. BY	APPD. BY
DOCUMENT/DRAWING NO.					
SHEET 5 OF 5					

 <b>पी डी आई एल</b> <b>PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA</b>	PNPM/PC-150/E/121/SEC-VI	0	 <b>Talcher</b> <b>Fertilizers</b>
		DOCUMENT NO	REV	
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## SECTION: VI - 1.1



### DESIGN PHILOSOPHY – INSTRUMENTATION

### BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES

AT

TALCHER, ANGUL DISTRICT, ODISHA (INDIA)

0	18.07.2023	18.07.2023	ISSUED FOR TENDER	VKS	SG	SKT
<b>REV</b>	<b>REV DATE</b>	<b>EFF DATE</b>	<b>PURPOSE</b>	<b>PREPD</b>	<b>REVWD</b>	<b>APPD</b>



	<b>NIT FOR BALANCE JOB FOR 36" PIPELINE TFL, TALCHER</b>  <b>DESIGN PHILOSOPHY – INSTRUMENTATION</b>	PNPM/PC-150/E/121/NCB	0	
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## ❖ SCOPE

This document describes in detail the scope of work, supply and responsibilities of bidder for carrying out instrumentation activities for this project. The scope includes work/service for engineering, manufacture, testing at works, Third Party Inspection, supply, dispatch, storage, handling, calibration, loop checking, cable supply, cable laying, erection material supply, erection, testing at site and commissioning of complete Instrumentation systems and its associates items as defined elsewhere in this tender. Real time data availability at NIC/ Odisha Water dept centre and TFL control room with storage at the centre through GPRS/GSM/Wireless technology shall be in bidder's scope.

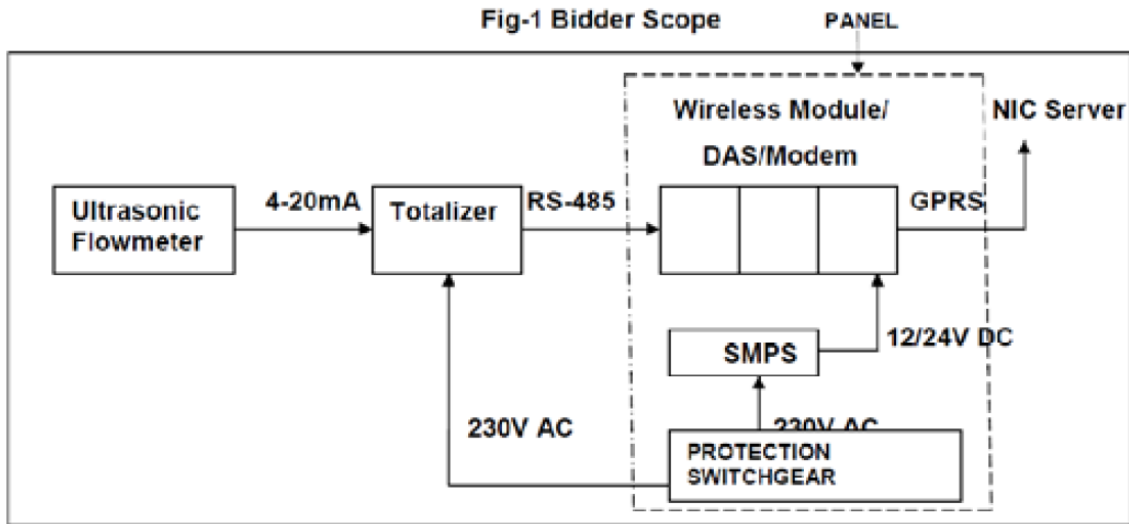
## ❖ DESIGN PHILOSOPHY INSTRUMENT

1. All instruments shall be as per attached P&ID as minimum.
2. Final water Flow (final discharge) measurement shall be selected very carefully for Accuracy and Reliability as water flow measurement may be having direct financial implications. Vendor to provide Clamp-on type ultrasonic flow meter. Upstream and downstream straight lengths shall be as per standard. Accuracy +/-1% or better to be used. Make : EIP Enivro/GE/ E&H/ Krohne/ Siemens.
3. Censored flowmeter as per water resources dept. Odisha shall be considered. Calibration of flowmeter shall be done in the presence of water resources dept. And weights & measurement dept. Flow data shall be transmitted to NIC (National Informatics Centre) / Water resource dept-Odisha and TFL control room through GPRS/GSM/Wireless technology. Its bidder/ flowmeter vendor responsibility take input from Odisha Water resource dept. and provide solution accordingly for real data availability. Any co-ordination with NIC / Odisha Water resource dept. or its any appointed agencies shall be in bidder's scope. Charges for any kind of storage/maintenance or any other charges to NIC / Odisha Water resource dept. for at least **2 years** from successfully commission or handover to TFL, whichever is later, shall be borne by the bidder. Same realtime data shall be available at TFL control room also. All hardware / cloud server / data storage at TFL control room also in bidder's scope.
4. Ultrasonic flow transmitter shall be connected to totalizer or part of totalizer which shall further be connected to wireless data module/data acquisition system and modem to transfer the flow data to NIC server. (Please refer fig-1(typical) for your reference and scope w.r.t FT, totalizer, DAS, Modem etc.).
5. The electronic unit of ultrasonic flowmeter shall be located in operator room for remote display.



	<b>NIT FOR BALANCE JOB FOR 36" PIPELINE TFL, TALCHER</b>  <b>DESIGN PHILOSOPHY – INSTRUMENTATION</b>	PNPM/PC-150/E/121/NCB	0	
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- The complete system shall be supplied in totality (supply erection and commissioning of instrument, totalizer, panel, cable, cable trays, supports, connectors, cable glands, JB, DAS, Modem, cable for remote display cable etc.) and in working condition.



**Figure-1**



- Please refer the updated BOQ/SOR for instrument items. There is no separate instrument control panel as such. All Pump start /stop shall be manual from local push button. Bidder to arrange the power for transmitters/DAS/remote display meter/GSM modem/totalizer etc.
- Bidder to note that GSM/GPRS based communication to the NIC server for instantaneous and totalized flow.
- One no non contact radar type level transmitter shall be provided in sump. The electronic unit shall be located in operator room for remote display (Make- EIP Enviro/ Emerson/ E&H/Siemens/Honeywell.)]
- One no. orifice flow meter and DP transmitter shall be provided at TFL raw water reservoir/fire water tank end.(refer P&ID). This transmitter shall be connected to TFL plant DCS (not in bidder scope).Make Orifice: Baliga, Microprecision, Minco, General Instruments & DP transmitter: E&H/Emerson/Yokogawa/ABB.
- Flow totalizer considered shall not be Mechanical type, instead it should be Electronics type, capable of retaining long term data and gives Report for daily/ weekly/ fortnightly/ monthly/ quarterly/ six monthly and Yearly.

	<b>NIT FOR BALANCE JOB FOR 36" PIPELINE TFL, TALCHER</b>  <b>DESIGN PHILOSOPHY – INSTRUMENTATION</b>	PNPM/PC-150/E/121/NCB	0	
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12. Pressure gauges shall be industrial SS316 Bourdon gauge/diaphragm or spring bellows type as per process requirement with the case in SS316. 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%. (Make : General Instruments, Micro process, gauges bourden, walchandnagar, thermal).
13. Radar level and flow transmitter electronic unit (for remote display), Data acquisition system/wireless data module/modem, temp scanner (please refer electrical scope) shall be housed in local operator room. If, its not possible to place the remote unit in operator room, local indicator shall be placed in the operator room.
14. 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). In case of multi-transmitter installation from a single orifice, a separate identical pair of tapping to be provided with a separate transmitter i.e. no branching from a single tapping is allowed.
15. Swagelok/ Parker/ Hoke compression fittings shall be used for the entire Plant.
16. Execution type for all field transmitters in hazardous/safe area shall be intrinsic safe as applicable. Flame/ex. proof enclosures shall be provided where intrinsic certifications are not available.
17. Flow Transmitter output cable shall be connected to a field JB (Cable and JB shall be in bidder's scope). Signal cables shall be as per BS-5308//IEC/eqiv, FRLS PVC, GI armoured mutual capacitance <60 pf/m, L/R ratio of < 25 microhenry /ohm for 0.5 mm<sup>2</sup> cable and < 40 microhenry /ohm for 1.5 mm<sup>2</sup> cables (shall meet the loop entity values for intrinsic safety class). Cable size shall be min 1P x 1.5mm<sup>2</sup>.
18. Bidder shall supply junction boxes (12 In x 2 Out) of Im6 WITH CABLE GLAND SS 316, flameproof with Ex (d) certification and weather proof as a minimum. Junction Box shall be CCOE/CMRS approved, for specified hazardous area class based on gas group service. All the JB terminals (phoenix make) shall be stud and nut type (CBT) mounted on rails in the junction box. All spare entries shall be provided with SS plugs. All the cable entries shall be from bottom only. SS316 Double compression Cable Gland shall be considered for cable entry.

	<b>NIT FOR BALANCE JOB FOR 36" PIPELINE TFL, TALCHER</b>  <b>DESIGN PHILOSOPHY – INSTRUMENTATION</b>	PNPM/PC-150/E/121/NCB	0	
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## ❖ INSTRUMENT SPECIFICATION

### Ultrasonic Flowmeter

Transmitter Accuracy +/- 1% of reading or better, Enclosure class IP66 or better, Die cast aluminium housing with epoxy paint. LCD indicator with remote sensing cable, Transducer/ suitable contact material and necessary accessories i.e. cable glands, mounting bracket, FRP canopy, gasket, nut bolt etc.

### Non Contact Radar Level Transmitter

Non Contact type Level Transmitter with remount mounted display unit, top mounted, accuracy +/- 2mm, type: Smart Electronic type, Body/flange material: SS316, End Connection: Flanged, End Connection size: 3IN-150#, Enclosure class IP66 or better, Die cast aluminium housing, LCD indicator with remote sensing cable and necessary accessories i.e. cable glands, mounting bracket, canopy, gasket, nut bolt etc.

### Flow Orifice

tapings 1set +1 set spare , flange Size ,rating & matl. 36" 300#RF, A105, plate material SS 316,2 Nos Gasket as Spare. To maintain high accuracy straight length requirement as per standard shall be followed.

### D/P type Flow Transmitters



3 way manifold valves , Cable Glands. Suitable Calib. Range .Smart type; accuracy 0.05% or better including spares.

### Pressure Gauge:

Industrial Pressure Gauge ,SS316 Bourdon gauge/diaphragm or spring bellows type as per requirement with the case in SS316.Process connection : 1/2" NPT (M) ,Dial Size: minimum 150mm,Minimum accuracy : +/- 1%.

### Power Cable

3C x 2.5Sq.mm,1100 V RMS,Cond. Matl:-Stranded annealed copper, Insulation Matl:-XLPE,Inner & Outer sheath sheath matl:-FR-PVC-Type ST2,Overall dia:-15.5mm +/- 1.0 mm. Std: IEC60502-1,IS5831,ASTM D2863,IEC60228. Make: DELTON/KEI/CENTURION POWER CABLE/KEI

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### Instrument Cable



1P x 1.5Sq.mm,600/1100 V RMS,Cond. Matl:-Stranded tinned copper, Insulation Matl:-XLPE,Inner & Outer sheath sheath matl:-FR-PVC-Type ST2,Overall dia:-13.5mm +/- 1.0mm. Std:IEC60502-1,BS5308 Part-1,IS5831,IEC60228,ASTM D2863,IEC60332-1.Make :DELTON/KEI/CENTURION POWER CABLE/KEI

6P x 1.5Sq.mm,600/1100 V RMS,Cond. Matl:-Stranded tinned copper, individual and overall Insulation Matl:-XLPE,Inner & Outer sheath sheath matl:-FR-PVC-Type ST2,Overall dia:-13.5mm +/- 1.0mm. Std:IEC60502-1,BS5308 Part-1,IS5831,IEC60228,ASTM D2863,IEC60332-1. Make :DELTON/KEI/CENTURION POWER CABLE/KEI

Flange connection size shall be as follows:

Thermo-well ( Min. Rating ANSI 300#)	1 ½" Flanged	1 ½" Flanged
Press. Gauge	½" NPT (M)	½" NPT




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**BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF  
PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES**

**SCOPE OF WORK  
FOR  
CIVIL, STRUCTURAL  
AND  
OTHER ALLIED WORKS**

<b>0</b>	<b>17.07.23</b>	<b>17.07.23</b>	<b>ISSUED FOR TENDER</b>	<b>SS</b>	<b>SS</b>	<b>RNS</b>
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

	BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES	PNPM/PC-150/E/121/NCB/VI-2.0	0
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## SCOPE OF CIVIL WORKS

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 process of establishing a world class Coal based fertilizer complex at Talcher, Angul District, Odisha (India).

The proposed plant shall be consisting Coal Gasification Plant, Ammonia Plant and Urea Plant, along with Offsite and Utility facilities, various offices for functional & administrative requirements. Besides above plants & facilities, TFL shall also have its own township complex.

To establish above facility, huge quantity of water will be required. This requirement will be met by drawing water from Brahmani River flowing approximately 13 km away from proposed plant. Water should be first collected at river bank by training the river through intake channel & storing water in the intake well. Intake well would have screens, isolation / sluice gates with spindles, pumps and pumping facilities to pump required volume of water from well to Raw water reservoir and Fire water reservoir in the plant through underground pipeline.

Broad scope of work comprises of balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities:

“Basic Design, Detail Engineering, Procurement, Supply, Manufacture, Fabrication, Transportation of all equipment & material to site including Loading, Unloading, Storage, Maintenance, Construction and Erection of all Civil & Structural (as described in following sections), 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.”

It may be noted that site shall be handed over to the Bidder on ‘as is where basis’ is. Foundations of sub-station and operator building have been constructed and bidder to carry out balance construction works.


Following Tender drawings are attached for reference and guidance to the Bidders:

1. Hydrographic survey in and around intake well TFL, Talcher.
2. Plan & cross section of existing intake well of TFL at Brahmani River.
3. Pipeline Route Survey showing crossings etc.

Detailed scope of work for **civil works** (both supply and services) is described below:

### **1. Bathymetric Survey and Dredging Works**

The **Bathymetric survey** is to be carried out in and around the intake well to ascertain the quantity of river bed material required to be dredged so that there is free flow of water to intake well. There is total number of six gates located at three levels (two numbers of gates at each level). So in order to get the water into intake well during lean season, it is required to remove the river bed material in and around the intake well.

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The Dredging work is required to be undertaken to de-silt the river bed. It has been observed that deposition of river bed material has also taken place just u/s of the intake well which is acting as natural spur and diverting water away from the intake well. This deposition of river bed material is also to be removed in order to have free flow of river water towards intake well.

The approximate quantity to be dredged is about 0.10 MCM (100000 cubic meters) in order to facilitate the flow of water towards the intake well.

River training work and bank protection is also envisaged to be done as per the profile of the Intake channel/river bank.

For reference to bidders, Hydrographic survey in and around intake well is attached with the NIT.

## 2. Architect Planner


Engagement of the services of Architect Planner for the execution of renovation works (including supply of materials); of existing buildings as well as new buildings. The competent architect shall submit the complete master planning with drawings showing all renovation and architectural features as well as finishing items such as doors, windows, gates, electrical wiring and plumbing/sanitary fixtures/ details, painting schedule, false ceiling etc. for approval from PMC/Owner prior to initiating the work.

Broad responsibilities of Architect planner are described below:

1. Develop and implement master plans for buildings including new construction and renovations.
2. Prepare architectural design based on design requirements.
3. Submit planning and architectural design to the PMC/Owner for review/approval.
4. Coordinate with management to determine the project priorities.
5. Develop and implement standard specifications for construction finishes.
6. Provide construction, time, cost, machineries, and other specifications to management.
7. Address issues/inquiries related to space utilization, square footages, cost and finishes etc.
8. Update existing design techniques with respect to latest architectural trends.
9. Develop planning and implementation for Horticulture around the building.
10. Any other activity/requirement of the client related to the architectural need of buildings/outdoor etc.

## 3. Dismantling of existing buildings/structures

Dismantling and demolishing works of old buildings/rooms shall include demolition of plain cement concrete under floor, dismantling of concrete works, old plaster or skirting, raking out joints and cleaning the surface for plaster, existing tiles in floor and wall laid in cement mortar G.I. water supply pipes with all fittings / fixtures / clamps, C.I. pipes (waste water & soil water) with fittings/fixtures and clamps including traps, C.I. or asbestos rain water pipe with fittings and clamps, doors, windows and clerestory windows (steel or wood) shutter including chowkhats, architraves, holdfasts etc., brick work manually/ by mechanical means ,water proofing in terracing, steel work manually/ by mechanical means in built up sections without dismembering aluminum/ Gypsum partitions, doors, windows, fixed glazing and false ceiling.

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#### 4. Construction of New Substation

Construction of New RCC framed structure for Substation (approx. 30 m x 20 m) shall cover all types of requirements for making the building equipped and operational for its intended use.

New construction shall include construction of foundations (if any), columns, beams, slab, roofs, plaster, flooring (PCC & Tiles), anti-termite treatment, roof treatment, water proofing, painting, doors, windows, rolling shutters, gates, tiles (in walls or skirting), rain water pipes, rain protection sheds, ladders, platforms, hand railing, sluice gates, repair of trash rack, grouting, fencing, transformer foundations, area cleaning/grading, pipe supports, construction of new washrooms etc.

Construction of intake guide channel/chamber (if required) along with provision for intake detachable MS screen (with lifting mechanism) in front of sluice gates is also included.

All the above has been described in the items of the SOR. Design and engineering, preparation of construction drawings and fabrication details of all structural and architectural items shall be responsibility of the Contractor. However, contractor shall submit all construction drawings such as foundations, beams, columns, slabs, fencing, pipe supports, finish details etc. for approval to PMC/Owner before commencement of the execution work.

#### 5. Renovation of Intake well and Pump house:

Pump house is an integral part of Intake well which shall house the Pumps and allied Piping facilities. Some minor renovation works of Pump house and Intake well has been done in recent time. However, further renovation works of intake well and Pump house shall cover all type of requirement for making the building equipped and operational for its intended use.

Renovation works shall be based on requirement such as plaster, flooring (PCC & Tiles), anti-termite treatment, roof treatment, water proofing, painting, doors, windows, rolling shutters, gates, tiles (in walls or skirting), rain water pipes, rain protection sheds, ladders, platforms, hand railing, installation of sluice gates, repair of trash rack, grouting, fencing, transformer foundations, area cleaning, pipe supports, construction of new washroom etc.


Tentative Plan and cross-section drawing of existing Intake well is attached with the NIT for reference to the bidders.

#### 6. Construction of new Office/Operator's building

Demolition of old building/rooms and construction of new office building and associated facilities such as washroom etc. for O&M personnel at intake pump house.

#### 7. Design and Installation arrangement of vertical turbine pumps, transformer/DG foundations, transformer/DG rooms, transformer gate, civil supports etc.

#### 8. Balance job of removal and disposal of existing Hume pipe (900mm dia) along approx. 8 km existing pipeline route.

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- i. Locating and survey of existing 900mm buried concrete pipeline and other facilities in the ROU,
- ii. Obtaining work permits/NOC from various statutory authorities having jurisdiction before execution of the work, and complying with all stipulations/conditions/recommendations of the authorities;
- iii. Cleaning & grading of the ROU;
- iv. Counting the number and type of trees cut in presence of DFO/concerned authorities and keeping record thereof;
- v. Cutting/uprooting of trees within ROU,
- vi. Shifting of all obstruction within the ROU/pipeline route alignment viz. electrical line/pole, telephone line (poles), foreign pipelines, coordination with concerned authorities and obtaining work permits/NOC from these authorities,
- vii. Surveys for crossings;
- viii. Trenching to all depths including excavation in all types of soils including chiseling as required for removal of the existing buried pipeline, including removal of pipe casings, valves,
- ix. Making the trench wider and deeper to the required cover as per the requirement of standard specification to accommodate the new 36" pipeline which shall be in the same alignment as the pipeline to be removed,
- x. Deployment of required equipments, machinery & manpower, carrying out necessary co-ordination, liason & interface with local people & other agencies, providing temporary access way/ pathway for local people (as required); Arrangement of all additional land required for contractors storage, access to construction; supply of all materials, consumables; carrying out cutting, lifting, removal , transportation, handling, including loading and unloading of existing pipeline including deployment of trailers, trucks, equipments & cranes;
- xi. Transportation and disposal of the excavated concrete pipes away from the work site, suitable end blinding of the pipeline sections at crossings or sections where pipeline are not/cannot be removed;
- xii. Carrying out all temporary, ancillary, auxiliary works and all incidentals & associated works not indicated herein but required to complete the work as per scope of work, specifications, standards, drawings and other provisions of the contract & instructions of Engineer-in-charge.

## 9. Pipeline Detailed Route survey

Detailed route survey for laying of proposed 36" raw water pipeline is to be conducted by the Contractor. However, Reconnaissance route survey drawing showing all the major road, railways and canal crossings has been attached with the NIT for reference purpose to the bidders.

The detail route survey of existing as well as new proposed raw water supply line needs to be carried out as the same is reported to be overlaid by many encroachments along the route and also, the ROU needs to be re-affirmed.

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Also, it is recommended that distinct demarcation to be placed along the route (at a minimum spacing of approx. 500 m) to avoid any future encroachments. It is proposed to lay the new line side by side to the existing line 1m below FGL.

There are approx. 14 no. of Road crossings, 2 no.'s of Railway crossings and 2 no's of Canal crossings. However, these crossings details are only for reference purpose to the bidders and they may change during actual detailed route survey which is to be done by the successful Bidder.

### **10. General Guidelines**

The Contractor is advised to 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 misunderstandings 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 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.

### **10. Detailed Engineering**

1. The CONTRACTOR shall carryout Analysis and Design of the structures required for this document as per the relevant latest IS codes and shall prepare all the required Architectural, Civil and Structural drawings needed for correct and accurate construction as per the Design Specifications given in this document.
2. The CONTRACTOR shall submit a Detailed Schedule for release of documents and drawings for review / approval to PMC/OWNER, within 2 weeks/or mutually period of date of award of the Contract. The CONTRACTOR shall strictly adhere to the approved schedule. The Format of Submission of the above mentioned schedule shall be mutually discussed and finalized after award of the job.

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3. Construction of various structures / facilities, whose designs and / or drawings are specially identified in the Project Schedule for approval by PMC/OWNER, shall not be taken up for construction at site till they are approved by PMC/OWNER and comments given are incorporated.
  4. For minor other structures / facilities, the CONTRACTOR shall directly submit the Approved for Construction (AFC) drawings to PMC for information before, taking up construction.
  5. It shall be the responsibility of the CONTRACTOR to accommodate all the functional requirements such as access, cutouts, clearances, interference etc. while designing / detailing of various structures / facilities.
  6. Complete analysis, design and all drawings of each independent structure / facility shall be submitted in one lot so as to facilitate overall systematic review by PMC.
  7. Only after the necessary architectural drawings are approved by the OWNER / PMC to their satisfaction, then the design drawings shall be reviewed and approved by PMC.
  8. The CONTRACTOR shall keep the OWNER / PMC informed of any major design revisions simultaneously in progress.
11. **Design Calculations**
1. The CONTRACTOR shall prepare the design calculations based on the standard accepted practice and guidelines from PMC / OWNER.
  2. All design calculations shall be written systematically in excel, legibly and submitted for approval as per standard accepted practice.
  3. For structures, analysis and design shall be done on latest version of STAADPRO SOFTWARE.
  4. For other miscellaneous works Excel and Word shall be used. Design calculations shall be done on A4 size sheet only.

## 12. **Drawings**

The CONTRACTOR shall prepare Civil & structural design & construction drawings, architectural drawings based on the standard accepted practice and guidelines from PMC / OWNER.

- Detail Engineering Drawings
- Bar bending schedules.
- Fabrication drawings.
- As-built drawings.
- Detailing / drafting shall be done on AUTOCAD Latest Version only. Drawing size used shall be preferably of A1 size only. For foundation layout, drainage plans and paving plans, A0 size drawings can be used if necessary.

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### **13. Construction**

1. Construction of all civil and structural works including all procurement of material, labour, Supervision, tools and tackles; dewatering of working area, diversion of nalah/drainage if any, area grading etc. shall be carried out by the CONTRACTOR.
2. Procurement and supply of all materials viz. cement, reinforcement, structural steel etc. shall be in the scope of CONTRACTOR.
3. All materials shall be procured in consultation with the Owner or as per the approved vendor list given elsewhere in this document. All materials of construction must be of ISI approved brands.
4. All materials and construction shall conform to the specification given elsewhere in this document.
5. Materials of construction, construction methodology etc. shall be such, so as to protect the structures and foundations against the harmful effect of chemical, fumes etc. present in the plant, its vicinity, in ground and / or subsoil water.
6. The CONTRACTOR shall be responsible for obtaining the statutory approval from local authorities such as Inspector of Factories, Development Authorities, Municipal Corporation and other concerned authorities before starting the work.
7. The CONTRACTOR shall ensure that the facilities are constructed in accordance with the APPROVED FOR CONSTRUCTION drawings and specifications.
8. The CONTRACTOR shall maintain and operate an adequate system of control of availability of latest drawings and specifications, at all the places where work is performed.
9. Construction shall include excavation in all types of soils / rock inclusive of necessary dewatering as applicable.
10. The CONTRACTOR shall redo / repair all the existing facilities viz. roads, paving, drainage etc. which are damaged during transportation, construction and erection activities performed by him.
11. Rain water harvesting is mandatory for buildings as per Factory Act of State.

### **14.0 Material of Construction**

- **Cement** - OPC 43 grade / OPC 53 grade cement shall be used in all works for foundations, Sub-structure & Super-structure.
- **Concrete-**  
Design mix M20, M25 & M30 grade design mix concrete or otherwise as specified in SOR. Minimum M 25 grade concrete shall be used for RCC works of super-structures and M30 grade concrete for all foundations.
- **Reinforcement Steel**  
The reinforcement shall be of hot rolled, cold twisted, weldable high yield deformed Fe500D properties rebar having Characteristic yield strength 500N/mm<sup>2</sup>, in accordance with table I of IS:1786. Binding wire used for tying the reinforcement shall conform to IS: 280 unless specifically mentioned herein or in engineering drawings.



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- **Structural Steel Works**

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 & IS: 4923. Structural pipes shall be either seamless or mild welded. Spiral welded pipe is not acceptable. All materials shall be procured must be of ISI approved brand of following make:-

- a) Steel Authority of India Ltd
- b) Tata Iron & Steel Co. Ltd.
- c) Rastriya Ispat Nigam Limited
- d) Jindal Steel & Power Ltd

- All materials and supply items shall be procured from approved Vendor list.


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**AND**  
**OTHER ALLIED WORKS**

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REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD


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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 to VI (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.
- 1.3 Site clearing - Site clearing means the cutting of trees, bushes, shrubs etc. and the pulling out of roots and stumps to effect a general cleaning of the site area. All these materials shall be removed from the site area at the **CONTRACTOR's** expenses and responsibility and shall be disposed off as directed by **Engineer-in-Charge**. Trees, bushes, roots, stumps and other materials shall not be disposed off by burning within the site boundaries unless the **Engineer-in-Charge** permits.

## 2.0 REFERENCE CODES & STANDARDS

- 2.1 Wherever reference of BIS Specifications/ or BIS Codes of Practice are made in the Specifications/ Schedule of Rates or Preambles, reference shall be to the latest edition of BIS (Bureau of Indian Standards).

BIS - 109	Ready mixed paint, brushing, priming, plaster to Indian Standard colour No. 631 & 361 white and off-white.
BIS - 248	Sodium bisulphite, technical (sodium metabisulphite).
BIS - 383	Coarse & Fine aggregates from natural sources for concrete.
BIS - 419	Putty, for use on window frames.
BIS - 427	Distemper, dry, colour as required.
BIS - 432	Mild Steel & Medium tensile steel bars.
BIS - 456	Code of Practice for Plain and Reinforced Concrete.
BIS - 515	Natural and Manufactured aggregates for use in mass concrete
BIS - 730	Hook bolts for corrugated sheet roofing
BIS - 800	Code of Practice for General Construction in Steel
BIS - 814	Covered electrodes for manual metal arc welding of carbon and carbon manganese steel.
BIS - 815	Classification coding of covered electrodes for metal arc welding of structural steels.
BIS - 816	Metal Arc Welding for General Construction of Mild Steel.

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BIS - 817	Code of practice for training and testing of metal arc welders.
BIS - 883	Code of practice for structural timber in building.
BIS - 1038	Steel doors, windows and ventilators
BIS - 1079	Hot rolled carbon steel sheets & strips
BIS - 1081	Code of practice for fixing and glazing of metal (steel & aluminium) doors, windows and ventilators.
BIS - 1161	Steel tubes for structural purposes.
BIS - 1285	Wrought aluminium & aluminium alloy extruded round tube and hollow sections
BIS - 1361	Steel windows for Industrial Buildings.
BIS - 1363	Hexagon head bolts, screws & nuts of product grade C : Part - I Hexagon head bolts ( size range M5 to M64)
BIS - 1367	Technical supply conditions for threaded steel fasteners
BIS - 1566	Hard - Drawn steel wire fabric for concrete reinforcement.
BIS - 1786	High strength deformed steel bars & wires for concrete reinforcement.
BIS - 2062	Steel for general structural purposes.
BIS - 2116	Sand for masonry mortars.
BIS - 2212	Code of practice for brickwork.
BIS - 2386	Methods of test for aggregates.
BIS - 2553	Safety glass: Part-I General purpose.
BIS - 2835	Flat transparent sheet glass
BIS - 3007	Code of practice for laying of asbestos cement sheets.
BIS - 4021	Timber door, window and ventilator frames
BIS - 4923	Hollow Steel sections for structural use.
BIS - 4925	Concrete batching and mixing plant.
BIS - 5410	Cement Paint
BIS - 6477	Dimensions for wrought aluminium & aluminium alloys, extruded hollow sections.
BIS - 7318	Fusion welding of steel.
BIS - 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, leveled 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 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.
- 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.

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- 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.
- 3.1.16 Excavation in ordinary soil means excavation in ordinary hard soil including stiff heavy clay, hard shale, or compact murum, or any material, 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**.
- i. Soil
  - ii. Sand



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- iii. Moorum
- iv. Hard-core
- v. Stone/gravel

All back filling material shall be approved by the **Engineer-in-Charge**.

- 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 leveled 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. 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 150mm, watered and compacted with mechanical compaction machines. **Engineer-in-Charge** may however permit manual compaction by hand 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





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500 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 and shall get the approval of **Engineer-in-Charge**.

Clay content : 15% to 20%

Laboratory dry density : Not less than 1600 kg/m<sup>3</sup>

Plasticity Index : Not more than 20.

- 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 BIS: 2720 Part-8. Compacted surface shall have at least 95% of laboratory maximum dry density. A minimum of one test per 500 sq. meters of compacted area shall be done.

- 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 BIS 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.

Prior to rolling, the moisture content of material shall be brought to within +/-2% of the optimum moisture content as described in BIS 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 300 mm thickness and shall be thoroughly compacted to achieve a compaction of at least 90% of laboratory maximum dry density up to a depth of 600 mm below finished grade. 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 150 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 500 sq meters for each layer shall be conducted.

If the layer fails to meet the required density, it shall be reworked or the material

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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.

BIS - 269 Ordinary Portland cement, 33 grade

BIS - 8041 Rapid hardening Portland cement

BIS - 455 Portland slag cement

BIS - 8112 43 Grade ordinary Portland cement

BIS - 12330 Sulphate resistant ordinary Portland cement

BIS - 12269 53 Grade ordinary port land cement


BIS - 6909 Specifications for super Sulphate cement

4.1.2 Water: Water used for mixing and curing concrete and mortar shall conform to the requirements as laid down in BIS: 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 BIS 383 and / or BIS 515. Before using, the aggregates shall be tested as per BIS: 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 BIS: 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**.

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#### 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 BIS-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 (BIS 4926)

#### 4.3 WATER CEMENT RATIO

Once a mix, including its water-cement ratio, has been determined and specified for use by the **Engineer-in-Charge**, that water cement ratio shall be maintained.

#### 4.4 LAYING

Concreting shall be commenced only after the **Engineer-in-Charge** has inspected and passed the sub-base / base or the centering, shuttering and reinforcement. Concrete in slab beams, columns, footings etc. shall be laid gently in layers not exceeding 15 cm and shall be properly consolidated by means of approved mechanical vibrators.


#### 4.5 CURING

- a. After the concrete has begun to harden, it shall be protected with moist gunny bags, sand or any other material approved by the **Engineer-in-Charge** against quick drying. After 24 hours of laying concrete, the surface shall be cured by flooding with water or by covering with wet absorbent materials for 7 days as per the direction of **Engineer-in-Charge**.
- b. Approved curing compounds may be used in lieu of moist curing with the permission of the **Engineer-in-Charge**. Such compounds shall be applied to all exposed surfaces of the concrete as soon as possible after the concrete has set. No extra payment shall be made for the same.

#### 4.6 GRADES OF CONCRETE

4.6.1 Grades of cement concrete shall be as given below:

	Grade Specified	Characteristic compressive strength at 28 days ( N/mm <sup>2</sup> )
i.	M 7.5	7.5 ( 75 Kg/cm <sup>2</sup> )
ii.	M 10	10 ( 100 Kg/cm <sup>2</sup> )
iii.	M 15	15 (150 Kg/cm <sup>2</sup> )
iv.	M 20	20 ( 200 Kg/cm <sup>2</sup> )
v.	M 25	25 (250 Kg/cm <sup>2</sup> )
vi.	M 30	30 ( 300 Kg/cm <sup>2</sup> )

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- 4.6.2 Grades lower than M 25 shall not be used in reinforced concrete.
- 4.6.3 M 7.5 grades of concrete may be used for lean concrete bases & M 10 for simple foundation of masonry walls.
- 4.6.4 A sieve analysis test of aggregates shall be carried out as and when the source of supply is changed without extra charge not withstanding the mandatory test required to be carried out as per CPWD specification.
- 4.6.5 All test 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**.
- 4.7 **NOMINAL MIX CONCRETE**
- 4.7.1 All concrete work (P.C.C / R.C.C.) shall be with nominal mix concrete unless specified otherwise. The proportions of materials used for concrete of grades M5, M 7.5, M10, M15 and M20 shall be as per following Table.

**Proportions for Nominal Mix of Concrete**

Grade of Concrete	Total Quantity of Dry Aggregate by Mass per 50 Kg of Cement (as sum of Fine and coarse aggregates), in Kg, Max.	Proportion of Fine Aggregate to coarse aggregate ( by Mass)	Quantity of water per 50 Kg of cement Maximum in liters.
M 5	800	Generally 1:2 subject to an upper limit of 1 : 1.5 and a lower limit of 1 : 2.5	60
M 7.5	625	-do-	45
M 10	480	-do-	34
M 15	330	-do-	32
M 20	250	-do-	30

**Notes:**

- The proportions of the fine aggregates should be adjusted from upper limit to lower limit progressively as the grading of the fine aggregates become finer and the maximum size of coarse aggregate becomes larger. Graded coarse aggregate as per BIS: 383 may be used.

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2. This Table envisages batching by weight. Volume batching when done, the nominal mixes would roughly be 1:3:6, 1:2:4 and 1:1.5:3 for M10, M15 and M20 respectively.
3. For under water concreting the quantity of coarse aggregate, either by volume or mass, shall be between 1.5 to 2 times that of fine aggregates.
- 4.7.2 The cement content of the mix specified for any nominal mix shall be proportionately increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction, so that water - cement ratio is not exceeded. In case of vibrated concrete, the limits specified, above may suitably be reduced to avoid segregation.
- 4.7.3 If the nominal mix concrete made in accordance with the proportion given for a particular grade does not yield the specified strength, such concrete shall be classified as belonging to appropriate lower grade. However, if the strength results of test are higher than those specified for the grade in the nominal mix of concrete it shall not be placed in a higher grade.
- 4.8 **DESIGN MIX CONCRETE**
- 4.8.1 Design mix shall be allowed for major works where it is contemplated to be used by installing weigh batch mixing plant as per BIS 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.
- 4.8.2 Before commencement of concreting, **CONTRACTOR** shall carry out preliminary tests 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 BIS 10262 at his own cost. The concrete mix to be actually used shall be approved by the **Engineer-in-Charge**.
- 4.8.3 Notwithstanding the above, the following shall be the maximum combined weight of coarse and fine aggregate per 50 kg of cement.

	<u>Grade of Concrete</u>	<u>Maximum weight of fine &amp; coarse aggregates together per 50 kg of cement</u> (for nominal mix only)
i.	M - 10	480 kg
ii.	M - 15	350 kg
iii.	M - 20	250 kg

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4.8.4 The workability of concrete produced shall be adequate, so that the concrete can be properly placed and compacted. The slump shall be as per BIS 456.

4.8.5 The minimum consumption of the cement for design mix shall be as per the standards given in IS codes.

#### 4.9 TESTING OF CONCRETE

4.9.1 Testing of concrete, sampling and acceptance criteria shall be in accordance with BIS 456.

4.9.2 A slump test shall be taken at each mixer at least once in every fifty batches mixed. Any batch for which a slump test is being made shall not be transferred to the place of laying until the slump test has been completed. Any batch which gives a slump in excess of that described at the time of preliminary tests shall be rejected and removed from the site.

4.9.3 At least six cubes shall be taken for every 30 cu. metres of concrete or part thereof deposited in the work on any day. Three cubes shall be tested for 28 days strength.

4.9.4 If a test for particular work does not meet the specified requirements, the **Engineer-in-Charge**, in his absolute discretion may accept the work at a correspondingly reduced rate provided the average strength at 28 days is not less than 85% of the specified strength.

4.9.5 If the results are poorer than 85% of the specified strength, the **Engineer-in-Charge** may order further testing of any kind as may be deemed necessary in his opinion, including load tests. The load tests shall be carried on the portion of the structure involving concrete represented by the unsatisfactory works test and such other adjoining elements of a building as the **Engineer-in-Charge** may decide. If the results of the load tests are not satisfactory, the CONTRACTOR shall at his own cost undertake remedial measures including dismantling and reconstruction according to the directions and to the satisfaction of the **Engineer-in-Charge**. If the load test is successful, the **Engineer-in-Charge** may exercise his judgment before accepting or rejecting the work and shall still have the power to apply a reduction in rate as herein-stated before, in case the work in question is accepted.

#### 4.10 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.

#### 4.11 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 leveled and having a hard and even surface. If the ground is to be



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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.

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, leveling 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 where called for in the drgs.

#### 4.12 **PROTECTION OF CONCRETE**

All concrete shall be protected from damage by rain or by workmen, equipment, overload or any other causes. All edges, corners and projections of concrete members likely to be damaged, shall be protected by means of wooden cover fillets.

#### 4.13 **CONSTRUCTION JOINTS**

Construction joints shall be made only where shown on the drawings or as approved by the **Engineer-in-Charge**. The procedure given in clause 13.4 of BIS: 456 shall be followed for general guidance.

#### 4.14 **SEPARATION JOINT**

Separation Joint shall be obtained by using an approved alkathene sheet struck on the surface against which concrete shall be placed. Adequate care should be taken to cause no damage to the sheet.

#### 4.15 **DAMP PROOF COURSES**

Damp proof course shall consist of cement concrete of specified proportions and thickness. Surface of brick or stone masonry shall be leveled and prepared before laying the cement concrete.



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#### 4.16 **SAMPLING OF CONCRETE**

Sampling & strength Test of concrete, Acceptance criteria and Inspection & Testing of Structure: This shall be as per the requirements laid down in clause Nos: 14, 15 & 16 of BIS: 456.

#### 5.0 **STEEL REINFORCEMENT**

5.1 Steel reinforcement shall comprise

- i. Mild steel bars conforming to BIS : 432 Part-I.
- ii. Cold twisted bars conforming to BIS: 1786
- iii. CRS bars
- iv. TMT bars
- v. Hard drawn steel wire fabric conforming to BIS: 1566

5.2 All joints in reinforcement shall be lapped adequately to develop the full strength of the reinforcement as per provision of BIS: 456 or as per instruction of **Engineer-in-Charge**.


As and when required, welded laps shall be provided as specified by **Engineer-in-Charge**. Following procedure shall be followed for welding of Tor steel reinforcement bars.

1. Welding of Tor steel reinforcement bars shall be taken up only after specific approval by **Engineer-in-Charge**.
2. Lap welding with longitudinal beads shall only be adopted.
3. Welding shall be carried in accordance with BIS 2751 & 9417. Only qualified welders shall be permitted to carry out such welding.
4. For cold twisted reinforcement, welding operations shall be controlled to prevent a supply of large amount of heat, larger than can be dissipated. The extreme non-twisted end portion shall be cut off before welding. Electrodes with rutile coating should be used.
5. Welding procedure shall be approved by **Engineer-in-Charge** and tests shall be made to prove the soundness of the welded connection
6. Stripper at closer spacing shall be provided in the lap welded joints as directed by **Engineer-in-Charge**.

5.3 M.S. round bars shall be hooked at ends as specified. Ribbed Tor-Steel shall be bent at right angles at ends as indicated or directed.

#### 6.0 **FORM WORK**



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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 plywood or steel shuttering.

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 BIS 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 a 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:

- |    |   |   |
|----|---|---|
| a. | Walls, columns and vertical faces of all structural members | 24 to 48 hours as may be decided by the <b>Engineer-in-Charge</b> |
| b. | Slabs (props left under)                                    | 3 days  |
| c. | Beam soffits (Props left under)                             | 7 days  |
| d. | Removal of props under slabs                                |   |
|    | 1. Spanning up to 4.5 m                                     | 7 days  |
|    | 2. Spanning over 4.5 m                                      | 14 days   |
| e. | Removal of props under beams and arches :                   |   |
|    | 1. Spanning up to 6 m                                       | 14 days   |
|    | 2. Spanning over 6m   | 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 BRICK WORK

This specification covers the construction of brick masonry in foundations, arches, walls, etc. at all elevations. The provision of BIS: 2212 shall be complied with unless permitted otherwise.

### 7.1 Bricks

All bricks shall conform to minimum class 7.5 as designated in CPWD Specifications unless specified otherwise.

### 7.2 Mortar

7.2.1 Cement and water shall conform to the requirements laid down for cement concrete work.

7.2.2 Sand for masonry mortar shall be coarse sand conforming to BIS: 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 BIS: 2116.

7.2.3 Mix of mortar for building brick work shall be as specified in the item of work.

7.2.4 Mixing of mortar shall be done in a mechanical mixer. When quantity involved is small, hand mixing may be permitted by the **Engineer-in-Charge**. Any mortar remaining unused for more than 30 minutes after mixing shall be rejected.

### 7.3 Brick Masonry

Brick work shall be built in English bond, unless otherwise specified. The thickness of joints shall be 10 mm  $\pm$  3 mm. Thickness of joints shall be kept uniform. In case of foundations and manholes etc. Joints up to 15 mm may be accepted.

### 7.4 Half Brick Masonry

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 third course.

### 7.5 Fixtures

All iron fixtures, pipe 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 coarse sand : 4 graded stone aggregate 20 mm nominal size) of size indicated in the item.

### 7.6 Curing

Brick work shall be protected from rain by suitable covering when the mortar is green. Masonry work shall be kept constantly moist on all faces for a minimum period of seven days.



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## 7.7 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 M 7.5. Combined aggregate shall be graded as near as possible to BIS : 383. The fineness modules of combined aggregate shall be between 3.6 and 4. The concrete block shall be properly cured as per BIS-456. The surface of conc. block shall have even face without any honeycomb and free from cracks.

### 7.7.1 Mortar

Cement and water shall confirm to the requirements laid down for cement concrete work.

7.7.2 Sand for concrete block masonry mortar's shall be coarse sand generally conforming to BIS: 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 BIS: 2116.

7.7.3 Mix of mortar for building concrete block shall be as specified in the item of work.

7.7.4 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.

## 7.8 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.

### 7.9 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.

### 7.10 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 coarse sand :4 graded stone aggregate. 20 mm nominal size) of size indicated in the item.

### 7.11 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.

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## 8.0 WOOD WORK

All materials workmanship for wood work shall conform to BIS : 883, it shall be good quality well seasoned second class Teak / Sal wood as approved by **Engineer-in-Charge**. The wood work shall conform to BIS: 4021.

## 9.0 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.

### 9.1 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.

BIS – 2062 Hot rolled sections and plates

BIS – 1079 Cold formed light gauge sections

BIS – 1161 Tubular sections

BIS – 4923 Hollow sections (rectangular or square)

### 9.2 Smithy Works

All smithy work shall be accurately made as shown on the drawings and shall be clean and sound. The metal shall not be burnt or injured in any way.


### 9.3 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 BIS-800. All members shall be so fabricated as to assemble the member's 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.

### 9.4 Fabrication Drawings

9.4.1 Fabrication and erection drawings shall be prepared by the **CONTRACTOR** on the basis of design issued to the **CONTRACTOR** in stages. These drawings shall be prepared by the CONTRACTOR or by an agency approved by the **Engineer-in-Charge**.

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- 9.4.2 Fabrication drawings shall be thoroughly checked, stamped "checked" and signed by the **CONTRACTOR**'s own responsible Engineer irrespective of the fact that such drawings are prepared by the **CONTRACTOR** or an approved agency, to ensure accuracy and correctness of the drawings. Unchecked or unsigned drawing shall not be submitted to **Engineer-in-Charge** for approval.
- 9.4.3 Fabrication drawings duly checked by the **CONTRACTOR** shall be submitted to the **Engineer-in-Charge** for checking & approval within 30 days from receipt of design drawings.
- 9.4.4 The approval accorded by **Engineer-in-Charge** on fabrication drawings shall not relieve the **CONTRACTOR** of the responsibility of fabricating and erecting safe and technically sound steel structures as per design drawings.
- 9.4.5 Fabrication drawings shall be drawn to a suitable scale large enough to convey the information clearly and shall include the following:
- Reference to design drawing number (along with revision number) based on which fabrication drawing has been prepared.
  - Structural layout plans, elevations, & sections with distinct erections, & sections with distinct erection marking of all members.
  - Framing plans, member sizes, orientations.
  - Fabrication detail of each and every member.
  - Details of Shop / field joints, connections and splices.
  - Location, type and size of welds and bolts.
  - Shape and size of edge preparation for welding.
  - Bill of material including bolts for connections.
- 9.4.6 The **CONTRACTOR** shall however ensure accuracy of the following and shall be solely responsible for the same.
- i. Provision for erection and erection clearance.
  - ii. Marking of members.
  - iii. Cut length of members.
  - iv. Matching of joints and holes.
  - v. Provision kept in the members for other interconnected members.
  - vi. Bill of materials.

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- 9.4.7 Connections, splices and other details where not shown on the design drawings shall be suitably designed and shown on the fabrication drawings based on good Engineering practice, developing full member strength.
- 9.4.8 The **CONTRACTOR** shall incorporate all the revisions in his fabrication drawings resulting from revision in design drawings during the course of execution of work at no extra cost.
- 9.4.9 The **CONTRACTOR** shall supply three (3) prints of each fabrication drawing submitted for checking to **Engineer-in-Charge**. After approval of fabrication drawings **CONTRACTOR** shall supply six (6) prints and two (2) reproducible of each approved fabrication drawing to **Engineer-in-Charge**. The rates quoted by the **CONTRACTOR** shall include the same.

9.5 Welding

Welding shall be adopted in most of the cases for fabrication of steel structure. Welding work shall be carried out as shown in relevant drawings as per BIS-816 or as required and approved by the **Engineer-in-Charge**. Welding of joints shall be so arranged that the resulting tensile and compressive stresses produced by each part of weld tend to balance each other.

The step back method of welding shall be adopted for continuous runs. Members which offer greater resistance to compression shall be welded first. The work shall be securely held in position by means of tack weld, clamps or jig before commencing of welding work so as to prevent relative movement due to distortion or other cause. All welds with blow holes, slag-intrusion and other defects must be removed from each run before another run is super imposed and also from the final run. Any defects in the work shall be rectified by the **CONTRACTOR** at his own expense. Bends, twists or distortion caused in any member due to faulty workmanship and method adopted during welding or in transit will be rejected and will have to be replaced / rectified by the **CONTRACTOR** at his own expense. According to the size of electrodes used, the **CONTRACTOR** is expected to adjust the current rating in the welding generators.

- 9.6 The **Engineer-in-Charge** reserves the right to have test done at any time for any welding and the cost of the test shall be borne by the **CONTRACTOR**.
- 9.7 Wherever continuous plates are used in built up member such as girders, columns, etc. the continuity of such plates shall be first ensured by full strength butt joints before welding such plates with the main member to form part of the built-up member.
- 9.8 All connection / joints made in shop shall wherever possible be welded connections and connections / joints made at site shall be bolted connections / site welded connections, continuous welding shall be done for all box members even if it is not required from design point of view.

9.9 Electrodes

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Electrodes used for welding shall comply with BIS-814 or BIS - 815 or any specification provided to the **CONTRACTOR** from time to time. No electrodes remaining in open containers for more than 72 hours shall be used.

9.10 No welder shall be employed to carry out welding in any position except those who are fully qualified to weld in that position as per BIS -7318, part-1 qualifying tests for metal arc welders. Welders employed shall be required both before commencing work and at intervals during the progress of work to make test pieces as laid down in BIS - 817 and 7318, part-1 for the purpose of grading of welders and according to the said grading, welders will be employed on jobs. Welders are to be got approved by **Engineer-in-Charge** before engaging on work.

9.11 MS Black/High Strength Bolts and Nuts

M.S.Black or high strength bolts, nuts and washers etc. shall be as per BIS-800, BIS-1363 and BIS-1367. Manufacturer's test certificate shall be made available to the **Engineer-in-Charge** or his representative, when called for. 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:-

- a. 1.5 mm for connected members of thickness below 12 mm and
- b. 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.

9.12 Every portion work shall have its erection mark or number stenciled on the member for guidance in erection and bears all necessary marks of erections as directed by the **Engineer-in-Charge**.

9.13 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 **Engineer-in-Charge** 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 Annexure attached in this enquiry.

9.14 The **Engineer-in-Charge** 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 **Engineer-in-Charge** 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 **Engineer-in-Charge** or his authorized representative.

9.15 Erection and Setting of Steel Structure

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The erection of steel work shall be in accordance with Bureau of Indian Standard Specifications Nos. BIS-800 and BIS - 816.

- 9.16 The **CONTRACTOR** shall be responsible for the suitability, safety and capabilities of all plant and equipment used for erection.
- 9.17 Prior to starting erection of fabricated structure, defects if any shall be rectified. The **CONTRACTOR** shall give to the **Engineer-in-Charge** not less than 24 hours notice of his intention to set out or give levels for any part of works, in order that arrangements may be made for checking. The **CONTRACTOR** shall provide all necessary arrangements and assistance which the **Engineer-in-Charge** may require for checking the setting out.
- 9.18 The **CONTRACTOR** shall erect the structural steel members in position, to dimension, and levels, as in relevant drawings and shall take care to see that component parts are not interchanged. Girders, stanchions etc., must rest fairly on their beds and will not be taken as erected until completely plumbed, aligned leveled, bolted or welded and strengthened, in every respect. The camber, if any, is to be maintained as shown in relevant drawings.
- 9.19 Particular care should be taken to ensure free expansion and contraction wherever provided in the relevant design / drawings or so directed on site.
- 9.20 While erecting, the holes in different component parts of structure should be made concentric with the use of drifts before any service bolts are fitted. No drifting shall be allowed except for bringing together several parts forming a member but the drifts must not be driven with such force as to disturb or damage the metal above the holes. Hammering of bolts to make holes concentric shall in no case be allowed. No nuts should be allowed to become loose and no unfilled bolt holes are to be left in any part of the structure unless otherwise specified in the relevant drawings. Welding should be adopted wherever specified in the drawings. Wooden rams or mallets shall be used in forcing members to position, in order to protect metal from injury or shocks, chipped edges shall be finished off smooth and all concave surface rounded off.
- 9.21 All erection tools and plants viz. derricks, cranes etc. will have to be provided by the **CONTRACTOR** as required in the erection work. All erection devices must be removed after the work is over, in such a way that no damage is done to the erected structures. Any damages, in this respect must be rectified by the **CONTRACTOR** at his own cost.
- 9.22 The maximum tolerance for line and level of the steel work shall be  $\pm 3.0$  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 of height and not more than 7.0 mm per 30 metre section. These tolerances shall apply to all parts of the structure unless mentioned in the drawings issued for erection purposes.
- 9.23 Match Marking & Stamping
- i. All materials shall be match marked to facilitate erection.



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- ii. All pieces shall be stamped on at least two sides with erection marks as per fabrication drawings to facilitate identification on receipt and assembly.

## 10.0 PAINTING ON STRUCTURAL STEEL

For painting of structural steel work, refer Painting Specifications -TS-2001 attached elsewhere with the NIT document.

## 11.0 MS GALVANIZED GRATINGS

MS Galvanized gratings shall be made out of M.S.flats and Tor steel round bars of approved pattern and thickness. All joints are welded together to form a perfect mesh. The details of gratings shall be as per specification.

## 12.0 ALUMINIUM GRATING

- 12.1 Aluminium grating shall be made out of aluminium flats of approved pattern and thickness. All joints welded / reverted together to form a perfect mesh including necessary steel fasteners as required.

## 13.0 STEEL / ALUMINIUM DOORS, WINDOWS AND VENTILATORS

- 13.1 The Steel doors, windows, ventilators and sashes shall be of the size and type as shown on the drawings and/or of the approved make conforming to BIS-1361 and BIS-1038 Fixing and glazing shall be done as per BIS-1081 and as per manufacturers instructions. The putty of approved make such as special gold size or equivalent conforming to BIS-419 shall be used.
- 13.2 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 BIS: 1285 & BIS : 6477 or equivalent as approved by **Engineer-in-Charge**.

## 14.0 NON-ASBESTOS HIGH IMPACT POLYPROPYLENE REINFORCED CEMENT CORRUGATED SHEETS FOR ROOFING AND CLADDING

All non asbestos high impact polypropylene reinforced cement 6mm thick corrugated sheets shall be of the specified approved quality and shall be in accordance with IS-14871 and fixing accessories such as J-bolts, L-bolts, roofs washers, etc. shall conform to BIS-730. Laying and fixing of sheets used as covering for roofs and wall shall conform to BIS-3007 part-I. Holes for receiving the fixing accessories in the crown of corrugation must be drilled and not punched and diameter should be 3 mm greater than the diameter of the bolts to be used. Bolts and screws should be 8 mm or more in dia. and the nuts of the hook bolts, crank bolts should bear a gal vanished iron limpet washers. The screw or bolts should be tightened sufficiently only to seat the bitumen washer over the corrugations so that the natural movement in the substructure of the roof may not damage sheeting. It is essential that the bolt holes are made water tight by the use of bitumen washers in conjunction with suitable G.I.washer. These form essential accessories to good fixing work. A cracked sheet should never be used.



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## **15.0 FLOORING AND PAVING**

### **15.1 Sub Base of floor**

15.1.1 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.

15.1.2 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 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.

### **15.2 Cement Concrete Floor Finish**

15.2.1 The surface of base concrete shall be thoroughly cleaned by scrubbing with coir or steel wire brush. Before laying the toping, the surface shall be soaked with water at least for 12 hours and surplus water mopped up immediately before the toping is laid.

15.2.2 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 toping, 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 toping 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.

## **16.0 PLASTERING**

16.1 Sand for plastering: shall be 50% fine sand and 50% coarse sand from approved sources.

16.2 Preparation of surface shall be done as per CPWD specifications.

16.3 Cement mortar shall be of the mix as indicated in the items and shall be mixed as specified in the CPWD specifications.

16.4 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.

16.5 The surface shall be thoroughly washed with water cleaned and kept wet to saturation point before plastering is commenced.

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- 16.6 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.
- 16.7 All plaster work shall be cured for at least 7 days.
- 16.8 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.
- 16.9 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.
- 17.0 WHITE & COLOUR WASHING AND CEMENT PAINTING**
- 17.1 White Washing
- 17.1.1 Where white wash is indicated, 3 coats of white wash shall be applied. The surface shall present a smooth and uniform finish.
- 17.1.2 White wash shall be prepared from lime slaked at site and mixed and stirred with 5 litres of water for one kg. of unsalted lime to make a thin cream. The cream shall be screened through a clean, coarse cloth and suitable adhesive such as DDL or equivalent as per manufacturer specification. About 1.3 kg of sodium chloride in hot water shall also be added for every 10 kg. of lime for making the coat hard and rule resistant. Indigo shall also be mixed @ 3 gm/Kg of lime. Each, coat shall be allowed to dry before next coat is applied. When dry, the wash should show no sign of cracking. One coat consists of application with brushes in horizontal stroke followed by vertical stroke.
- 17.2 Colour Washing
- 17.2.1 Where colour wash is indicated, one coat of white wash and two coats of colour of tints approved by the **Engineer-in-Charge** shall be applied. Dados and skirting shall not be white washed, colour washed or distempered or painted.
- 17.2.2 Only Colour stainer of approved brand not affected by lime, shall be added to colour wash. Indigo (Neel) shall, however, not be added in colour wash.

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- 17.2.3 The colour wash shall be applied as described for white wash. After the surface has been prepared the first primary coat shall be of white wash. Minimum two coats of colour wash shall then be applied. The entire surface shall present a smooth and uniform finish of even tint or shade.
- 17.3 Distempering
- 17.3.1 Where distempering is indicated, two coats of distemper oil emulsion or dry distemper over a priming coat as specified in the item shall be applied. Each coat of distemper shall be approved by the **Engineer-in-Charge** before next coat is applied.
- 17.3.2 Distemper oil emulsion shall be as per BIS: 248 of approved brand and manufacture. The distemper shall be diluted with water or a prescribed thinner in the proportion of 4 parts of paste by weight to one part of cold water or in the proportion specified by the manufacturer, which shall be invariably followed.
- 17.3.3 The surface to be distempered shall be cleaned of dust, dirt, chalking and other foreign matter. All cracks, holes and surface defects shall be repaired with gypsum to give a smooth surface, and papered and wiped clean. The surface shall then be rubbed down again with sand paper and made smooth. The surface thus prepared shall be given a coat of alkali resistant, priming paint conforming to BIS: 109 or any other primer as specified by the manufacturer and allowed to dry at least for 48 hours.
- 17.3.4 Dry distemper shall be of approved make and shade conforming to BIS 427 and shall be prepared as per manufacturer's specification. The surface to be distempered shall be cleaned of dust, dirt, chalking and other foreign matter. All cracks, holes and surface defects shall be repaired with gypsum to give a smooth surface, and papered and wiped clean. The surface shall then be rubbed down again with sand paper and made smooth. The surface thus prepared shall be given a coat of alkali resistant, priming paint conforming to BIS: 109 or any other primer as specified by the manufacturer and allowed to dry at least for 48 hours.
- 17.3.5 After the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub cut the priming coat and then dusted off. Prepared distemper shall then be applied with brushes in horizontal strokes followed immediately by vertical ones which together constitute one coat.
- 17.3.6 Subsequent coats shall be applied in the same way, with time intervals of at least 24 hours between consecutive coats.
- 17.3.7 A uniform finished surface without patches, brush marks, or distemper drops shall be obtained.
- 17.4 Cement Painting
- 17.4.1 Cement paint: Cement paint shall comply with BIS: 5410 specification for cement paint, of colour as required.

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- 17.4.2 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**.
- 17.4.3 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.
- 17.4.4 On external plastered surfaces, sand faced or plain plastered and concrete surfaces, cement paint shall be vigorously scrubbed on to work the paint into the voids and provide a continuous paint film free from pin holes and other openings. Curing shall be done between the coats and for at least 2 days following the final coat.

## 18.0 GLAZING

- 18.1 Sheet glass glazing of doors, windows etc. shall be of selected quality glass conforming to BIS: 2835. Toughened splinter proof industrial safety glass shall conform to BIS: 2553. No cracked chipped or disfigured glass shall be accepted Glass shall be in one piece for each pan.
- 18.2 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.

## 19.0 METHOD OF EXECUTION WORKS

### 19.1 General

- 19.1.1 The Owner shall furnish the Contractor with only reference points of the job site and a level bench mark, and the Contractor shall at his own cost and initiative, set out the works to the satisfaction of the Engineer-in-Charge but shall solely be responsible for the accuracy of such setting up notwithstanding satisfaction as aforesaid of the Engineer-in-Charge or any other assistance rendered by the Engineer-in-Charge for the purpose.
- 19.1.2 The Contractor shall provide, fix and be responsible for the maintenance of all stakes, templates, level marks, profiles and the like and shall take all precautions necessary to prevent their removal or disturbance, and shall be responsible for the consequence of such removal or disturbance and for their efficient and timely reinstatement. The Contractor shall also be responsible for the maintenance of all survey marks, boundary marks, distance marks and centre line marks, whether existing or supplied / fixed by the Contractor.
- 19.1.3 Before commencing the work, the Contractor shall at his own cost and initiative provide all necessary references, level posts, pegs, bamboos, flags, ranging rods, strings and other materials for proper layout of the work in accordance with the scheme for fixing bench marks acceptable to the Engineer-in-Charge. The centre of longitudinal or face line and cross line shall be marked by means of small masonry

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pillars. Each pillar shall have distinct mark at the center to enable a TOTAL STATION to be set over it. No work shall be started until all these points are approved by the Engineer-in-Charge in writing. But such approval shall not relieve the Contractor of any of his responsibilities in respect of the adequacy or accuracy, thereof. The Contractor shall also provide all labour, material and other facilities necessary for the proper checking of layout and inspection of the points during construction.

- 19.1.4 Pillars bearing geodetic marks located at the site / unit of works under construction should be protected and fenced by the Contractor.
- 19.1.5 On completion of works, the Contractor must submit to the Engineer-in-Charge the geodetic documents according to which the work was carried out.
- 19.1.6 The Contractor shall be exclusively responsible for the provision and maintenance of horizontal and vertical alignments and levels and for the correctness of every part of the work in accordance there with and shall at his own cost rectify any errors or imperfections therein.
- 19.1.7 The Contractor shall at all times during the progress and continuance of the works be responsible for and effectively maintain and uphold in good, substantial, sound and perfect condition of all / and every part of works and shall make good from time to time and at all times as often as the Engineer-in-Charge shall require any damage or defect that may during the above period arise in or be any way connected with works.
- 19.1.8 The portion which is under HOLD shown in the approved drawing or the portion which would be brought under HOLD during execution on account of coordinating different activities of other working agencies shall be taken up by the Contractor to execution only after the said HOLD is withdrawn. The Contractor on this account shall not be entitled to claim for any compensation.
- 19.1.9 The Contractor shall maintain adequate drainage facilities at the work site at all times during the execution of the work.
- 19.1.10 No compensation shall be made by the Owner / Consultant for any damage done by rain or traffic during the execution of the work.
- 19.1.11 The Contractor shall afford all reasonable facilities such as scaffolding etc., and cooperation to the various other agencies and Contractors, for services not included in this contract, who may be working on the site simultaneously so that entire work can proceed smoothly and simultaneously to a successful completion. The Tenderer must take all the aforesaid factors into consideration while quoting his rates. Nothing extra shall be paid on any ground out of or relating to the aforesaid factors.
- 19.1.12 For details of works, materials and workmanship, attention is invited to the "Schedule of Rates", Scope Drawings, Special Conditions of Contract, Materials and Job Specifications, this section, etc. and the Tenderers must quote the rates keeping in full view the requirement of the said documents.

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19.1.13 Except otherwise clearly stated, CPWD Specifications with Correction Slips (latest) shall be followed in all Civil, Structural and other allied Works and in absence of CPWD Specifications for any work, relevant Indian Standard codes of practices (latest) shall be followed. Where there are no Specifications available for any work either in CPWD Specifications or in IS Codes of practices, the work shall be carried out as per the direction of Engineer-in-Charge.

19.1.14 The following notations have been used throughout the "Schedule of Rates" and Materials and job Specifications:

1.	Cu.M	Cubic Metre
2.	Sq.M	Square Metre
3.	m.	Metre
4.	mm	Millimeter
5.	Cm. / Cms.	Centimeter / Centimeters
6.	No. / Nos.	Number / Numbers
7.	Tonne / Te.	Metric Tonne
8.	Kg.	Kilogram
9.	RCC	Reinforced Cement Concrete
10.	PCC	Plain Cement Concrete

19.1.15 The quoted rates shall be applicable for all heights, depths etc. except otherwise clearly stated in the description of items and nothing extra shall be paid to the contractor on this account.

19.1.16 Description of items and mode of measurement for payment indicated herein shall override those given elsewhere if these are at variance.

19.1.17 Any materials / accessories / fittings etc. which may not be specifically mentioned in the description of items but which are normally used or necessary are to be provided by the contractor without any extra cost to Owner / Consultant and the work must be completed in all respects.


## 19.2 DEFINITION OF PLINTH

19.2.1 The portion of a structure between the surface of the finished ground and the surface of the floor immediately above the ground will be considered as plinth, which is generally 300 mm to 600 mm above finished ground level of the site area.

19.2.2 Plinth Level as shown in the drawing shall be treated as plinth level for the purpose of payment.

## 19.3 MATERIALS

19.3.1 The supply / procurement of all materials, required for the job, shall be the responsibility of the Contractor unless otherwise stated in the "Schedule of Rates" and elsewhere in the tender documents. The quality of the materials procured by the Contractor shall be subject to the approval of Engineer-in-Charge or his authorized representative before the materials are allowed to be used in the works. All the materials to be procured by the Contractor shall be in conformity with the CPWD

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Specifications with correction slips (latest) and in absence of which as laid down in the relevant Indian Standard Codes of practices (latest).

- 19.3.2 Transport of all materials shall be the Contractor's responsibility and it shall be at their own risk and cost.
- 19.3.3 The Engineer-in-Charge shall determine the suitability of materials to be used on the job and the Contractor shall get all materials approved by the Engineer-in-Charge. Any material procured and brought to site by the Contractor, found not to conform to the specifications and does not meet the approval of the Engineer-in-Charge, for use, will be rejected, and the Contractor shall remove and dispose off the same at his own cost and he shall not have any claim for compensation in this regard.

#### **19.4 TESTS**

- 19.4.1 According to the nature and importance of works, Owner / Consultant will demand the conduct of tests on concrete and other building materials etc., in which case the Contractor shall get the same done at his own cost in a laboratory to be approved by the Owner / Consultant.
- 19.4.2 Providing and operating necessary measurements and testing devices, materials and consumables are included in the scope of work and the rates quoted shall be deemed to include the cost of such tests which are required to ensure achievement of specified quality of work.
- 19.4.3 Providing and performing the pressure test for plumbing and sanitary fittings before plastering or finishing of wall and floor slits shall be in contractor scope

#### **19.5 EXECUTION OF WORK**

##### **EARTH WORK**

- a. The prices for all excavations shall include for removing and clearing away all shrubs, bushes, roots etc.
- b. The prices for all excavations shall also include for all leveling and ramming foundation beds, trimming of sides and bottom, grading to proper level as required.
- c. Removal and carrying shall include for all loading, unloading and handling as may be necessary and also all necessary means of transport (Mechanical or animal or manual) as required.
- d. The prices are also to include removal of water caused by rain, seepage, spring due to water table or any other cause, either by pumping or by bailing, that may accumulate in the trenches, foundations, pits, etc. It is likely that the subsoil water may encounter during excavation. The Contractor shall be responsible to remove all water accumulated in trenches, foundations, pits, etc. due to subsoil seepage, rainwater or from any other sources. For the above reasons, if the Contractor is required to install some special type of dewatering system, the same shall be arranged by the Contractor at his own cost and nothing extra shall be payable. The



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Contractor shall be fully responsible for removal of all water from the working area including necessary shoring and strutting, etc., wherever required, in order to maintain safe working condition and good engineering practice at his own cost and nothing extra shall be paid on this account.

- e. Where excavations are made in excess of the depth required the Contractor shall, at his own expenses, fill up to the desired level with lean concrete of nominal mix. 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size).
- f. In case of hard / dense soil, the last 150 mm depth of such depth specified in the drawing or decided by the Owner shall be excavated just prior to the laying of plain cement concrete bed.
- g. In case surplus excavated materials are to be disposed off at different leads as per items in the "Schedule of Rates" the distance for such disposal shall be measured over the shortest practicable route as decided by Engineer-in-Charge and not necessarily the route actually taken by the Contractor for disposal. For the purpose of measurement of lead, the area excavated shall be divided into blocks (mutually agreed) and for each block the distance from center of the block to center of disposed material pertaining to this block shall be taken.
- h. For payment of Earthwork in foundations / pits / trenches, etc., the excavation in earthwork volume shall be calculated by multiplying the base area as per the dimensions of mat (lean) concrete indicated in the drawing for different foundations by the specified depth of excavation considering vertical cut up to the bottom of mat concrete level from ground level. Extra excavation carried out by the Contractor with sloping sides or with larger base area or with extra deepening of trenches / pits / foundations, etc. for working convenience shall not be measured and paid for. The payment for back filling and disposal of surplus excavated material shall also be made on the same basis as that for excavation. Therefore excavation, back filling and disposal of surplus earth resulting from the excavation over the mat concrete dimensions and for the depth beyond bottom level of mat concrete as indicated in the drawings shall not be paid for. However, for the cases where waterproofing / acid proofing is indicated as per drawings on outer sides, the mode of measurement shall be as per IS: 1200. Nothing extra shall be paid for sorting / screening of the excavated materials to obtain good earth for filling.
- j. Nothing extra shall be paid on account of any lift for disposal of excavated materials.
- k. Proper precautions shall be taken during the excavations to prevent any damage to the existing structures, pipes, sewer lines etc. If such damage occurs, it shall be rectified by the Contractor at his own expense.

**19.5.2 PLAIN AND REINFORCED CEMENT CONCRETE WORKS**

- a. The prices for concrete beds and slabs are to include for laying on any type of subgrade, laying to falls or camber and for preparing surface to receive concrete.



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- b. All concrete surfaces shall be finished to a fair face to give smooth and even surfaces and nothing extra shall be paid on this account.
- c. The prices are to include leaving pockets, cutouts and holes and to provide wooden boxes or any other suitable arrangement in R.C.C for providing pockets for bolts as per approved working drawings and nothing extra shall be paid on this account.
- d. All pockets / holes are to be properly covered by suitable means, so that dirt, rain water etc., should not enter the pockets / holes etc. No deduction in R.C.C quantity shall be made for pockets and nothing extra shall be paid for providing pockets as mentioned in para 5.02c above.
- e. For measurement of openings in plain concrete / R.C.C work, refer clause No. 4.13 of IS: 1200 (Part-3).
- f. Threads of bolts etc., which have already been fixed in the pockets, are to be greased and properly covered with gunny bags or polythene sheet to protect it from damage from all sources and nothing extra shall be paid on this account.
- g. The prices shall include for all rebating, throating, chamfering, weathering, moulding etc. to accord with the details shown in the approved working drawings.
- h. Nothing extra shall be paid for any intricate work for foundation of equipments and machinery (Static / Dynamic) in R.C.C walls and other superstructure work or in concreting in small and thin sections in P.C.C or R.C.C work.
- i. The prices for concrete are to include for hoisting and / or lowering to any heights and / or depth required and in any type of form work, packing around reinforcement wherever required and finishing the surfaces to fair and even surfaces.
- j. The prices shall include for working up or hacking of concrete surface for providing keys for further concrete work and shall also include all planes, rebated or grooved construction and other joints.
- k. All reinforced cement concrete used shall be of controlled concrete with designed mix and weigh batched conforming to IS : 456 unless otherwise specified. In all concrete and R.C.C work, broken graded coarse aggregate shall be used. The design mixes of concrete of different grades shall be established at the beginning of the work considering the required workability. However, if batching plant facility is not available, only nominal mix concrete is permissible.
- l. Concrete admixtures for workability, if necessary, may be used in R.C.C., if decided by the Engineer-in-Charge. No extra payment for material or mixing etc. shall be made on this account.
- m. Machine and equipment foundations shall mean all foundations including pedestals of vessels, towers, pumps, compressors, motors or any other equipment or machinery (both static and dynamic), pipe supports etc., and / or the like.

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- n. The prices shall include applying cement slurry on reinforced cement concrete surfaces, keys of construction joints etc. @ 2.75 Kg/Sq.m of surface area of receiving cement concrete including roughening and proper cleaning etc., complete as directed by Engineer-in-Charge.
- o. The prices shall include for performing water tightness for all water retaining R.C.C structure as stipulated in IS: 3370 (Part-I), wherever specified in the drawing.
- p. Cement to be used for plain & reinforced cement concrete and other works shall be of Ordinary Portland Cement conforming to IS : 269 unless otherwise stated in the "Schedule of Rates" and elsewhere in this Section of NIT.
- q. Any concrete having honeycomb is not acceptable and shall be rejected and redone at contractor's cost.

#### 19.5.3 REINFORCEMENT AND EMBEDMENTS

- a. Wastage in cutting will not be paid for. Steel actually fixed in position only will be paid by the linear measurement including hooks and laps. Lapping of bars will be allowed only where the required bar length exceeds the standard lengths available. All other laps provided, unless otherwise specified in the drawings, shall not be measured and paid for. Weight of binding wire shall not be measured for payment.
- b. Bars shall be issued in lengths and in forms as available in the stores. Nothing extra shall be paid for de-coiling and straightening of the bars.
- c. Reinforcement is to be tack welded in addition to binding by 18 S.W.G annealed wire wherever necessary to improve efficiency of the joint. Bars of 28 mm diameter and above shall be provided with stitch weld in addition to binding with 18 SWG annealed wire and nothing extra shall be paid for stitch welding. Welding of mild steel plain and deformed reinforcements shall conform to IS: 2751, 'Code of practice for welding of mild steel plain and deformed bars for reinforced concrete construction'.
- d. The Contractor shall prepare the bar bending schedule for all reinforced cement concrete work as per the approved / "good for construction" drawings furnished by the Owner / Consultant and nothing extra shall be paid on this account.

#### 19.5.4 SHUTTERING

- a. The prices for shuttering shall include for providing splayed edges, notching, chamfering, allowances for overlaps and passing at angles, battens, strutting bolting, wedging, easing, striking and removing.
- b. The concrete work should have ply wood / steel shuttering as not to require any plastering, after striking out the shuttering. Any concrete having honeycomb is not acceptable and is liable to be rejected and redone at Contractor's cost.
- c. The prices are also to include for all necessary supports, struts, braces, etc., dressing with shuttering compound and / or other approved method to prevent adhesion between concrete and form work and all raking for circular cutting and waste.

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- d. The prices shall also include for all labour and materials necessary for providing form work at all heights and depths and including striking, dismantling the form work assembly etc. after the necessary stripping period of concreting is over and also making all the joints in shuttering fully leak-proof providing low density polythene sheets / bitumen paper.
- e. The prices shall also include for forming detailed design required for the form work and / or all other sundry labour.
- f. All shuttering shall be either plywood or steel shuttering to produce plain, smooth and even surfaces, which will thus be integrally finished. If any impressions of the shuttering joints are noticed after the striking of the shuttering, the same should be treated by rubbing with Carborundum stones and nothing extra shall be paid on this account.
- g. In case of dowel bars projecting out from R.C.C works such as columns, beams etc. nothing extra shall be paid for any special provision like making holes that may be required to be left in the form work.

#### 19.5.5 MASONRY WORKS

The prices for brick work shall include the following:

- a. Fair face of brick work with selected brick with class designation 75 or as specified in the description of relevant Items in the "Schedule of Rates" from the lot.
- b. Raking out joints for plastering and pointing done as separate process of finishing joints, flush as the work proceeds.
- c. All rough and / or fair cutting and waste unless specifically stated otherwise.
- d. Plumbing to angles.
- e. Providing holes left or formed for fixing pipes etc.
- f. Forming reveals to the jambs, where fair cutting on exposed face is not involved.
- g. All masonry work shall be done using mortar with coarse sand.

#### 19.5.6 WOOD WORK AND JOINERY

- a. All joiners' work shall include necessary nails and screws, and all other necessary materials.
- b. The description includes all necessary keys, wedges, dowels, hard or bamboo pins, pined tenon joints and cleaning of nail heads.
- c. Nothing extra will be paid for rebated and / or splayed meeting stiles of doors and Windows.

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**19.5.7 STRUCTURAL STEEL WORK**

- a. The weight of structural steel work for the sake of payment shall be calculated by linear measurements and unit weight taken from the relevant IS codes based on approved fabrication drawings assuming all members to be cut square without making any deduction for bolts, bevel ends or edges, beveling of plates. Gusset plates shall be paid for minimum rectangle enveloping their actual periphery.
- b. Welds, black-bolts, high tensile bolts, nuts, plain and tapered washers etc. shall not be measured and paid for. Rate for the structural steel work shall be deemed to include the same. Nothing extra shall be paid on this account.
- c. Nothing extra shall be paid over the unit rates for structural members to be built up by butt or fillet welding as indicated in the approved fabrication drawings or as per the instruction of Engineer-in-Charge, from either:
  - i. Plates.
  - ii. Two or more rolled steel sections.
  - iii. One or more rolled steel sections and plates.
- d. Nothing extra shall be paid over the unit rates for sealing the joints of box sections made out of channels or joists by continuous butt welding.
- e. All paints and primers specified in various Items in the "Schedule of Rates" shall be best quality of approved brand and manufacturer such as M/s. Asian Paints, M/s. Berger Paints (India) Ltd., M/s. Johnson & Nicholson and / or other equivalent paint approved by the Engineer-in-Charge.
- f. On box / compound sections, the painting shall be done before fabrication on all those surfaces which become inaccessible after fabrication.
- g. Prior approval of the Engineer-in-Charge shall have to be obtained for changing the sections due to non-availability of certain sections and using built-up sections / compound sections and nothing extra shall be paid on this account.
- h. The word "Fabrication" wherever used for the description of work herein shall include: Straightening, cutting, notching, beveling, drilling or cutting holes, necessary welding, fastening, etc. to prepare the structural member as per fabrication drawings.
- i. The word "Erection" wherever used for description of work shall include:  
Hoisting, putting in position at all required heights, aligning and fixing with necessary welding, bolting and / or other fasteners as per approved drawings and technical specifications with all safety standards.
- j. Preparation of "AS-BUILT" construction drawings incorporating all approved changes at site shall be in Contractor's scope of work and it shall be considered included in relevant Items of the "Schedule of Rates".
- k. For sand blasting / painting by the specialized agency other than indicated in the NIT, if proposed by the Contractor, the same shall be got approved from the Engineer-in-Charge at site.

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- l. The Contractor shall prepare design of joints and detailed fabrication and erection drawings in sequence of erection on the basis of detailed design drawings supplied by the Owner / Consultant from time to time. Nothing shall be paid extra on this account. The above fabrication drawings must show clearly all shop and site joints and connection with erection marks on each loose part.
- m. The Contractor shall submit his design calculations for the design of joints. All joints shall be designed for full strength of the members or otherwise as indicated in the design drawings.
- n. The design calculations of joints and fabrication drawings will be checked and approved by the Owner / Consultant as per mutually agreed time schedule and the Contractor should strictly adhere to these approved drawings and specifications. Fabrication work shall be taken up only with the approved fabrication drawings.

#### 19.5.8 STEEL AND ALUMINIUM DOORS, WINDOWS & VENTILATORS

- a. The prices are to include for necessary hardware fittings and fixtures as specified and fixing to frames with necessary lugs etc., all necessary chases, holes, etc., grouting of holes and making good to match after doors, windows and ventilators, etc. are fixed. The price of steel doors / windows / ventilators is also to include application of required primer and paint of approved shade, make and manufacturer.
- b. The prices shall also to include for providing good quality glass panes of required thickness as indicated in the "Schedule of Rates".

#### 19.5.9 FLOORS AND BASES


- a. The price for hard core shall include for all labour in laying to falls or camber, hand packing, edges of haunches forming splayed edges, watering and rolling with power driven roller and ramming wherever required to solid compaction.
- b. The prices shall include also for works at all heights and depths.

#### 19.5.10 FINISHING WORKS


- a. The prices shall include for work at any height / depth and for all necessary scaffolding etc. as required.
- b. The prices shall include for providing and laying of materials for all the items of plaster and also raking to form key for plaster and for all work in narrow width, formed angles, chamfered external angles and for making good the faces.

#### 19.5.11 MISCELLANEOUS

- a. The Contractor may have to splice shorter length of structural steel members to obtain required length at site. If extra pieces of materials are required for splicing (say for lap jointing) then the same will be measured and paid for in the relevant structural steel items and nothing extra on any other account shall be paid to the Contractor for such splicing.

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- b. The Contractor should note that steel wedges, packing plates, shim plates, etc. used by them for leveling and alignment of structural members are to be considered erection devices and these should be taken out after proper alignment is over to the satisfaction of Engineer-in-Charge. Such erection devices shall neither be measured nor paid for.

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**TECHNICAL SPECIFICATION  
FOR  
ROUTE SURVEY**

**CONTENTS**





**TECHNICAL SPECIFICATIONS  
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## **1.0 SCOPE**

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This specification covers the minimum requirements of topographical survey along the pipeline route including locating the centre-line of pipeline alignment on the ground, field measurements for Planimetry and profile and preparation of drawings and documents.

## **2.0 REQUIREMENTS**

- 2.1 All survey works shall be performed by or under the supervision of a qualified land surveyor.
- 2.2 All measurements shall be in metric units.
- 2.3 The readings and noting shall be neat, legible and scorings and over-writing shall be dully initialled by the Surveyor.
- 2.4 All survey shall be carried out using approved methodology and equipments e.g. DGPS, GPS. Total Stations, Auto levels, High precision Theodolite etc.


## **3.0 PRELIMINARY AND LOCATION SURVEY**

### **3.1 Reconnaissance surveys**

- 3.1.1 TFL/PDIL will provide only start and end location of survey and contractor will procure required SOI map, satellite imageries and other document at his own cost. Contractor has to carry out table top study and subsequently field verification for route identified based on table top study'.
- 3.1.2 Contractor has to make critical evaluation of alternate routes and will recommended for techno-commercial feasible route based on merits and demerits to TFL/PDIL and shall obtain approval of most feasible route before start of detailed engineering survey.

### **3.2 Alignment and location surveys:**

- 3.2.1 A preliminary survey for locating the centre-line of pipeline alignment on the ground shall be carried out and where it becomes apparent that a better route could be followed, the Surveyor shall consult TFL/PDIL for authorization to make change.
- 3.2.2 Turning Points (TPs) shall be located by Surveyor considering the following :
  - To avoid obstruction along the line, by ranging on ground and shifting the Turning Points if need be
  - Check for terrain gradient by using hand clinometers / other suitable equipment.
  - Ensure proper angle of crossing by keeping as nearly right angle to road / rail / streams etc. as far as possible.

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- To check from construction point of view and avoid objects like power, telephone and telegraph poles, walls, tube wells or such other structures falling in the strip of land, 50 m on either side of pipeline alignment.

### 3.3 Staking of pipeline route

3.3.1 The pipeline defining trench centre line shall be staked by placing suitably painted marker stakes at Turning Points (TPs) and at Intermediate Points (IPs) between consecutive TPs. All turning points (TPs) and intermediate points are referred as Intersection Points. The pipeline centre line shall be staked on the ground as follows:

First, the Turning Points (TPs) shall be staked on the ground. After locating and marking the TPs, the intermediate points shall be staked while measuring slack distance. The staking shall normally be done at intervals of 250 m approx along the centre line of the pipeline.

3.3.2 The intersection Points shall be serially numbered from the starting point. The serial number of each Intersection Point shall be boldly inscribed on the marker stake. In addition, the Turning Point (TP) marker stake shall identify the Turning Point reference number from the starting point.

3.3.3 For Intermediate Points (IPs) letter "P" shall precede the serial number of the intersection Point maker. For Turning Points, the letters "IP" shall precede the Turning Point reference number and the letter "P" shall precede the serial number of the Intersection Point.


3.3.4 The marker stakes at Turning Points (TPs) shall be referred with three reference stakes around the TP. The reference stakes shall carry the Turning Point reference number and their respective distance from the TP marker stake.

3.3.5 Change in direction of line shall be marked on the TP marker stakes. In addition, direction markers near TPS and other locations shall be placed wherever necessary.

### 3.4 Stakes and Marker

3.4.1 All marker stakes shall be of pre-cast reinforced cement concrete (1:2:4) pillars or stone, having tentative dimensions of 150 X 200 X 800 mm and shall be buried to a depth of about 500 mm at intervals of 250 m approx along the centre line of the pipeline.

If, pre-cast RCC markers are provided, it should have reinforcement of 04 nos-6 mm dia bars with 04 equally spaced rings of 6 mm dia. All pre-cast RCC pillars should be engraved with TFL name on one shorter vertical face. In case of stone pillars, TFL to be written with the paint.

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The exposed surface of the blocks shall have a smooth finish and shall be painted with Red Paint. All letters and figures shall be paint marked on the surface of the blocks in white.

3.4.2 On the top surface of the marker, a cross inside a circle shall be engraved at the centre or a nail shall be put centrally inside an engraved circle, to indicate the exact position of the Intersection Point. The circle shall be of approximately 50 mm diameter. In case of stone markers, a cross inside the circle at the centre of stone shall be made with the paint.

3.4.3 Surveyor can, however, propose to TFL/PDIL other types of stakes / markers which are better suited to site conditions.

#### **4.0 BENCH MARKS**

4.1 Bench Marks (BM) at approx. every 5 Km on permanent structures along the Right-of-Use (ROU) i.e. within 100 m side of RoU, shall be established and described. Additional bench marks shall be established near the major pipeline crossing sites, if any.

#### **5.0 CROSSINGS**

##### **5.1 General**

As far as possible, crossings shall be made right angles. The surveyor shall record the angles of crossing for all fences, property lines, utilities, railways, canals streams, etc. that are crossed. In addition, the true bearings of the centerline of the road, railway, canal as well as that of the pipe centre-line shall be recorded. Turning Points (TPs) provided near crossings shall be located, at least 50m from the crossing's boundaries, in stable and firm ground.


##### **5.2 Railway Crossings**

The angles for all railway crossings shall be as close to 90 degree as possible, but in no case less than 85 degrees to the centre-line of the railway. The details of other features of railway track such as electric & telephone pole no & their respective distance from the centre line of the pipeline. Also distance of nearest railway station to be given along with MSL, of the crossing.

5.3 The angles of crossing for secondary roads shall be as close to 90 degrees as possible, but in no case less than 45 degrees to the centre-line of the roads. All temporary roads, unpaved village roads, cart-tracks, etc. come under the category.

##### **5.4 River/Stream/Nala Crossings**

These crossings shall be established as close as possible to the locations shown on the route map. Crossings shall be located in a comparatively straight each of the river where

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the banks are stable and there is sufficient area for construction. Angle of crossing shall be as close to 90 degree as possible.

### 5.5 Canals/Drainages Ditch Crossings

The angle of crossing shall be as close to 90 degrees as possible but in no case less than 60 degrees to the centre-line of the canal / drainage. Crossings shall be located where there is no evidence of slumping or corrosion of banks or bed.

### 5.6 Utility Crossings

Utilities crossed shall be located at centre-lines with stakes containing station numbers in the survey. The angle of crossing shall be measured and locations established relative to their above-ground facilities. The names and sizes of all utility lines shall be included in the survey notes. In cases of overhead power and telephone lines, the distance to the poles and towers on each side of the survey line shall be measured, and the numbers of poles or towers noted. Line voltage shall also be recorded. Wherever possible, the survey shall be established so that there is a minimum distance of 50 meters from the survey line to the nearest High Tension pole or tower.

## 6.0 ACCURACIES IN MEASUREMENT

6.1 Surveyor shall incorporate corrections to the linear ground measurement due to standard errors, variations from standard errors, variations from standard temperature and pull.

6.2 The error for angular closure for the work shall not exceed one minute per station and for linear measurements it shall be read to the nearest 0.005 M

6.3 The observations for measurement of vertical distances on bench marks shall be read to accuracy to the nearest 5 mm and for Intersection Points and other points also Pipeline route and at crossing to the nearest 10 mm.


## 7.0 CHAINAGE

7.1 Distance between Intersection Points staked along the pipeline route shall be measured and recorded. In addition, distance between level points shall also be measured and recorded.

7.2 Chainage will be continuous in the direction of survey.

7.3 The true bearing of all straights shall be observed and recorded.

7.4 Data on nature of terrain, viz sandy, stony, marshy, vegetation, etc. and type of ground will also be recorded along with chainages of change of points.


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## 8.0 MEASUREMENT OF HORIZONTAL ANGLES

- 8.1 Horizontal angles are measured to indicate the change in direction of alignment and specify the horizontal bend at the Turning Points.
- 8.2 The line at both ends shall be tied to the grid control system being used for end facilities. True bearing at the beginning, end and every 15-20 KM shall be observed to keep a check on errors in angular measurement.

## 9.0 PROFILE

- 9.1 The continuous profile of the proposed pipeline route shall be established from the reduced levels (RL) taken
- i) At starting point
  - ii) At all Turning Points (TPs)
  - iii) At all Intermediate Points staked on the ground.
  - iv) At all points on the pipeline route where there is a change in slope.\
  - v) Profile of obstructed area by depth/height
- 9.2 When the terrain is flat, reduced level shall be additionally recorded along the pipeline route at 100m interval.
- 9.3 When the terrain is undulating observation of reduced level shall be made at a sufficient number of points so as to given an accurate plotting of the ground profile along the route.
- 9.4 For road and railway crossings, the reduced levels shall be recorded at all points along the pipeline alignment wherever there is a change in slope within the entire width of the Right-of-Use of the road/railway. Contractor shall prepare a detailed drawing for the crossing in scale 1:100 (in both horizontal and vertical directions) which shall be truly representative of the crossing profile.
- 9.5 For river / stream/nala/canal crossings, levels shall be taken at intervals of 5M up to 30M beyond the highest banks on both sides. Levels shall be taken at closure intervals, if there is a change in slope. Contractor shall prepare a detailed drawing for the crossing in scale 1:100 (in both Horizontal and Vertical directions) which shall be truly representative of the crossing profile.
- 9.6 In Right-of-Use having slope across the pipeline alignment, as encountered in hilly areas, Ghat regions, ravines and other similar areas as directed by TFL, cross-section at 50M interval and for a length of 50M on either side of the pipeline alignment shall be observed and recorded.
- 9.7 For major water crossing sites, cross section as above shall be observed at both banks.

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9.8 Maximum misclosure shall not exceed  $24 \sqrt{K}$  mm where 'K' is the distance in Km  
Maximum length of line of sight shall not exceed 100M.

9.9 All levels shall be with respect to Mean Sea Level (MSL).

## 10.0 **BUILT-UP AREAS**

### 10.1 **Monuments and Properties**

The pipeline alignment shall run clear of the existing monuments, properties and structures etc., as indicated in pipeline Route Survey Data Sheet (Annexure-IV).

For congested areas, closer distance may be adopted; however, location shall be approved by TFL.

### 10.2 **Parallel Alignment**

The pipeline alignment wherever runs parallel to an existing or planned under / over ground facility will be treated as parallel alignment. For underground facilities surveyor shall identify and locate them with suitable special ground laths. The following clearances shall be observed in case of parallel alignment defined above.

- Between existing / planned electrical power cable /lines and the proposed line – 50.0 metres.
- Between existing/planned communication cables/lines and the proposed line – 25.0 metres.

### 10.3 **Parallel Encroachment**

Unless otherwise stated, when the pipeline alignment runs generally parallel to a road or railway it shall be kept sufficiently clear of the Right of way limits of the facility.


## 11.0 **SURVEY NOTES, OBSERVATIONS AND COMPUTATIONS**

11.1 The procedures followed both for field and office calculations shall be such that the results obtained shall be maintained by surveyor.

11.2 All up-to-date notes and observations related to the basis for determination of boundary lines and corners shall be maintained by surveyors.

11.3 Survey records must contain schematic diagrams of all horizontal controls pertinent to the project showing all existing and established control points, bench marks, any triangulation station and boundary lines.

11.4 Geo-graphical and UTM co-ordinates of all Centre line, Turning Points and starting/end points of the pipeline shall be computed and furnished to the TFL.

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## 12.0 MAPS AND DRAWINGS

12.1 All maps and drawings shall be made on standard format. Surveyor shall perform mapping and drawing work so as to contain all relevant data consistent with the survey notes and observations. The drawings shall also contain details of roads, streets, highways, structures, all types of crossings, terrain, surface vegetation and all other details which will be required for the purpose of engineering design.

12.2 Following types of detailed survey drawings will be made

- Right-of –Use Planimetry in UTM grid : 1:2500 along the line  
: 1:2500 across the line
- Ground Profile : 1:2500 Horizontal  
: 1:250 Vertical
- Crossing Details (Road, Railway, Stream, Nala & Canal) : 1:100 Horizontal  
: 1:100 Vertical
- Crossing Details (River Crossing), Up-to 250 M width : 1:200 Horizontal  
: 1:200 Vertical
- Up to 500 M width : 1:500 Horizontal  
: 1:500 Vertical
- Greater than 500 M width : 1:1000 Horizontal  
Up-to 250 M width) : 1:1000 Vertical
- Detailed Pipeline Route Map : 1:50,000 on SOI Topo Map
- Additional Route Map for Hilly, Ghat and ravenous regions : 1:15,000
- Crossing Section for sloping Right-of Use : 1:100 Horizontal  
: 1:100 Vertical


**Note:** Crossing drawings shall be prepared using same horizontal and vertical scale as indicated above. No. of sheets may increase, if required.

## 13.0 PRESENTATION OF FIELD SURVEY DATA

### 13.1 Survey Drawing

- Survey drawing shall contain the following data as a minimum requirement.
- Right-of-Use Planimetry drawings shall show all objects within 50 metres on either side of the Pipeline in Plain.




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- In case of all rail, road, river, steam, canal and utility crossings, the angle of crossing shall be mentioned.
- In case of rail, road, river, stream and canal crossings wider than 10m, the distances at the start and at the end of the crossing from the nearest IP shall also be mentioned. For crossings less than 10m, the distance of the centre line of crossing from the nearest IP shall be given.
- For all river, stream and Nala crossings, the level of water at the time of survey and the approximate surface velocity of the flowing stream shall be observed and recorded and reported in the survey drawings. Also, the general nature of the surface soil (soft/hard, normal soil or rock/boulders) at the bed and banks of the River/Stream/Nala shall be observed and mentioned in the drawings.
- “Ground profile (chainage vs ground elevation) for the entire pipeline route shall be prepared and presented in a tabular format.

### 13.2 Pipeline Route Map

- Sanctuary, National Park, Coastal Regulatory Zone (CRZ), Eco Sensitive Zone (as notified by the respective authorities / Govts.), Reserved forest and the like that are located within a distance of 10 km radius from the pipeline centre-line. These details are to be highlighted in the route map.
- Pipeline route map shall show all features including, but not limited to roads and railroads, canals, streams, lakes, rivers, villages, towns, etc. within a distance of 10 km radius from the pipeline centre-line.
- Other points of interest like Hospital, Police Stations, Fire Stations, Office of the District Authorities and the like within a distance of 10 km radius from the pipeline centre-line.
- Additional information like cultivated areas, barren land, areas prone to flooring, rocky areas and forests including access path/roads to Right-of Use shall also be shown on the route maps.
- Additionally for areas which are undulating such as hilly areas, Ghat regions, ravines, and other areas as directed by TFL, Pipeline route map to a scale 1:15,000 shall be drawn over a distance of 1.0 Km from the pipeline centre-line on either side of it.
- For such areas, contours shall be plotted at 10 m contour interval.
- Right-of Use Planimetry drawings shall show all objects within 50 metres on either side of the Pipeline in Plains.
- In case of all rail, road, river, steam, canal and utility crossings, the angle of crossing shall be mentioned.
- In case of rail, road, river, stream and canal crossings wider than 10m, the distances at the start and at the end of the crossing from the nearest IP shall also be mentioned. For crossings less than 10m, the distance of the centre line of crossing from the nearest IP shall be given.

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- For all river, stream and nala crossings, the level of water at the time of survey and the approximate surface velocity of the flowing steam shall be observed and recorded and reported in the survey drawings. Also, the general nature of the surface soil (soft/hard, normal soil or rock/boulders) at the bed and banks of the river/stream/nala shall be observed and mentioned in the drawings.
- “Ground profile (chainage vs ground elevation) for the entire pipeline route shall be prepared and presented in a tabular format using Microsoft Access Database format”.

#### **14.0 DOCUMENTS/DATA SUBMISSION**

Four sets of hard copies of all approved survey data/documents and Detailed Route Survey Report shall be submitted to the TFL/PDIL.

All drawings/reports/formats etc. related to Detailed Route Survey shall be submitted to the TFL/PDIL. It shall be prepared on electronic media. All drawings/sketches shall be prepared using latest version of AutoCAD. In addition, final approved survey data / documents shall be submitted in soft to TFL/PDIL as Hard Disc/CD.

BRAHAMANI RIVER

N 2317900.000

N 2317800.000

N 2317700.000

N 2317900.000

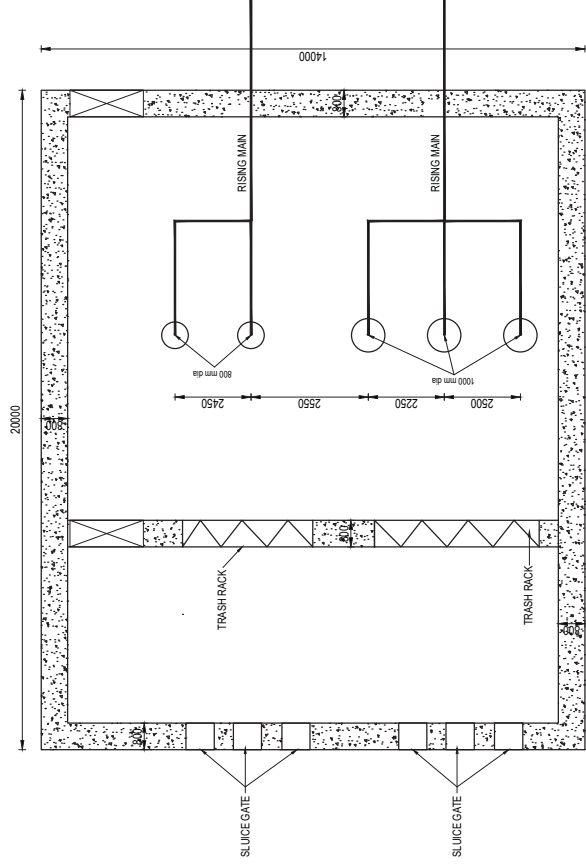
N 2317800.000

N 2317700.000

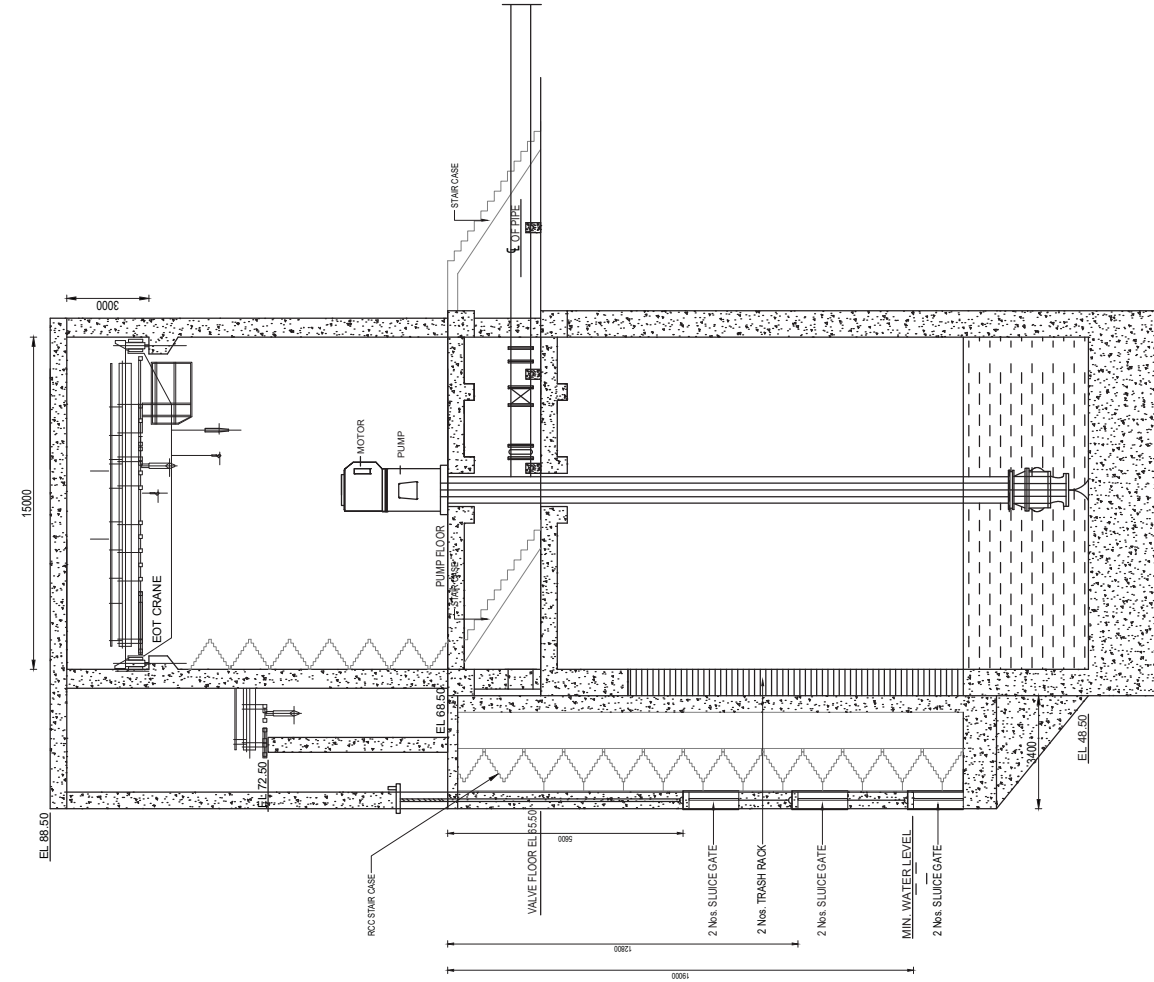
PHD INTAKE WELL

TFL INTAKE WELL

CLIENT:	TALCHER FERTILIZERS LIMITED
PROJECT:	REHABILITATION STUDY OF EXISTING INTAKE WELL TFL, TALCHER
TITLE:	HYDROGRAPHIC SURVEY IN AND AROUND INTAKE WELL - TFL, TALCHER
COMPANY:	<b>WAPCOS LIMITED</b> (A GOVERNMENT OF INDIA UNDERTAKING) 76 - C, Institutional Area, Sector - 18 Gurgaon (Haryana) Pin - 122015
SHEET No. 1	DRG. No. WAP/WB/BRAHAMANI/PHD/INTAKE WELL



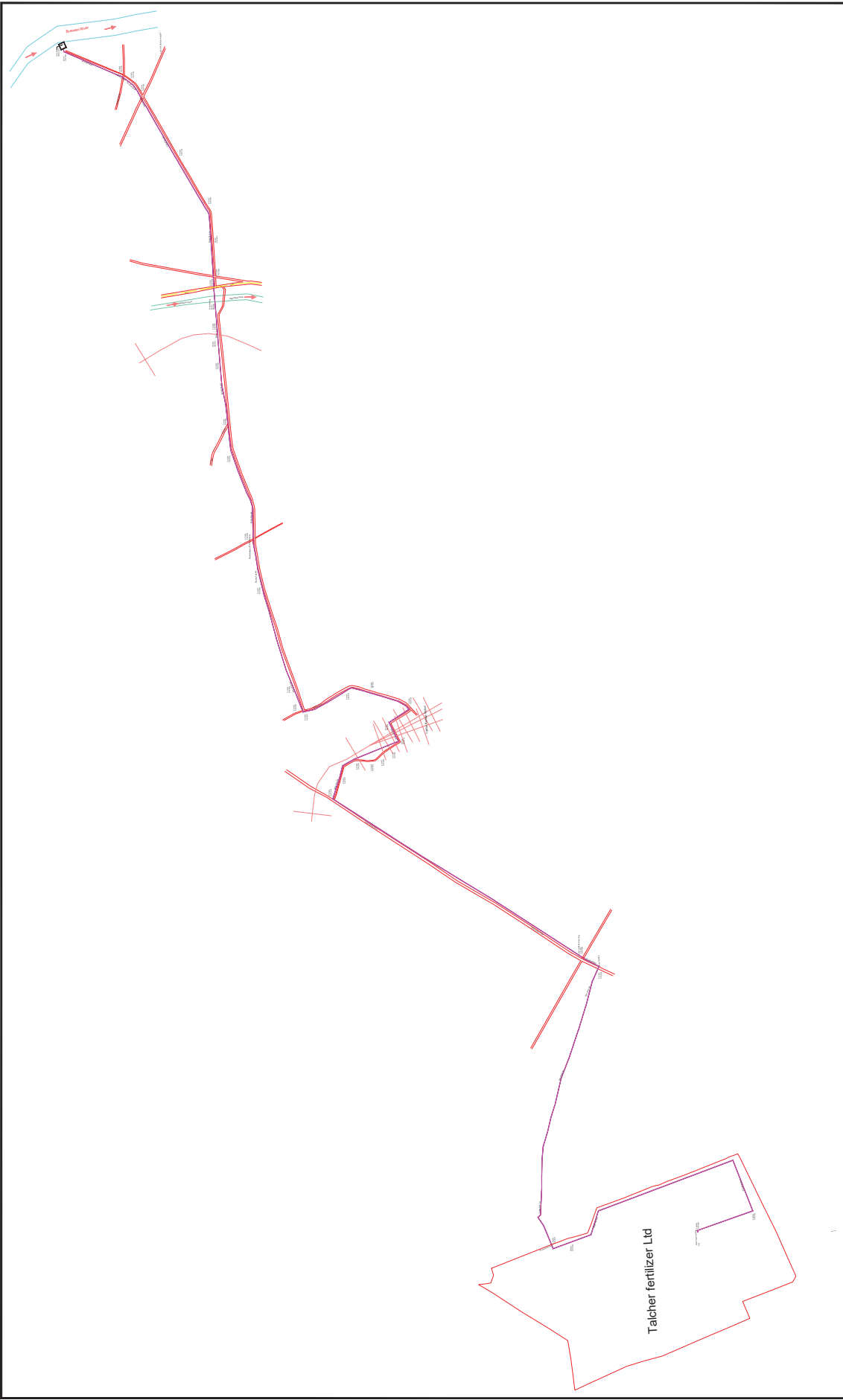
PLAN OF EXISTING INTAKE WELL



SECTION OF EXISTING INTAKE WELL

Note : Dimensions are tentative.

CLIENT :	TAL CHAR FERTILIZER LIMITED
PROJECT :	WATER WITHDRAWAL SYSTEM FOR TFL
TITLE :	PLAN & CROSS SECTION OF EXISTING INTAKE WELL OF TFL AT BRAHMAN RIVER
<b>WAPCOS LIMITED</b> (A Division of Indian Overseas Bank) 76 - C, Institutional Area, Sector - 18 Gurgaon (Haryana) Phn - 122015	
SHEET No. 1 OF 1	DWG. No. - WAPWD/INTAKEWELL/EXISTING



CLIENT :	TALCHAR FERTILIZER LIMITED
PROJECT :	WATER WITHDRAWAL SYSTEM FOR TFL
TITLE :	EXISTING PIPELINE ROUTE FROM PUMP HOUSE TO TFL RAW WATER RESERVOIR
	<b>WAPCOS LIMITED</b> (A GOVERNMENT OF INDIA UNDERTAKING) 76 - C, Institutional Area, Sector-18 Gurgaon (Haryana) Phn-122015
SHEET No. 1 OF 1	DRG. No. - WAP/WR/PIPE LINE/EXISTING



INTAKE WELL

BRAHAMANI RIVER

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PHD INTAKE WELL

PHD INTAKE WELL

TFL INTAKE WELL

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PROJECT	TALCHER FERTILIZERS LIMITED
PROPOSED WORK	REHABILITATION STUDY OF EXISTING INTAKE WELL
TITLE	INTAKE WELL - TFL, TALCHER
DRAWN BY	TFL, TALCHER
CHECKED BY	TFL, TALCHER
DATE	15/03/2015
SCALE	AS SHOWN
PROJECT NO.	76 - C (domestic) Area, Scope - 18 (Crop area) (Rajm)
DATE	15/03/2015
SHEET No.	1
PROJECT NO.	76 - C (domestic) Area, Scope - 18 (Crop area) (Rajm)

**WAPCOS LIMITED**

76 - C (domestic) Area, Scope - 18 (Crop area) (Rajm)  
15/03/2015

BRAHAMANI RIVER

N 2317900.000

N 2317800.000

N 2317700.000

N 2317900.000

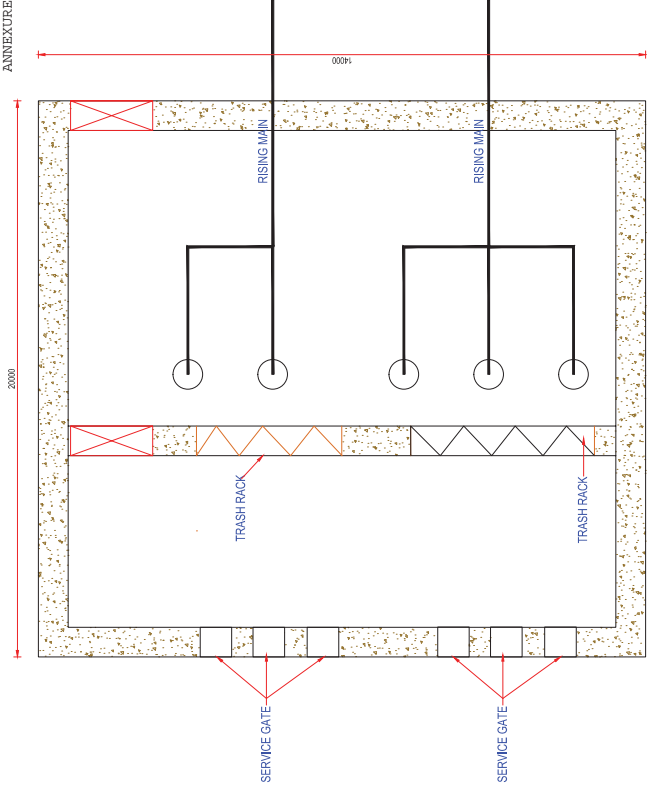
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PHD INTAKE WELL

TFL INTAKE WELL

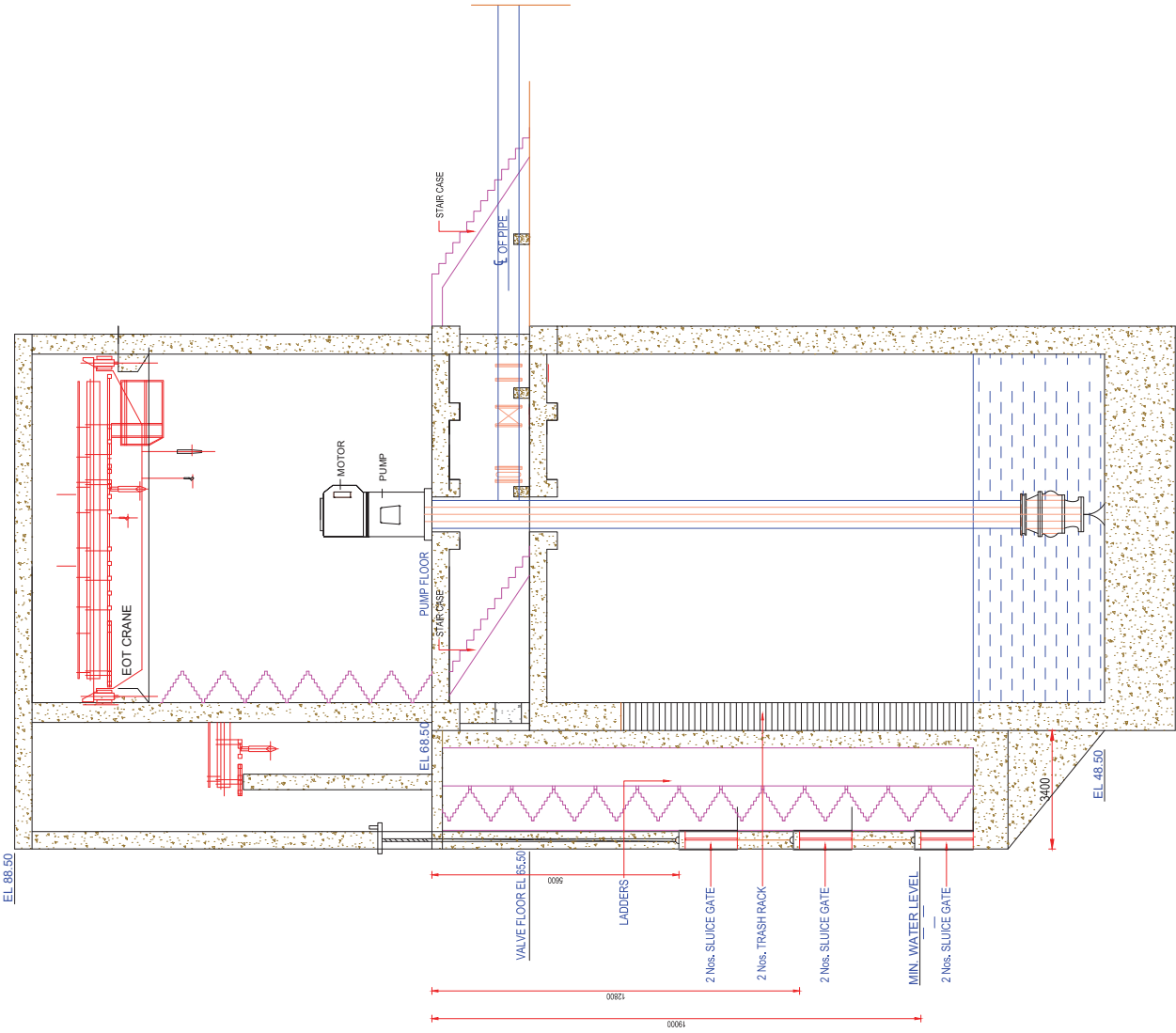
CLIENT:	TALCHER FERTILIZERS LIMITED
PROJECT:	REHABILITATION STUDY OF EXISTING INTAKE WELL TFL, TALCHER
TITLE:	HYDROGRAPHIC SURVEY IN AND AROUND INTAKE WELL - TFL, TALCHER
COMPANY:	<b>WAPCOS LIMITED</b> (A GOVERNMENT OF INDIA UNDERTAKING) 76 - C, Institutional Area, Sector - 18 Gurgaon (Haryana) Pin - 122015
SHEET No. 1	DRG. No. WAP/WBR/BRAHAMANI/PHD/INTAKE WELL



PLAN OF EXISTING INTAKE WELL



Note: Dimensions are tentative.

CLIENT:	TALCHAR FERTILIZER LIMITED
PROJECT:	WATER WITHDRAWAL SYSTEM FOR TFL
TITLE:	PLAN & CROSS SECTION OF EXISTING INTAKE WELL OF TFL AT BRAHMANI RIVER
<b>WAPCOS LIMITED</b> <small>(A GOVERNMENT OF INDIA UNDERTAKING)                  76 - C, Institutional Area, Sector - 18 Gurgaon (Haryana)                  Pin-122015</small>	
SHEET No. 1 OF 1	DEG. No. - WAPW/INTAKE WELLEXISTING





SECTION OF EXISTING INTAKE WELL



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**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.
- National Building Code
- Factory Rules

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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                  |
| b. Kettle type | - | 0.30 × Bundle weight |

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- 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.

- Process Building / Technological Structure (Open / Enclosed type)

Operating area - 5.0 kN/m<sup>2</sup>



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Maintenance area	-	7.5 kN/m <sup>2</sup>
Ground floor	-	10.0 kN/m <sup>2</sup>
2. Compressor House/TG House		
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>
3. Service Platform		
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>
4. Substation / Control Room		
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>
5. Office building		
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>
6. Laboratory		
Upper floors	-	4.0 kN/m <sup>2</sup>
Ground floor	-	5.0 kN/m <sup>2</sup>
7. Cooling Tower		
Operating platform /cover	-	3.0 kN/m <sup>2</sup>
Slab of hot water basin & Sump		
8. GT Building / DM Plant /ETP		
Operating platforms	-	3.0 kN/m <sup>2</sup>
Ground floor	-	5.0 kN/m <sup>2</sup>
9. Staircase		
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.

For all other buildings not covered in above Table, the imposed loads shall be taken as specified in IS:875 (Part II)



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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/sec. 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 |

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## 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%

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	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, foundations, 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 between a Standard Holding down Bolt or Anchor Sleeve and the face of Foundation/pedestal shall not be less than 6 x (dia of bolt) mm.



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:

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Open paved area	: 300 mm (min.) OR as indicated in 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 **M 30** for 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 per IS standards.:

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	As per IS Code recommendations	0.55	As per IS Code recommendations	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 mm 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

The reinforcement shall be of hot rolled, cold twisted, weldable high yield deformed CRSD (Corrosion Resistance Steel with Fe500D properties) rebar having Characteristic yield strength 500N/mm<sup>2</sup>, in accordance with table I of IS:1786. Binding wire used for

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tying the reinforcement shall conform to IS: 280 unless specifically mentioned herein or in engineering drawings.

#### 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**



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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**

- 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.

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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 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 & IS: 4923. Structural pipes shall be either seamless or mild welded. Spiral welded pipe is not acceptable.

## 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                                    |

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- 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
- 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:

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a. General Construction

- Trusses, Purlins, Side Girts, Bracings : 6 mm
- Columns, beams (mean flange thickness) : 7 mm
- Gussets in trusses & girders
  - i. Upto and including 12 m span : 8 mm
  - ii. Above 12 m span : 10 mm
- Flare Trestles, Stiffeners : 8 mm
- Base plates : 10 mm
- Chequered plate : 6 mm (on plain)
- Grating : 5 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

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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.

#### 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.

Width of Piperack	Wind Force at each Tier level(N)
– 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> )	

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s = Spacing of portals (m)

For pipe racks of width greater than 10 m, the projected height shall be lesser of the following two:

1.  $0.8 \times (\text{diameter of largest pipe including insulation (m)} + \tan 10^\circ \times (\text{width of rack (m)}))$ .
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 – 3.0**  
**TECHNICAL SPECIFICATION FOR SUPPLY OF PIPING ITEMS**  
**FOR**  
**BALANCE JOB OF SUPPLY, ERECTION, TESTING &**  
**COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM**  
**AND ALLIED FACILITIES**

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Sl. No.	Description	Remark
1.	Technical Specification for supply of Pipes	
2.	Technical Specification for supply of Fittings	
3.	Technical Specification for supply of Flanges	
4.	Technical Specification for supply of Studs & Nuts	
5.	Technical Specification for supply of Gaskets	
6.	Technical Specification for supply of Valves	



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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 + 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.

	<b>TECHNICAL SPECIFICATION FOR SUPPLY OF PIPES</b>	PNMP-TS-6100	0
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 5 OF 6</b>	

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.



**TECHNICAL SPECIFICATION  
FOR SUPPLY OF PIPES**

PNMP-TS-6100	0
<b>DOCUMENT NO.</b>	<b>REV</b>
<b>SHEET 6 OF 6</b>	

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
<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					



**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



 पी डी आई एल <b>PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PNMP-TS-6300	0
		DOCUMENT NO.	REV
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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)



**TECHNICAL SPECIFICATION FOR  
SUPPLY OF FITTINGS**

PNMP-TS-6300

0

DOCUMENT NO

REV

SHEET 3 of 5

- 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
		DOCUMENT NO	REV
		SHEET 4 of 5	

## 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
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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



**PROJECTS & DEVELOPMENT INDIA LTD**

PNMP-TS-6400

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**DOCUMENT NO.**

**REV**

**SHEET 1 OF 5**

**TECHNICAL SPECIFICATION**

**FOR**

**SUPPLY OF FLANGES**





## TECHNICAL SPECIFICATION FOR SUPPLY OF FLANGES

PNMP-TS-6400

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 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 1/2" 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
		<b>DOCUMENT NO.</b>	<b>REV</b>
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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	ASTME 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
<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					



**PROJECTS & DEVELOPMENT INDIA LTD**

PNMP-TS-6610


0

DOCUMENT NO.

REV

SHEET 1 OF 4

**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° 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° 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

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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
<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					



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TECHNICAL SPECIFICATION  
FOR  
SUPPLY OF GASKETS

## 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
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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.

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- 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-06 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					

 पी डी आई एल <b>PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PNMP-TS-6700	0
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**TECHNICAL SPECIFICATION**  
**FOR**  
**SUPPLY OF VALVES**





TECHNICAL SPECIFICATION FOR  
SUPPLY OF VALVES

PNMP-TS-6700	0
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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 ± 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
		<b>DOCUMENT NO.</b>	<b>REV</b>
		<b>SHEET 3 OF 5</b>	

C.S./LT C.S./A.S./S.S. -- do -- -- do --	150 lbs $\geq$ 26" 300 lbs $\geq$ 18" $\geq$ 600 lbs - all sizes	100 % valves -- do -- -- 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>पी डी आई एल</b> <b>PDIL</b>	<b>TECHNICAL SPECIFICATION FOR</b> <b>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.

SI. 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.

**PIPING MATERIAL SPECIFICATION**

CLIENT : M/S..TFL  
 PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.  
 LOCATION : TALCHER,ODISHA

Project :TFL  
 DOC. No.TFL-PDS-600  
 Rev.:1

Class: B24

**PROJECTS AND DEVELOPMENT INDIA LIMITED**

SERVICE BD,CWS,CWR,DO,ES,FG,FN,FO,FW,IAW,NI,PA,P G ETC		TEMPERATURE LIMITS (Deg.C)					
		Ref.SI	Ref.SI				
RATING ASME 150# RF	CORROSION ALLOWANCE 1.5 MM(MIN.)	MATERIAL CS					
ITEM	NOTES	SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
<b>PIPE</b>							
PIPE		2 - 6	SCH 40	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE		8 - 10	SCH 20	BE	ERW,API 5L GR.B,ASME B36.10,	PPA211300	
PIPE		12 - 12	SCH 20	BE	ERW,API 5L GR.B,ASME B36.10,	PPA211300	
PIPE		1/2 - 3/4	SCH 80	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
PIPE		1 - 11/4	SCH 80	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
PIPE		11/2 - 11/2	SCH 80	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
PIPE		14 - 14	SCH 10	BE	ERW,API 5L GR.B,ASME B36.10,	PPA211300	
PIPE		16 - 18	SCH 10	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		20 - 20	SCH 10	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		22 - 24	SCHSTD	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		26 - 28	SCHSTD	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		30 - 32	SCHSTD	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		34 - 34	SCHSTD	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		36 - 38	SCH XS	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		40 - 42	SCH XS	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		44 - 46	SCH XS	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE		48 - 48	SCH XS	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
<b>FLANGE</b>							
FLANGE		1/2 - 24	150#	SO-RF 125 AARH	CS ASTM A105,ASME B16.5,SLIP ON	FL0260801	
LONG W.N.FLANGE		11/2 - 11/2	300#	WN-RF 125 AARH	CS ASTM A105,ASME B16.5,24mm Bore,200mm Long	LN0270802	
W.N.FLANGE		26 - 48	150#	WN-RF 125 AARH	CS ASTM A105,ASME B16.47 SR.B,WELD NECK	WN0270701	
SPACER AND BLIND		14 - 48	150#	RF 125 AARH	CS ASTM A105,ASME B16.48,	RS022PO01	
SPECL BLIND		1/2 - 12	150#	RF 125 AARH	CS ASTM A105,ASME B16.48,	SP022PO01	
<b>BLIND FLANGE</b>							
BLIND FLANGE		26 - 48	150#	RF 125 AARH	CS ASTM A105,ASME B16.47 SR.B,	BF0220701	
BLIND FLANGE		1/2 - 24	150#	RF 125 AARH	CS ASTM A105,ASME B16.5,	BF0220801	
<b>GASKET</b>							
GASKET		1/2 - 24	150#	SPRL-WND RF	TP304 SS WDG:GPH FLR:TP304 SS INR RNG:CS OTR RNG,ASME B16.20,	GSQN30301	
GASKET		26 - 48	150#	SPRL-WND RF	TP304 SS WDG:GPH FLR:TP304 SS INR RNG:CS OTR RNG,ASME B16.20/B16.47 SR.B,	GSQN30J01	
<b>STUD &amp; NUTS</b>							
STUD & 2NUTS HVY HEX		-			ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
<b>DRIP RING</b>							
DRIP RING		3 - 3	150#	RF 125 AARH	CS ASTM A105,PDIL-PDS-600,	DR022QK01	
<b>FITTING (BW)</b>							
BRANCH WELD		2 - 48		BW	CARBON STEEL,ASME B31.3,	RWOJ11200	
BRANCH WELD WITH RP		2 - 48		BW	CARBON STEEL,ASME B31.3,	WBOJ11200	
CAP		2 - 48		BW	ASTM A234 WPB-SMLS,ASME B16.9,	CP7310900	
ELBOW		2 - 6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	EL7310900	
ELBOW		8 - 48		BW	ASTM A234 WPB-WLDD,ASME B16.9,	ELOY10900	L
ELBOW		8 - 48		BW	ASTM A234 WPB-WLDD,PDIL-PDS-600,R=3D	ELOY1QK00	3
ELBOW		8 - 48		BW	ASTM A234 WPB-WLDD,PDIL-PDS-600,R=5D	ELOY1QK00	5
ELBOW		8 - 48		BW	ASTM A234 WPB-WLDD,PDIL-PDS-600,R=7D	ELOY1QK00	7
REDUCER CONC.		2 - 6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	RC7310900	
REDUCER CONC.		8 - 48		BW	ASTM A234 WPB-WLDD,ASME B16.9,	RCOY10900	
REDUCER ECC.		2 - 6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	RE7310900	
REDUCER ECC.		8 - 48		BW	ASTM A234 WPB-WLDD,ASME B16.9,	REOY10900	
TEE		2 - 6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	TE7310900	
TEE		8 - 48		BW	ASTM A234 WPB-WLDD,ASME B16.9,	TEOY10900	

**PIPING MATERIAL SPECIFICATION**

CLIENT : M/S..TFL  
 PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.  
 LOCATION : TALCHER,ODISHA

Project :TFL  
 DOC. No.TFL-PDS-600  
 Rev.:1

Class: B24

**PROJECTS AND DEVELOPMENT INDIA LIMITED**

SERVICE BD,CWS,CWR,DO,ES,FG,FN,FO,FW,IAW,NI,PA,P G ETC		TEMPERATURE LIMITS (Deg.C)					
		Ref.SI	Ref.SI				
RATING ASME 150# RF	CORROSION ALLOWANCE 1.5 MM(MIN.)	MATERIAL CS					
ITEM	NOTES	SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
WELDOLET		2 - 48		BW	CS ASTM A105,MSS SP 97,	WL0213300	
<b>FITTING (SW)</b>							
CAP		1/2 - 11/2	3000#	SOCW	CS ASTM A105,ASME B16.11,	CP0230207	W
COUPLING		1/2 - 11/2	3000#	SOCW	CS ASTM A105,ASME B16.11,	CN0230207	W
ELBOW		1/2 - 11/2	3000#	SOCW	CS ASTM A105,ASME B16.11,	EL0230207	
HALF COUPLING		1/2 - 11/2	3000#	SOCW	CS ASTM A105,ASME B16.11,	HF0230207	
SOCKOLET		1/2 - 48	3000#	SOCW	CS ASTM A105,MSS SP 97,	SL0233307	
TEE		1/2 - 11/2	3000#	SOCW	CS ASTM A105,ASME B16.11,	TE0230207	
<b>FITTING (THD)</b>							
CAP		1/2 - 11/2	3000#	THD	CS ASTM A105,ASME B16.11,	CP0240207	T
COUPLING		1/2 - 11/2	3000#	THD	CS ASTM A105,ASME B16.11,	CN0240207	T
PLUG		1/2 - 11/2		THD	CS ASTM A105,ASME B16.11,ROUND HEAD	PG0240200	
THREDOLET		1/2 - 48	3000#	THD	CS ASTM A105,MSS SP 97,	TL0243307	
<b>NIPPLE</b>							
NIPPLE		1/2 - 11/2	SCH160	PLN-PLN	SMLS,API 5L GR.B,ASME B36.10,	NPA151312	1
NIPPLE		1/2 - 11/2	SCH160	PLN-THD	SMLS,API 5L GR.B,ASME B36.10,NPT	NPA161312	2
NIPPLE		1/2 - 11/2	SCH160	THD	SMLS,API 5L GR.B,ASME B36.10,NPT	NPA141312	3
<b>SWAGE NIPPLE</b>							
SWAGE (CONC)		1/2 - 11/2		PE	ASTM A234 WPB-SMLS,MSS SP 95,	NC73J4500	P
SWAGE (CONC)		1/2 - 11/2		PLN-THD	ASTM A234 WPB-SMLS,MSS SP 95,	NC7364500	T
SWAGE (ECC)		1/2 - 11/2		PE	ASTM A234 WPB-SMLS,MSS SP 95,	NE73J4500	P
SWAGE (ECC)		1/2 - 11/2		PLN-THD	ASTM A234 WPB-SMLS,MSS SP 95,	NE7364500	T
<b>STRAINER</b>							
T-TYPE STRAINER		2 - 24	150#	FLGD	CS ASTM A216 GR WCB,TTS210,	TTS210	
Y-TYPE STRAINER		1/2 - 11/2	600#	SOCW	CS ASTM A105,YTS201,	YTS201	
Y-TYPE STRAINER		2 - 24	150#	FLGD	CS ASTM A216 GR WCB,YTS210,	YTS210	
<b>VALVES</b>							
GATE VALVE		1/2 - 11/2	800#	SOCW	CS BODY ASTM A105,GAV201,	GAV201	
GATE VALVE		2 - 48	150#	FLG	CS BODY ASTM A216 GR WCB,GAV210,	GAV210	
GLOBE VALVE		1/2 - 11/2	800#	SOCW	CS BODY ASTM A105,GLV201,	GLV201	
GLOBE VALVE		2 - 12	150#	FLG	CS BODY ASTM A216 GR WCB,GLV210,	GLV210	
CHECK VALVE		1/2 - 11/2	800#	SOCW	CS BODY ASTM A105,CHV201,	CHV201	
CHECK VALVE		2 - 24	150#	FLG	CS BODY ASTM A216 GR WCB,CHV210,	CHV210	
BALL VALVE		1/2 - 11/2	800#	SOCW	CS BODY ASTM A105,BAV201,	BAV201	
BALL VALVE		2 - 24	150#	FLG	CS BODY ASTM A216 GR WCB,BAV210,	BAV210	
BUTTERFLY VALVE		2 - 24	150#	RF	CS BODY ASTM A216 GR WCB,BUV203,LUG TYPE	BUV203	
BUTTERFLY VALVE		26 - 48	150#	FLG	CS BODY ASTM A216 GR WCB,BUV204,	BUV204	
PLUG VALVE		1/2 - 1	600#	THRD	CS BODY ASTM A105,PLV201,	PLV201	
PLUG VALVE		11/2 - 24	150#	FLG	CS BODY ASTM A216 GR WCB,PLV202,	PLV202	

**PIPING MATERIAL SPECIFICATION**

CLIENT : M/S..TFL  
 PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.  
 LOCATION : TALCHER,ODISHA

Project :TFL  
 DOC. No.TFL-PDS-600  
 Rev.:1

Class: B20

**PROJECTS AND DEVELOPMENT INDIA LIMITED**

SERVICE CW(UG)	TEMPERATURE LIMITS (Deg.C)			
	Ref.SI	Ref.SI		

RATING ASME 150# RF	CORROSION ALLOWANCE 1.5 MM(MIN.)	MATERIAL CS			
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ITEM	NOTES	SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
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**PIPE**

PIPE		2 - 6	SCH 40	BE	SMLS,API 5L GR.B,C&W,ASME B36.10,	PPX111300	
PIPE		40 - 42	10.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		44 - 46	10.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		48 - 48	10.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		8 - 10	SCH 10	BE	ERW,API 5L GR.B,C&W,ASME B36.10,	PPX411300	
PIPE		12 - 14	SCH 10	BE	ERW,API 5L GR.B,C&W,ASME B36.10,	PPX411300	
PIPE		16 - 18	SCH 10	BE	LSAW,API 5L GR.B,C&W,ASME B36.10,	PP1A11300	
PIPE		20 - 24	SCH 10	BE	LSAW,API 5L GR.B,C&W,ASME B36.10,	PP1A11300	
PIPE		1/2 - 3/4	SCH 80	PE	SMLS,API 5L GR.B,C&W,ASME B36.10,	PPX121300	
PIPE		1 - 11/4	SCH 80	PE	SMLS,API 5L GR.B,C&W,ASME B36.10,	PPX121300	
PIPE		11/2 - 11/2	SCH 80	PE	SMLS,API 5L GR.B,C&W,ASME B36.10,	PPX121300	
PIPE		26 - 28	08.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		30 - 32	08.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		34 - 36	08.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		38 - 38	08.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		52 - 54	12.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		56 - 58	12.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		60 - 62	12.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		64 - 66	12.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		68 - 70	14.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	
PIPE		72 - 72	14.00 MM	BE	LSAW,IS 3589 GR.FE410 C&W,ASME B36.10,	PPQW11300	

**FLANGE**

FLANGE		1/2 - 24	150#	SO-RF 125 AARH	CS ASTM A105,ASME B16.5,SLIP ON	FL0260801	
FLANGE		26 - 72	150#	SO-FF	IS2062 GR.B,AWWA C207-D,RING TYPE,SLIP ON	FLA452701	
SPACER AND BLIND		14 - 24	150#	RF 125 AARH	CS ASTM A105,ASME B16.48,	RS022P001	
SPECL BLIND		1/2 - 12	150#	RF 125 AARH	CS ASTM A105,ASME B16.48,	SP022P001	

**BLIND FLANGE**

BLIND FLANGE		1/2 - 24	150#	RF 125 AARH	CS ASTM A105,ASME B16.5,	BF0220801	
BLIND FLANGE		26 - 72	150#	FF	IS2062 GR.B,AWWA C207-D,	BFA412701	

**GASKET**

GASKET		1/2 - 24	150#	SPRL-WND RF	TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.20,	GSQN30301	
GASKET		26 - 72	150#	3.0 MM THK FF	GSKT FLAT RNG,GARLOCK 3000(SYN FBR WINBR BDR),ASME B16.21/AWWA C207-D,RING TYPE	GSTO80S01	

**STUD & NUTS**

STUD & 2NUTS HVY					ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX							

**FITTING (BW)**

BRANCH WELD		2 - 48		BW	CARBON STEEL,ASME B31.3,	RWOJ11200	
BRANCH WELD WITH RP		2 - 48		BW	CARBON STEEL,ASME B31.3,	WBOJ11200	
CAP		2 - 24		BW	ASTM A234 WPB-SMLS,ASME B16.9,	CP7310900	
ELBOW		8 - 24		BW	ASTM A234 WPB-WLDD,ASME B16.9,	ELOY10900	
ELBOW		2 - 6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	EL7310900	
ELBOW		26 - 48		BW	IS2062 GR.B,ASME B16.9,	ELA410900	
REDUCER CONC.		2 - 6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	RC7310900	
REDUCER CONC.		8 - 24		BW	ASTM A234 WPB-WLDD,ASME B16.9,	RCOY10900	
REDUCER CONC.		26 - 48		BW	IS2062 GR.B,ASME B16.9,	RCA410900	
REDUCER ECC.		2 - 6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	RE7310900	
REDUCER ECC.		8 - 24		BW	ASTM A234 WPB-WLDD,ASME B16.9,	REOY10900	
REDUCER ECC.		26 - 48		BW	IS2062 GR.B,ASME B16.9,	REA410900	



PIPING MATERIAL SPECIFICATION

CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA

Project :TFL
DOC. No.TFL-PDS-600
Rev.:1

Class: B20

PROJECTS AND DEVELOPMENT INDIA LIMITED

Table with columns: SERVICE CW(UG), TEMPERATURE LIMITS (Deg.C) (Ref.SI, Ref.SI), RATING ASME (150# RF), CORROSION ALLOWANCE (1.5 MM(MIN.)), MATERIAL (CS)

Table with columns: ITEM, NOTES, SIZE (NPS), SCH/ RAT, END, DESCRIPTION, COMM CODE, SPCL REV

Table rows for TEE (2-6, 8-24, 26-48) and WELDOLET (2-48) with descriptions and codes.

FITTING (SW)

Table rows for FITTING (SW) including CAP, COUPLING, ELBOW, SOCKOLET, TEE with descriptions and codes.

FITTING (THD)

Table rows for FITTING (THD) including CAP, PLUG, THREDOLET with descriptions and codes.

NIPPLE

Table rows for NIPPLE with descriptions and codes.

SWAGE NIPPLE

Table rows for SWAGE NIPPLE (CONC) and (ECC) with descriptions and codes.

VALVES

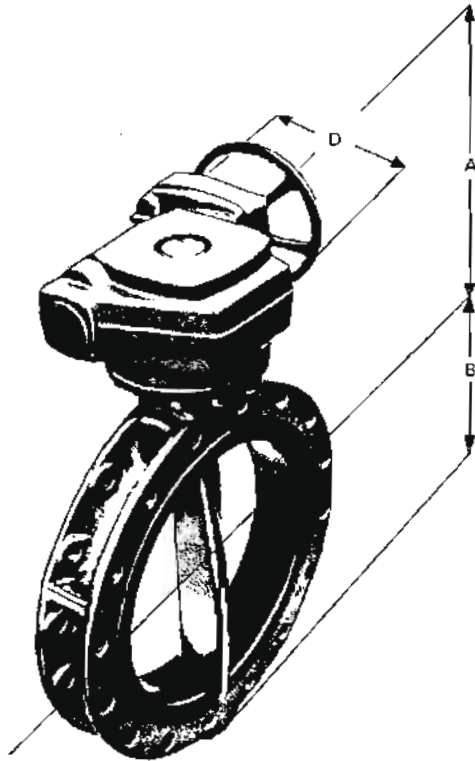
Table rows for VALVES including GATE VALVE, GLOBE VALVE, and BUTTERFLY VALVE with descriptions and codes.

:





**BUTTERFLY VALVE**



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	<b>BUV 204</b>
PRESSURE RATING CLASS	150
FACE	RF
<b>CONSTRUCTION</b>	
BODY	FLANGED SHORT BODY FULL-DRILLED BOLTHOLES IN FLANGES RUBBER LINED
GEAR OPERATED	YES
NOMINAL SIZE	26" - 64"
<b>MATERIALS</b>	
BODY	A 216 Gr. WCB
BODY LINING	ETHYLENE-PROPYLENE
DISC	A216 GR.WCB+ RUBBER LINED
SHAFT	13 Cr
SHAFT PACKING	PTFE
<b>DESIGN CONDITIONS</b>	
PRESSURE RATING	ASME B16.47

rev.1  
rev.1

**GENERAL**

1. RUBBER LINING: THE WETTED SURFACES OF VALVE SHALL BE FULLY LINED AND LINING SHALL EXTEND OVER THE FLANGE SEALING FACE
2. FACE-TO-FACE DIMENSIONS SHALL BE PER AWWA C 504 SHORT-BODY
3. COPPER AND COPPER ALLOYS NOT PERMITTED

**MANDATORY STANDARDS:**

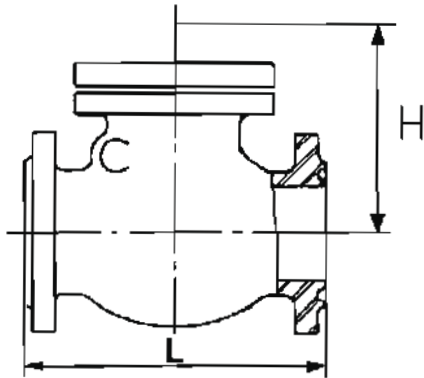
AWWA C 504, ASME B16.47

**NOTES:**

- a) THE VALVE SHALL BE DESIGNED FOR CLOSURE IN DEAD-END-PIPING
- b) FLANGES ACC. TO ASME B16 47 SERIES B



**CHECK VALVE**



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	<b>CHV 210</b>
PRESSURE RATING CLASS	150
FACE	RF
<b>CONSTRUCTION</b>	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
NOMINAL SIZE	2" - 24"
<b>MATERIALS</b>	
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
DISC	A 216 Gr. WCB 13Cr. FACED
HINGE PIN	13 Cr.
<b>DESIGN CONDITIONS</b>	
PRESSURE RATING	ANSI B16.34

GENERAL

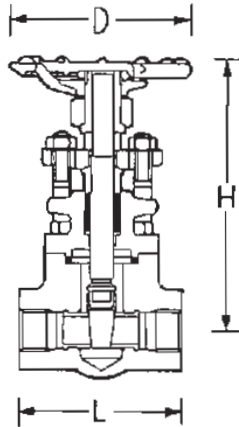
1. COPPER AND COPPER ALLOYS NOT PERMITTED

MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45



**GATE VALVE**



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	<b>GAV 201</b>
PRESSURE RATING CLASS	800
FACE	SW
<b>CONSTRUCTION</b>	
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	NON-RISING
STEM (NO CASTING)	RIISING
STEM AND YOKE TYPE	OS & Y
GATE TYPE	WSS
GEAR OPERATED	NO
BY-PASS VALVE	NO
NOMINAL SIZE	1/2" - 1 1/2"
<b>MATERIALS</b>	
BODY	A 105
BODY SEAT RING	A 182 Gr. F6a STELLITED
GATE	A 182 Gr. F6a
STEM	13 Cr.
STEM PACKING	GRAFOIL/GRAPHITE
TRIM NUMBER	8

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF	PARALLEL	DOUBLE	SLIP ON OR SPLIT
PDF			FLEXIBLE

<b>DESIGN CONDITIONS</b>	
PRESSURE RATING	API 602

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

MANDATORY STANDARDS:

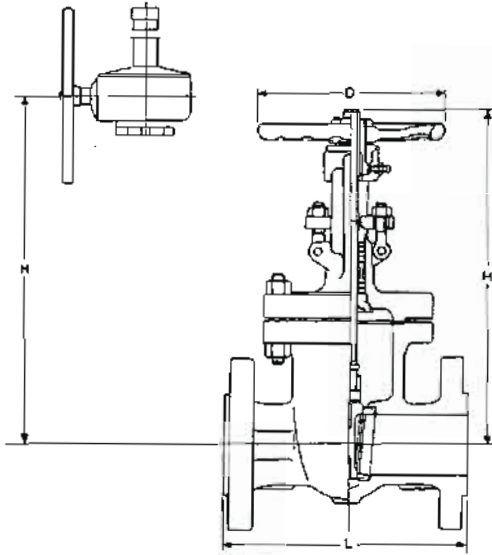
API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

- a) LENGTH TO BE VERIFIED BY MANUFACTURER



**GATE VALVE**



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	<b>GAV 210</b>
PRESSURE RATING CLASS	150
FACE	RF
<b>CONSTRUCTION</b>	
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	NON-RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
GATE TYPE	WSF OR WDF
GEAR OPERATED	YES > = 14"
BY-PASS VALVE	NO
NOMINAL SIZE	2" - 48"
<b>MATERIALS</b>	
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
GATE	A 216 Gr. WCB 13 Cr. FACED
STEM (NO CASTING)	13 Cr.
STEM PACKING	GRAFOIL /GRAPHITE
TRIM NUMBER	8

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF			FLEX. SOLID WEB
WDF	PARALLEL	DOUBLE	SLIP ON OR SPLIT
PDF			FLEXIBLE

<b>DESIGN CONDITIONS</b>	
PRESSURE RATING	ANSI B16.34

**GENERAL**

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO API 600 AND MSS-SP 45, LOCATION E-F

**MANDATORY STANDARDS:**

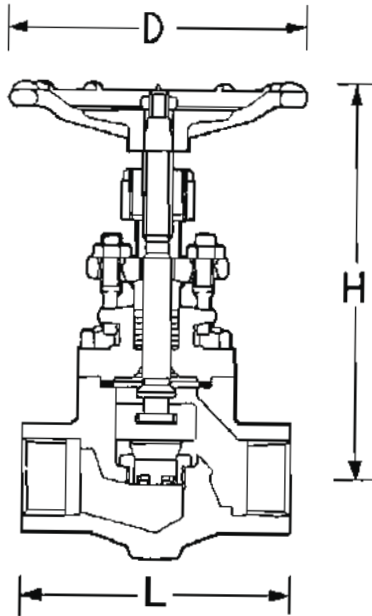
API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45, ASME B16.47

**NOTES:**

- a) FLANGES > 24" ACC. TO ASME B16.47 SERIES B



**GLOBE VALVE**



DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	<b>GLV 201</b>
PRESSURE RATING CLASS	800
FACE	SW
<b>CONSTRUCTION</b>	
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
DISC TYPE	SWIVEL PLUG
GEAR OPERATED	NO
BY-PASS VALVE	NO
NOMINAL SIZE	1/2" - 1 1/2"
<b>MATERIALS</b>	
BODY	A 105
BODY SEAT RING	A 182 Gr. F6a STELLITED
DISC	A 182 Gr. F6a
STEM (NO CASTING)	13 Cr.
STEM PACKING	GRAFOIL/GRAPHITE
TRIM NUMBER	
<b>DESIGN CONDITIONS</b>	
PRESSURE RATING	API 602

GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED
2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

NOTES:

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) LENGTH TO BE VERIFIED BY MANUFACTURER

**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
11.0	Certification	MSS-SP25 & P.O. Applicable STD/ P.O.	MSS-SP25 & P.O. Applicable STD/ P.O.	H	R
<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					

 <b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
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## PART II: TECHNICAL

### SECTION : 4.0

#### DESIGN PHILOSOPHY – ROTATING EQUIPMENTS & EOT CRANE

#### FOR

#### BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES

#### PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)

0	18.07.23	18.07.23	ISSUED FOR ENQUIRY	AIN	YKG	RRK
P2	27.03.2019	27.03.2019	ISSUED FOR ENQUIRY	NY	ASR	GC
P1	07.03.2019	07.03.2019	ISSUED FOR ENQUIRY	NY	ASR	GC
P	08.02.2019	08.02.2019	ISSUED FOR ENQUIRY	NY	ASR	GC
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
		DOCUMENT NO	REV	
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Sl. No.	SECTIONS
1.	GENERAL
2.	DESIGN REQUIREMENT
3.	INSPECTION AND TESTING FOR CENTRIFUGAL PUMPS
4.	PREPARATION FOR SHIPMENT FOR CENTRIFUGAL PUMPS
5.	EOT CRANE
6.	VENDOR'S DATA
7.	SPARE PARTS

**NOTES:** This document shall be used with relevant information contained in the documents listed below (in order of priority) :

1. Letter for invitation of bid or succeeding official confirmed order.
2. Specification sheet of particular pump with relevant drawings, if any, for the project in question.
3. This document.
4. Codes & Standards referred in the above mentioned documents and in this document.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
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## 1.0 GENERAL

1.1 This Philosophy states that contractor's scope of work shall include detailed engineering, procurement, supply, manufacturing, fabrication, transportation, inspection & testing, loading, unloading, insurance during transit, storage, construction, erection/ installation of all **Mechanical Rotating Equipments** with allied electrical, instrumentation and civil works, obtaining all necessary statutory approvals from concerned government authorities as applicable, testing, mechanical completion, pre-commissioning, commissioning, performance guarantee test runs including total project management and handing over of **Raw Water Reservoir and allied services** of prescribed capacity for **M/s Talcher Fertilizer Limited ( TFL)**.

## 2.0 DESIGN REQUIREMENT

### 2.1 DESIGN REQUIREMENT FOR CENTRIFUGAL PUMPS

2.1.1 This standard shall be followed in establishing the minimum engineering requirements for centrifugal pumps for non-critical services / water handling services.

2.1.2 The pumps shall be designed, manufactured and supplied as per Hydraulic Institute Standard / DIN 24256 / ISO-2858 /IS-1520/ IS-13518/ IS-5120/ equivalent national & international Standard. Latest codes& standards shall be followed.

2.1.3 The pump shall be designed to develop the specified differential head at rated capacity, suction pressure and specific gravity while running at the rated speed. Rated speed of pump shall be full load speed of the drive motor. The pump

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
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characteristics shall be guaranteed / tested with reference to the full load speed of motor.

- 2.1.4 Guarantee point shall refer to the differential head, rated capacity, specific gravity, and full load speed of the driver.
- 2.1.5 The pump and accessories shall be suitable for outdoor, unsheltered installation and continuous duty unless otherwise specified in the respective specification sheets.
- 2.1.6 The pumps shall be supplied complete with all the accessories as specified in the respective specification sheets inclusive of necessary appurtenances, auxiliary piping, special tools, spares etc.
- 2.1.7 Accessories required / recommended by pump vendor other than those specified in the pump specification sheet for safe and efficient operation of the pump unit shall be included in the pump vendor's scope of supply and the same shall be identified in the bid separately with adequate justification.
- 2.1.8 Deviations and/or exceptions to the enquiry specification sheet, enclosures, applicable standards, etc., must be listed for each document, clausewise with proper reason in a separate annexure in the bid. Otherwise it shall be assumed that all the requirements of the enquiry are acceptable without any reservation and shall be binding to the bidder.
- 2.1.9 Pumps shall have SI dimensions, comply with applicable ISO standards except for piping connections which shall be as per ANSI/ASME standard.
- 2.1.10 Reference list of pumps which are in operation for similar service conditions shall be furnished with the offer indicating broad specifications, purchase order number, date and name & address of user.

## 2.2 BASIC DESIGN FOR CENTRIFUGAL PUMPS

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
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- 2.2.1 The shut off head of the pump shall be 105% to 120% of the head at rated capacity.
- 2.2.2 Maximum allowable noise level shall be within 85 dBA measured at a distance of 1.0 meter.
- 2.2.3 It should be possible to increase the head minimum by 5% by installing higher size impeller.
- 2.2.4 In addition to static balancing, impellers shall be dynamically balanced as per G6.3 of ISO-1940.
- 2.2.5 Pump inlet, outlet and auxiliary connections shall be flanged. All connections shall be provided with companion flanges, nuts, bolts and gaskets as per piping design philosophy of the ITB/NIT.
- 2.2.6 Non-Standard Connections of 1<sup>1</sup>/<sub>4</sub>, 2<sup>1</sup>/<sub>2</sub>, 3<sup>1</sup>/<sub>2</sub>, 5, 7 nominal pipe sizes shall not be used.
- 2.2.7 When specified, pump shall be provided with drip tray under the stuffing box and leak-off line with flange, companion flange, nuts, bolts and gaskets. Material composition shall be same as that of pump casing. Leak - off piping shall be arranged upto the edge of the base plate.
- 2.2.8 Pump inlet, outlet and auxiliary flanged connections shall confirm to the facing and drilling requirements of ANSI / ASME B 16.1 or ANSI / ASME B16.5.
- 2.2.9 All equipment shall be designed to permit rapid and economical maintenance. Major parts such as casing components and bearing housings shall be designed (shouldered or dowelled) to ensure accurate alignment on reassembly.
- 2.2.10 Impeller shall be keyed to the pump shaft. Impeller nut shall be used to secure the impeller and a positive mechanical locking method shall be adopted.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
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- 2.2.11 The pump shaft shall be one piece for horizontal pumps. For vertical pumps number of shafts shall be minimum .
- 2.2.12 Shafts for horizontal pumps shall be fitted with deflectors. Deflectors shall be made of suitable non-sparking material.
- 2.2.13 Pump alignment with its corresponding driver/motor to be carried out for all condition i.e. without process piping & with process piping, Cold & Hot alignment. No residual stresses due to piping shall occur in the complete system. Vibration while pre-commissioning / commissioning and handing over of system to owner must be within limit as in specified codes & standards.
- 2.2.14 Replaceable wear ring surfaces shall be furnished on impeller and casing. Mating wear surfaces of hardenable materials shall have a difference in Brinell hardness number of at least 50.
- 2.2.15 Radial and thrust bearings shall be rolling element type. These shall be designed for 24,000 hours bearing life.
- 2.2.16 For between bearing pumps arrangement, bearing housing shall be cast integral with the lower half of the pump casing or bolted to it. Bearing housing should be provided with stiffening brackets and be sufficiently rigid to resist the dynamic loads during operation.
- 2.2.17 Castings shall be sound and free from shrink holes, blow holes, cracks, scale, blisters and other similar injurious defects. Ferrous pressure casting shall not be repaired by peening, plugging, burning in or impregnating. When weld repairs to castings are authorized by ASTM specification for the material, repair welding shall be carried out in accordance with that specification. Unless otherwise specified, weld repairs shall be inspected according to the same quality standards used to inspect the casting.
- 2.2.18 Material of construction of various pump parts shall be as per pump specification sheet. If the vendor considers other materials better, the same shall be offered as an alternative only. Materials not specified in the specification sheet shall be

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
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selected by the vendor in accordance with the service conditions. Chemical composition and physical properties of the special materials, wherever used, must be furnished along with the offer.

2.2.19 A name plate of 18 Cr - 8 Ni Stainless Steel or Monel, securely attached by stainless steel pins at an easily accessible point on the pump body shall be furnished. The name plate shall be stamped with following information:

- Purchaser's item number
- Pump serial number
- Capacity in m<sup>3</sup>/h
- Differential head in meters
- Revolution per minute
- Casing hydrostatic test pressure in kg / cm<sup>2</sup>g
- Absorbed power in kW

In addition to above an arrow shall be cast / attached at a reasonably observable point on the pump to indicate direction of rotation.

2.2.20 Motor shall have power ratings including service factor at least equal to following percentage of pump rated absorbed power. :

Pump absorbed power ( in kW )	Motor rating percentage of absorbed power
< 22	125
22 - 55	115
> 55	110

2.2.21 Vendor shall indicate for vertical pumps, minimum liquid level for pump operation / startup in the offer.

2.2.22 For vertical pumps, a hole shall be provided in the column pipe above the maximum liquid level to relieve pressure on stuffing box.

2.2.23 For vertical the specified head shall be measured at the discharge flange, at pump mounting level. Pumps shall be suitable to develop specified discharge head in

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
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addition to column losses and vertical distance, between minimum level in the sump tank and center line of the discharge flange. Pump vendor shall indicate total head to be developed by the pump in the offer.

2.2.24 Vertical pumps taking suction from sump / vessel shall be furnished with corrosion resistant suction strainer. Perforation / mesh size shall be suitable for proper operation of pump. Sufficient free flow area of the strainer shall be provided.

2.2.25 Pumps shall be provided with shaft sleeve under mechanical seal.

2.2.26 Shaft sleeves shall be hard chrome oxide coated under flexible member of mechanical seal.

2.2.27 Gland Packed pumps shall not be offered.

2.2.28 When pumps are specified with mechanical seals

2.2.28.1 Make of mechanical seal shall be Flowserve, Eagle Burgmann, John Crane make.

2.2.28.2 Mechanical seal shall be inside mounted, balanced type with Carbon versus Tungsten Carbide faces or Carbon versus Silicon Carbide faces. Suitable flushing plan shall be provided.

2.2.29 Coupling make shall be as follows:

Driver rating up to 25 kW : Lovejoy (RRL), Pinbush type  
Unique, Flender

Driver rating more than 25 kW : Pinbush type/All metallic type  
Rathi-Discoflex type M, Euroflex,  
Triveni-Flexibox

### 3.0 INSPECTION AND TESTING FOR CENTRIFUGAL PUMPS

3.1 All pumps shall be subjected to inspection by Owner / inspector of owner/ purchaser or authorized third party inspecting agency as defined in the purchase

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>DESIGN PHILOSOPHY – ROTATING EQUIPMENTS &amp; EOT CRANE</b>	PNPM/PC150/E/121/SEC-VI-4.0	0	
		DOCUMENT NO	REV	
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order. Test and inspection plan shall be submitted to the inspector for approval. The inspector shall indicate additional test to be witnessed over and above the once specified in the pump specifications.

- 3.2 Inspector shall have free access at all reasonable times to the vendor's / sub vendor's shops. Vendor shall furnish to the inspector all necessary information and assistance to verify that the requirements of the order specifications have been met. The vendor shall give 2 weeks notice regarding readiness of material for inspection to the inspector.
- 3.3 Acceptance of shop test shall not relieve the vendor of this responsibility in any way.
- 3.4 Inspector (TPI) shall witness / inspect the following :
  - 3.4.1 Review of material test certificate for casing, impeller, shaft, shaft sleeve, wearing rings etc., and for spare parts.
  - 3.4.2 Dynamic balancing of impeller as per ISO-1940
  - 3.4.3 Hydrostatic test.
  - 3.4.4 NPSHR test
  - 3.4.5 Performance test and Complete unit test with Job motor including vibration check
  - 3.4.6 Disassembly / strip down test.
  - 3.4.7 Visual inspection and dimensional check.
- 3.5 Applicable national/ international standard shall be applied with respect to the tolerances of each dimension.
- 3.6 All casting shall be visually inspected before machining for surface defects and irregularities.
- 3.7 All repairs of defects found on inspection shall be subjected to prior approval of purchaser's inspector.



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### 3.8 PERFORMANCE TEST

3.8.1 Performance test of each pump in the manufacturer's shop shall be carried out.

3.8.2 Pumps shall be operated in shop for a period sufficient to obtain complete test data. Unless otherwise agreed, the test speed shall be the rated speed of the pump.

3.8.3 Test procedure shall be as per Hydraulic Institute Standard / IS - 5120.

3.8.4 During the performance test, pump when operated at rated speed and rated capacity shall give guaranteed characteristics of total head, efficiency, brake kW and NPSH within the following tolerances.

Rated differential head : + 5%, - 2%

Rated kW : + 4%

NPSHR : 0

3.8.5 During performance test, pump shall operate without undue heating of bearings, excessive vibration, noise or other mechanical faults. Such defects if noticed shall be promptly rectified to the satisfaction of the inspector.

3.8.6 Instruments (if any) measurement tolerance shall be as per accuracy class I of IS-1520.

3.8.7 When operating fluid has viscosity appreciably higher than test fluid, test values of capacity, head, efficiency and power input shall be corrected to specified viscosity of operating fluid as per IS - 5120 / Hydraulic Institute Standard. Characteristic curves shall be plotted accordingly.

3.8.8 Job driver shall be used during performance test .

3.8.9 NPSHR test shall be conducted. Test shall be done at 5 points from shut off to 110% of rated capacity.

### 3.9 HYDROSTATIC TEST

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3.9.1 Each pressure casing shall be hydrostatically tested to 1.5 times the maximum allowable casing pressure. Multistage pumps may be segmentally tested at appropriate section pressure.

3.9.2 Test pressure shall be maintained for a minimum period of 30 minutes during hydrostatic test.

3.9.3 Vendor shall compile all the tests & inspection reports relevant to purchase order scope of supply in folder(s). Following reports must be included:

- Material certificates (chemical analysis, chemical test & impact test)
- Results of non destructive inspection
- Results of hydrostatic test
- Records of performance test
- Records of NPSH test
- Records of dimensions
- Other test conducted by vendor as per specification
- Guarantee certificates

#### **4.0 PREPARATION FOR SHIPMENT FOR CENTRIFUGAL PUMPS**

4.1 Pumps shall be despatched only after the shop test data and performance test curves are approved by the inspector.

4.2 The unmachined exterior surfaces shall be sand blasted, descaled and cleaned. The surface must be free from foreign material before paint is applied.

4.3 The external surface subject to atmospheric corrosion shall be painted with two coats of primer and two coats of epoxy based finish paint.

4.4 All the internal parts and machined unpainted exterior surfaces shall be protected with suitable rust preventive.

4.5 When driver is supplied with pump, the same shall be duly mounted on a common base frame.

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4.6 Both halves of the coupling shall be supplied by vendor in machined condition.

4.7 Each unit shall be suitably packed for outdoor storage for at least six months.

## 5.0 EOT CRANES

LSTK Contractor to provide EOT Cranes of adequate capacity in Pump House, wherever required for ease in operation and maintenance activities. EOT crane shall be selected for cater access to the maximum area of the pump house. Cranes to be provided in nearest multiple of 5 Metric Tonnes considering maximum Safe weight to be lifted. Relevant Indian/ ISO Standards applicable for EOT Crane shall be followed . All statutory guidelines to be complied by the LSTK contractor. Double Rail travel EOT crane having capacity minimum 1.4 times of maximum weighted part to be selected and also complying to IS: 3177 and statutory guidelines.

## 6.0 VENDOR'S DATA

6.1 The vendor shall supply the drawings and documents as per NIT

6.2 Each drawings / documents shall have the following information in a separate block :

Owner's Name :

Name of the Project / Plant

Consultant Name :

Purchase Order Number

Equipment Code Number / Name

Drawing Number / Revision Number

Supplier Reference Number

6.3 Contractor to furnish Complete List of all rotating equipment with their quantity, tag numbers and Power consumption along with the bid. Material Requisition (MR) for all machinery/ equipment to submitted by contractor for Owner's review & approval. Owner's/ PMC comments are to be duly incorporated by contractor and afterwards contractor shall proceed with procurement activity with respective OEMs. Technical Bid Evaluation (TBE) documents are to be furnished by bidder to Owner for information.

The un-priced copies of purchase requisition / purchase orders detailing both technical and commercial aspects for all items shall be submitted to Owner for review & comments. Contractor to proceed for placement of order on

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corresponding successful OEM only after receipt of CLEARANCE from Owner against the subject PR/PO.

## 7.0 SPARE PARTS

7.1 Spare parts as per NIT and shall be quoted in the proforma enclosed with enquiry.

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## SECTION VI - 5.0

### TECHNICAL SPECIFICATION FOR ELECTRICAL SYSTEM AND CATHODIC PROTECTION SYSTEM



#### FOR

### BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES

**PROJECT : INTEGRATED COAL BASED FERTILISER  
COMPLEX, AT TALCHER, ANGUL DISTRICT,  
ODISHA**



**CLIENT : TALCHER FERTILISERS LIMITED, ODISHA**

0	18.07.2023	18.07.2023	Issued for Tender	SS	SKB	SKB
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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7.0	Equipment Specification
8.0	Cabling
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10.0	Earthing and Lightning Protection
11.0	Cathodic Protection System.
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--	SLD for 33 KV ICOG Breaker Panel (Drg. No. PC150-7411B-0985A)
--	SLD for 3.3 KV Switchboard (Drg. No. PC150-7411B-0985B)
--	SLD for 415 V Switchboard (Drg. No. PC150-7411B-0985C)



### LIST OF ATTACHMENTS

Technical Specification No.	Description
PC150-TS-0801	Transformers
PC150-TS-0802	Neutral Earthing Resistor
PC150-TS-0803	Medium Voltage Switch Boards
PC150-TS-0804	High Voltage Switch Boards
PC150-TS-0805	Sheet Steel Distribution Boards
PC150-TS-0806	Lighting Sub Distribution Boards
PC150-TS-0807	Induction Motors
PC150-TS-0808	Interlocking Sw. Socket and Plug
PC150-TS-0810	Battery Charger
PC150-TS-0811	Battery
PC150-TS-0812	Cables
PC150-TS-0813	Prefabricated Ladder Type Cable Racks
PC150-TS-0814	Local Control Stations
PC150-TS-0815	Junction Box
PC150-TS-0816	Electricals for Over Head Cranes and Hoists
PC150-TS-0817	Capacitor Bank & Associated Equipment
PC150-TS-0818	Cathodic Protection Power Supply Module (CPPSM)
PC150-TS-0819	Cathodic Protection Transformer Rectifier Unit
PC150-TS-0820	Impressed Current Cathodic Protection System
PC150-TS-0821	UPS System
PC150-TS-0822	Soft Starter

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Electrical Sketches	Description
PC150-PDS:E 113	Foundation Details of 11/0.433kV Transformers
PC150-PDS:E 114	Foundation Details of 11/3.45kV Transformers
PC150-PDS:E 115	Typical Details of Transformer Room Door
PC150-PDS:E 116	Sump Pit for Transformer Oil
PC150-PDS:E 119	Typical Foundation Arrangement for Panels in Sub-Station
PC150-PDS:E 120	Typical Foundation Details for HT/LT Circuit Breaker Panels
PC150-PDS:E 203	Steel Tubular Lighting Pole
PC150-PDS:E 204	Installation of Electrical Poles
PC150-PDS:E 206	Installation Arrangement Street Lighting Fixtures
PC150-PDS:E 207	Details of Bracket Arm for Street Lighting Pole
PC150-PDS:E 208	Installation Arrangement Area Lighting Fixtures
PC150-PDS:E 210	Junction Box for Street Lighting Pole
PC150-PDS:E 213	Typical Street Lighting Pole
PC150-PDS:E 402	Component rating for DOL starter
PC150-PDS:E 464	Schematic Diagram Panic Light
PC150-PDS:E 510	Details of Concrete Cable Trench
PC150-PDS:E 511	Cable Rack Arrangement in Trenches
PC150-PDS:E 516	Typical Arrangement of Cables buried in slit
PC150-PDS:E 530	Pre-Fabricated Cable Tray Straight Run
PC150-PDS:E 531	Pre-Fabricated Cable Tray Horizontal Tee
PC150-PDS:E 532	Pre-Fabricated Cable Tray Horizontal Cross
PC150-PDS:E 533	Pre-Fabricated Cable Tray 900 Horizontal Bends
PC150-PDS:E 534	Pre-Fabricated Cable Tray 900 Vertical Bend Bending Rad. 1000 mm
PC150-PDS:E 535	Pre-Fabricated Cable Tray 900 Vertical Bend Bending Radius 600 mm
PC150-PDS:E 536	Pre-Fabricated Cable Tray Coupling Arrangement
PC150-PDS:E 537	Pre-Fabricated Cable Tray Fixing Arrangement
PC150-PDS:E 538	Pre-Fabricated Cable Tray Reducing Coupler Plate
PC150-PDS:E 602	Earthing Conductor Details
PC150-PDS:E 603	Arrangement of Connections of Earth Conductors
PC150-PDS:E 604	Typical Details of Connection in Earth Pit
PC150-PDS:E 605	Earth Pit Details
PC150-PDS:E 606	Typical Arrangement of Earthing for Motor and Start Stop Push Button
PC150-PDS:E 610	3.8 M GI Electrode for Earthing
PC150-PDS:E 611	GI/Al Accessories for Earth Electrode
PC150-PDS:E 613	Earthing of storage tank & vessel
PC150-PDS:E 615	GI Earth Bus
PC150-PDS:E 617	Typical Arrangement for Neutral and Equipment Earthing



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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## 1.0 SCOPE

- 1.1 This scope covers the engineering, manufacture, testing at works, supply of all electrical equipment, delivery to site in well packed condition, storage, handling, erection, testing and commissioning of complete Electrical System and Cathodic Protection System for. Balance Job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and Allied Facilities.
- 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 Balance Job of Permanent Raw Water Supply System and Cathodic Protection of the Pipeline. 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 tray/ 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 per-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.
  - 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

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- 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 LSTK 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 Balance Job of Permanent Raw Water Supply System and Cathodic Protection of the Pipeline' (hereinafter referred as Plant in short) comprising, but not limited to :



- a. 4 Pole Structure complete with pin/strain type insulators, GOD, DO fuses (3No) with necessary 33 kV 10KA Station class lightening arresters, CT, PT, Insulators, Jumpers, Guy wires as required, Anti climbing device, Danger board etc., Outdoor cubical type Metering Panel with Trivector Meter (CT,PT & Meter as per CESU requirement ) suitable for receiving power from State Electricity Board CESU, complete in all respect.

Contractor shall liaison with CESU/State Electricity Board regarding Specification of Metering Panel, CT, PT etc. and shall obtain approval from CESU, so that no issue arises during commissioning / charging.



- b. 33 KV XLPE cables from 4 Pole structure to ICOG Panel to 33/3.45 kV Transformer.
- c. 33 kV ICOG Breaker Panel.
- d. 33/3.45 kV Transformer and 3.3/0.433 kV Transformers
- e. Switchgears:
- 3.3 kV Switchgears/ switchboards.
  - 415 Volt Switchgears/ switchboards including Extension of PMCC, DC Distribution Board, Lighting Sub-distribution boards, Power Distribution Board, Junction boxes etc.

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- Local control Panels, Local Control stations, Switch Sockets.
- FCMA Starter with Vacuum Contactors, HT Fuses, Metering etc. complete in all respect.
- f. 3.3kV Motors.
- g. Power Factor corrective Capacitor Bank alongwith VCB, RVT, Series Reactor, Control Panel, APFC Relay, HT vacuum contactor, HT Fuse, Relays etc. complete in all respect
- h. All Cables (as required) viz
  - Power Cables
  - Control Cables,
  - Earthing cables,
- i. Erection/ installation & all sundry materials for installation, testing & commissioning of equipment/ panels/ fittings/ cables (including jointing & termination of cables) comprising (but not limited to) following:
  - Brackets, support structures, erection materials & accessories, as required
  - Cable trays, racks, pipes, ducts, cable channels etc as required.
  - Testing checking kits/ instruments
- j. Illumination System (Normal, Panic Lighting)
- k. Neutral grounding, NER.
- l. Earthing of equipment & structures.
- m. Protection against lightning, as required..
- n. 110 V DC Batteries, Battery Charger and DC Distribution Boards.
- o. Electrics for Ventilation Systems.
- p. Cable trench/Cable tray with supporting structure.
- q. Cathodic protection of Pipeline.
- r. 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
- s. 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.
- t. Contractor shall consider any other requirement which is not covered in this NIT, but required for successful operation of the plant.
- u. Spares & consumables for complete electrics as follows:
  - Commissioning Spares (as per Clause No. 15.0 and Mandatory / Insurance Spares for all equipments (as per Section 8.0: Spare Parts) shall be supplied by the Contractor.
  - 2 years Operational Spares
  - 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.
- v. Tools & Tackles.

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- w. Testing Equipments/ instruments.
- x. Arranging services of major equipment suppliers during installation and commissioning.
- y. Any and all other items/ facilities/ services not specifically mentioned but essential/ required for completeness of the systems/ equipments/ facilities
- z. 2 KVA UPS System with UPS Power Distribution Board and Ni-Cd Batteries
- 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 Specifications 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 Construction power shall be arranged by contractor through suitable rated DG Set.
- 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 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.
- 1.9 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. However, the value of total increase or decrease shall be limited to  $\pm 25\%$  of the contract value irrespective of the changes in quantity of individual items.
- 1.10 In case of any discrepancies between Technical Specification and SOR in respect of description of equipment / work, the details indicated in the SOR shall prevail.
- 1.11 In case of any discrepancies between Technical Specification – Electrical System and Technical Specification of equipment/item/work in respect of description of equipment/ item/work, the details indicated in the Technical Specification – Electrical System shall prevail.
- 1.12 All equipment and accessories shall be suitable for trouble free and continuous service at their rated capacity in the specified ambient and system conditions.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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## 2.0 BASIS OF DESIGN

### 2.1 General

2.1.1 While sizing the system necessary consideration shall be given to restrict the system voltage drop within permissible limits during starting of large rated motors. At the same time, the short circuit current shall be kept within limits keeping in view of the market availability of switchgears rating.



2.1.2 Contractor while performing detailed engineering activities shall adhere to following guidelines.

- a) If any equipment is not covered in this Technical Specifications 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.
- d) Contractor shall obtain approval from all statutory authorities such as CESU/State Electricity Board, Central Electricity Authority (CEA)/Electrical Inspectorate etc. for all electrical facilities including electrical switchboards & panels supplied and installed by Contractor.
- e) Contractor shall assist in Liaison and in all interface coordination with other contractors of project at construction, erection, testing & commissioning phase for 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) Bidder shall must visit the site and collect all relevant information required for detailed engineering 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.
- h) All the electrical equipments shall be of proven design and technology.
- i) Load details (rating of all motor, Lighting, Switch socket etc.) load shall be submitted.
- j) 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 price implication.
- k) Seismic zone as applicable shall be considered for design of all electrical equipment.

### 2.2 Statutory requirement Codes and Standards

2.2.1 The design, installation, testing & commissioning shall conform to compliance of following statutory requirements :

- Indian Electricity Act
- Indian Electricity Rules
- The Indian Factories Act

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- 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 CPCB, CEA etc.
- Guidelines of Insurance Companies Association.

The design, installation, testing & commissioning shall be in accordance with established codes, good engineering practices 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, CESU/State Electricity Board 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 statutory bodies/authorities . 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: 2544	Porcelain post Insulators for system with normal voltage greater than 1000 volts

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IS: 2633	Methods of testing uniformity of coating on zinc coated articles
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
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: 4759	Hot dip zinc coating on structural steel and allied products
IS: 5082	Specification for wrought Aluminium alloys bars, rods, tubes and sections for electrical purposes
IS: 5561	Electric power connectors
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: 9628	Specification for three phase induction motor with type of protection "n"
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
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

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IS: 12459	Code of practice for fire protection of cable runs
IS: 12615	Energy efficient motors
IS: 13234	Guide for short circuit calculations
IS/IEC: 60947	Low voltage switchgear and control gear
IS: 60034-5	Degree of protection provided by Integral design of rotating electrical machines
SP: 30	National Electrical Codes (NEC) - BIS Publication
IS/IEC 62271	HV Switchboard.
IEC 60947	LV 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/IS 60470, IEC 60694	General panel assembly, switchgear, contactor based motor starters specifications
IEC 60871-1 /IS 13925 [part 1]	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 System
- Data sheets
- Technical specification / Installation Standards, etc.
- Applicable IS/IES standards

In case of any contradiction between various referred standard/ specification/ data sheet and statutory regulation, most stringent requirements shall prevail. However, Owner's decision in this regard will be final and binding.



2.5 Item not covered and required shall confirm to the latest issue of IS/IEC.

## 2.6 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%



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- Altitude above mean sea level Lower than 1000 Mtrs.
- Atmospheric pollution Humid & Dusty and corrosive.



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.

### 3.0 SYSTEM DETAILS AND UTILIZATION VOLTAGES

3.1 The various voltage levels for power distribution shall be as follows:

A. Normal Power	Through 33kV XLPE Cables from 2 Nos. 4 Pole Structure / ICOG Panel (CESU Power Supply) 33KV $\pm$ 10%, 50Hz $\pm$ 5%, 3Ph, 3 W
B. Distribution Equipment	a) 3.3KV $\pm$ 10%, 50 Hz $\pm$ 5%, 3 Ph, 3 W with resistance earthed neutral b) 415V $\pm$ 10%, 3 Ph, 4 W/240V $\pm$ 10%, 1 Ph, 2W, 50 Hz $\pm$ 5% solidly grounded neutral.
Combined variation in voltage & frequency	$\pm$ 10%
Control Supply for: - 415V motors  - Switch Gear Breaker Controlled Feeders : a. Closing, tripping & spring charging motors b. Auxiliary power	AC 240V $\pm$ 10%, 50 Hz $\pm$ 5%, 1Ph (For contactor controlled motors) DC 110V $\pm$ 5% (For breaker controlled motors)  DC 110V $\pm$ 5%, 2 W AC 240V $\pm$ 10%, 50 Hz $\pm$ 5%, 1Ph, 2W
Voltage Ratings - Motors above 150 KW up to 1000 KW. -Motors up to150 KW	3.3 KV, 3 Ph AC 415 V, 3 Ph AC
- Space heaters - Lighting - Panic Lights - Power Sockets/Receptacle	240V, 1 Ph AC 415V/240V AC 110V DC 415V, 3 Ph AC/240V, 1 Ph AC

3.2 Minimum fault level to be considered for engineering and selection of equipment shall be as follows:  
For 33kV supply – 31.5 kA for 3 sec.

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For 3.3kV supply – 26.24 kA for 3 sec.

The fault level for 415V switchboards shall not exceed 50KA for 1 sec.

### 3.3 System Earthing

The neutral of 3.3 KV systems shall be non-effectively earthed through resistance. The earth fault current of 3.3 KV shall be limited to full load current of the transformer or 400 A, whichever is less.

The neutral of 415V supply system shall be solidly earthed.

The DC system shall have positive pole earthed through high impedance. Prospective touch voltage earthing shall comply with the requirements of relevant Indian/IEC standards.

### 4.0 POWER SUPPLY AND DISTRIBUTION.

4.1 Two nos. Four pole structure with double break 33kV Isolator shall be provided to receive double circuit power from State Grid CESU.

Double circuit 33 KV incoming power from 4 pole structure to ICOG Breaker Panel through 33kV XLPE cable shall be in Contractor scope. 33/3.45 kV transformer to step down the voltage and Tapping of the power to 3.3 KV Switchboard and further distribution to equipment at 3.3 KV, 3.3/.433 kV Transformers, PMCC, DC System through proper type and size of cables, their supply, erection, testing and commissioning etc. shall be in Contractor's scope.

4.2 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.



4.3 Inter tripping & Interlocking cable between shall be in the scope of Contractor.

4.4 The insulation system of cable, 3.3 KV equipments shall be based on unearthed system only.

4.5 The entry of cables in the switchboards shall be from bottom only.

4.6 The normal operation of the 3.3 KV Switchgears 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 below 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 3.3kV 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:

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- 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 (two incoming feeders and one Bus Coupler).
  - vii. Tripping of incomer breakers shall be prevented in case of loss of power of both the incomers.

#### 4.7 Lighting Distribution



- 4.7.1 Lighting Distribution Boards shall receive power from 415 V Switchboard. 10% of light shall be used as panic light (110 V DC operated) in case of failure of normal power.
- 4.7.2 All Indoor Lighting fixtures of Substation, Pump House etc. shall receive power from Lighting Sub-distribution Boards (Indoor).
- 4.7.3 All outdoor lighting fixtures including outside lighting of Sub-Station, Pump House etc., shall receive power from lighting sub-distribution board (Outdoor). Suitably rated contactor operated through photo-cells / clock timer shall be provided.
- 4.7.4 415 V Switchboard shall feed Lighting Sub Distribution board having 63A 4 Pole MCCB as incomer and 16Amp as DP RCBO as outgoing. Six, Nine or Twelve way Lighting Sub Distribution board shall be used having 30 % as spare outgoing RCBO feeder.
- 4.7.5 Welding outlets shall be fed from 415 V Switchboard.

#### 4.8 DC Power



- 4.8.1 110 V DC system shall be provided for control of circuit breaker feeders, panic lighting and other loads.  
  
It shall be obtained from Ni-Cd batteries to be located in in a separate room in the Sub-Station. Separate dedicated Battery, Battery Charger and DC Distribution Board shall be provided in substation.
- 4.8.2 The battery shall be provided with SCR controlled automatic rectifier-cum battery chargers and shall consist of load-cum-float-cum-boost charger and stand by unit for these.
- 4.8.3 Rectifier-cum- battery charger shall have independent power supply to be fed from the 415 V Switchboard.
- 4.8.4 Substation requiring 110V DC shall have 2 sources from 415 V PMCC with auto changeover facility in case of failure of 1 source, Redundant battery chargers with separate battery banks shall have to be provided by Contractor.
- 4.8.5 DC Distribution Board with 2 Nos. of outgoing feeders for 33 kV ICOG Panel, 2 Nos. of outgoing feeders for 3.3 KV Switchboard, 2 Nos. of outgoing feeders for 415 V Switchboard, 4 Nos. outgoing feeders for Panic Lights, 4 Nos. outgoing feeders for 24 V System and 2 Nos. Spare feeders, shall be provided
- 4.8.6 For all other specifications of Battery Charger , refer PC150-TS-0810.

#### 5.0 SUB-STATION

- 5.1 New Substation including Transformer Room, Capacitor room shall be considered for accommodation of all electrical equipments.

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- 5.2 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.).
- 5.3 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.
- 5.4 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.
- 5.5 Transformer floor shall be at least 300 mm above the finished floor level.
- 5.6 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,
- 5.7 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 33/3.3 KV/415 V Switchboards:
- a) The clear space of 1.5 M at rear side of 33/3.3 kV Switchboard.
  - b) A clear space of 1 M behind for single front switchboard.
  - c) A clear space of 2.25 M between the two boards facing each other.
  - d) A clear space of 2.0 M on either side at entrance/exit.
  - e) A clear space of 1 M between two boards in same line after future panel space of switchboard.
- 5.8 Epoxy flooring shall be done to reduce the heat load and improve the aesthetic look.
- 5.9 The substation shall have ventilation system complete with required Nos. of exhaust fans plus 2 Nos. Spare exhaust fans. Battery Room shall have Flame Proof exhaust fan and 1 No. Spare flame proof Exhaust Fan. No. of Air Change for Substation and Battery Room shall be considered as 15 and 10 respectively.
- 5.10 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 resistant protective epoxy coating. Light fittings, exhaust fan, on/off switches etc. in this room shall be chemical resistant type and flame proof type.
- 5.11 Location of battery charger shall be nearer to battery room.
- 5.12 All doors and windows shall have anodized aluminium frame and provided with toughened glass.
- 5.13 Continuous fixed type glass ventilators on all sides shall be provided near the ceiling height for natural lighting.
- 5.14 Arrangement shall be provided for lifting heavy equipment to be brought into the sub-station.
- 5.15 The sub-station and Transformer Rooms shall house all the electrical power, control and monitoring equipment except those required for operation in the Pump House. The equipment shall broadly include the following: -
- Step down Transformers.
  - 33 kV ICOG Breaker Panels

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- 3.3 kV Switchboard
- 415 V Switchboard (Extension of Existing Switchboard)
- Lighting Sub -distribution Boards
- Battery Sets
- Rectifier-Cum-Battery Charger
- DC Distribution Boards
- Neutral Earthling Resistors (Indoor / Outdoor as per requirement)
- FCMA Starter for 3.3 kV Motors for Pumps
- Any other equipment required

5.16 Separation walls between transformers / substations shall be provided.

5.17 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 as per Drg. No. PC150- PDS: E 113 attached with this bid package.

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. PC150-PDS:E 114 for draining away of any oil, which may escape or leak from the tanks, to a waste oil tank.

5.18 A clear space of at least 1.5 Meters shall be maintained all around the transformers after installation of Nitrogen injection system etc., as required.

5.19 Separate common oil pits are required for Transformers.

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.

The location of sump pump over pit shall not be less than 15 M from nearest transformer.

Oil Pit under Transformer: 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.

5.20 In substations/, space for future extension of switchboards shall be provided. One panel extension space on each side (for each bus section) shall be provided for 3.3kV



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Switchboards. One panel extension space on each side (for each bus section) or two panel extension space on one side (in exceptional cases) shall be provided for 415 V PMCC.

## 6.0 PROTECTION & METERING

- 6.1 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 and interlinked 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.
- 6.2 Numerical relay shall indicate MWH, MVAR, MVA, V, A, Hz, PF.
- 6.3 All Auto-changeover logic shall be build in Numerical Relay. Numerical Relays shall have sufficient I/O to cater the same and there shall be minimum 10 % spare I/O for future use.
- 6.4 All Numerical Relays of 33KV, 3.3KV and 415 V Switchgear/Switchboards shall be of same Make and Model (Series).
- 6.5 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.
- 6.6 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.
- 6.7 In general, fast acting relays (with time delays if required) shall be used and all fault tripping shall be done through high speed tripping relays.
- 6.8 Relay setting, parameterization and commissioning of the Numerical relays shall be done by OEM authorized personnel only. Arranging the same shall be responsibility of Contractor.
- 6.9 Bare minimum protection for power distribution system shall be as indicated in SLD. However, contractor shall provide any other necessary protection required for complete protection of system:.
- 6.10 Notes for Relay Protection Philosophy
1. HV capacitor bank feeders shall be provided with 51, 51N, 59 (over voltage), 60 (Neutral displacement), 86 and 95 relays.
  2. 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 capacitor feeders.
    - b. HV and 415 V 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.
  3. One no. DC supply supervision relay (80) shall be provided for each incoming DC supply to the switchboard.
  4. Breaker control switch shall be hardwired type.
  5. Accuracy class of the current transformers shall be

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- Class PS for differential and special requirements.
- Class 1.0 / 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.

6. Accuracy class of the potential / voltage transformers shall be

- Class 5P for protection purpose.
- Class 1.0 for metering purpose.

All the PTs shall have secondary voltage 110 V or 110 V / sqrt.3 and rated burden of minimum 50 VA per phase for both metering and protection core.

7. Numerical relays in all HV motor feeders shall be suitable for RTD / BTD inputs.
8. Each bus section shall be provided with separate under voltage relays.
9. Metering 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 in the equipment specification sheet. All the metering instruments shall be flush mounted.
10. Motors shall also be provided with Unbalanced (-Ve) Sequence Protection Relay (46), as required.
11. Numerical under voltage relays (27) with time delay relay including VT fuse failure relay shall be provided for Bus VTs.
12. No Meters, transducers or measuring equipments to be installed in the Protection CT circuit.
13. All required Alarms and Trips shall be incorporated in the Numerical relays. Sufficient LED shall be available in the Relays.

6.11 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.

All HV, LV Switchboards ( including PCC, PMCC, EPMCC, ASPB etc.) Incomers and Bus-coupler shall have Communicable Multi-Function Meter with Accuracy Class: 1.0 with suitable Metering CT.



All CESU metering requirement shall be met in Metering panel with CT, PT, TVM etc. as per Technical Specifications of CESU and CESU approved make. . Metering Panels complete with CT, PT etc. shall be in Contractor's scope.

**7.0 EQUIPMENT SPECIFICATION**

**7.1 General Constructional Features**

**7.1.1** 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.

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Fine mesh screen of corrosion resistant material shall be furnish on all ventilating openings to prevent entry of insects.

- 7.1.2 The equipment to be installed in indoor plant area shall be enclosed in dust, damp and vermin proof enclosure equivalent to IP 54 as per relevant Indian Standards/IEC.
- 7.1.3 The equipment excluding motors to be installed in outdoor plant area shall have IP 65 enclosure. Motors shall have IP 55 enclosure.
- 7.1.4 4 mm FRP (fire retardant and UV stabilized) canopies shall be provided for all outdoor equipments like motors, starters, LCS, SDBs, sw. sockets etc.
- 7.1.5 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 etc. located in well ventilated room may have IP 43 enclosure however, opening for the ventilation shall be covered with fine wire mesh.
- 7.1.6 Creepage distance shall be 31mm/kV (for highest system voltage) for all equipment.
- 7.1.7 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
- 7.1.8 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.
- 7.2 **33kV ICOG Breaker Panel**
- 33 kV ICOG Panel shall be free standing floor mounted cubicle type. 33 kV ICOG Panel shall have complete protection and metering. 33 kV ICOG shall be located in the Substation. 33 V ICOG Panel shall be as per SLD.
- 7.3 **Transformers**
- 7.3.1 The transformers shall be double wound, copper conductor, and Dyn11 type. Transformers shall have 33 kV & 3.3 kV primary windings and 3.45 KV & 0.433 kV Secondary winding.
- 7.3.2 33/3.45 kV Transformers shall have Online Tap Changer with RTCC Panels. Manual Bypass arrangement shall also be provided. 3.3/0.433 kV transformers shall have 'OFF' load tap changers. Further, to compensate for the voltage regulation, the no load voltage of the secondary side shall be kept as per IS.
- 7.3.3 The rating of transformers shall be selected keeping following into considerations:
- (a) Duty : Continuous
  - (b) Outdoor type : ONAN.
  - (c) Class of Insulation : B or better for oil filled
  - (d) Tap changer : ON Load / OFF load type
- 7.3.4 Maximum temperature rise over ambient of 50 Degree Celsius shall be limited to:
- (a) Outdoor transformers:
    - Top oil (measured by thermometer) : 50<sup>0</sup> C
    - Winding (measured by resistance) : 55<sup>0</sup> C
- 7.3.5 Special consideration shall be given in specifying the percentage impedance of the transformers to suit the switchgear short-circuit capacity.
- 7.3.6 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.



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- 7.3.7 Suitable Nitrogen Injection Fire Prevention and Extinguishing System (NIFPES) shall be considered for transformers having oil capacity more than 2000 Ltrs.
- 7.3.8 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.
- 7.3.9 The instruments such as OTI/WTI, Buchholz relay and MOG shall have Magnetic Reed Switches. The mercury switch contacts are not acceptable.
- 7.3.10 For all transformers, conservators shall be provided with Magnetic Oil Gauge (MOG) having 1NO contact activated on Low oil level. For transformers where the oil capacity is more than 2000 Ltrs, Air cell shall be provided in the conservator.
- 7.3.11 All Routine tests shall be performed in compliance with B.S.171, IEC publication No.60076, IS 2026:1977 (parts I to V), CBIP and IS: 2026:1981 (Part III) before dispatch from Manufacturer's works and at erection site during commissioning or latest editions or any other authoritative standard. Type Test Certificates shall be submitted for similar rating of transformers.
- 7.3.12 For all other specification refer PC150-TS-0801.
- 7.4 Neutral Earthing Resistor (NER)**
- 7.4.1 The NER shall be provided to earth the neutral of 3.3 KV systems. Neutral of 415V supply system shall be solidly earthed.
- 7.4.2 Neutral earthing resistor shall be outdoor type made of AISI 304/406 punched stainless steel grid element. The earth fault current of 3.3 KV shall be limited to full load current of transformer or 400 A for 10 Seconds whichever is less & 80 A Continuous rating.
- 7.4.3 Resistance value of NER shall be 4.98 Ohms.
- 7.4.4 For all other specification refer PC150-TS-0802.
- 7.5 Switchboards**
- 7.5.1 General
- 7.5.1.1 33 kV ICOGs & 3.3 kV Switchboard shall be manufactured and supplied by the OEM (Original equipment Manufacturer) of the Circuit Breaker. Design & manufacturing of HV switchboard & ICOGs by channel partner, franchise or sub-vendor of the OEM shall not be acceptable in any case.
- 7.5.1.2 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.
- 415 V Switchboard shall be single front for ease of operation & maintenance.
- 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.
- 7.5.1.3 Suitable shutter arrangement shall be provided to protect the person from accidental contact with live bus in trolley chamber.
- 33 kV & 3.3kV Breaker with Integral Earthing switch system shall be with proper interlocks.

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7.5.1.4 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 415V switchboards above 1600A rating.

7.5.1.5 LOTO (locked out tag out) arrangement shall be provided for all switch boards (i.e. all HV panels & each module of 415 V Panels which shall include following provisions:-

- Provision for hooking lockout devices by multiple lock arrangement to prevent opening of panel door and racking-in of circuit breaker.
- Provision for attaching tag-out device for warning against energisation and to provide information regarding date of isolation, agency working on the equipment, etc.
- Provision for Hasp such that the same shall be put-in and closed in the locking arrangement of the breaker/switch and panel door.
- LV SWGR design shall be such that the feeder doors should not open in locked out tagged out condition .

7.5.1.6 3.3 kV Switchboard shall conform to IS/IEC 62271-200, IAC-A FLR-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 conform to loss of service continuity . LV switchboard shall conform to IEC 60947.

7.5.1.7 The busbars and connection shall be made of electrolytic grade copper only. Aluminium busbars are not acceptable. All busbars shall have Raychem sleeving.

7.5.1.8 Clearance between gland plate to cable termination point in all switchboards shall be adequate but not less than 300mm to ensure proper cable termination.

7.5.1.9 FRP supports shall be used for bus bars with adequate clearances and creepage distance to prevent flash over due to effect of dust moisture.

7.5.1.10 Protective relays shall be mounted on the front of the switchgear panel.

7.5.1.11 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 conformal 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.



7.5.1.12 All Process Stop and other important Parameters shall be routed through Numerical relays for recording and Time-stamping. Common Audio Visual Alarm for each Bus section of Switchboard may be provided through Numerical relays. Sufficient LED shall be available in the Relay.

7.5.1.13 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.



7.5.1.14 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.

7.5.1.15 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.



7.5.1.16 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.

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- 7.5.1.17 Control supply shall be tapped from control bus in each cubicle/ panel itself through DP MCB of suitable rating.
- 7.5.1.18 The minimum thickness of sheet steel used in HV and LV switchgear including charger, 415 V Switchboard 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
- 7.5.1.19 A bottom channel of not less than 100 mm shall be provided.
- 7.5.1.20 415 V Switchboard / DC Distribution Board shall be single front execution
- 7.5.1.21 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.
- 7.5.1.22 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.
- 7.5.1.23 The switch boards shall have PVC insulated bus bar system suitable for rated voltage. At joints of these bus bars removable shrouds shall be provided.
- 7.5.1.24 All switch boards shall generally have two sections operating independently with two 100% rated incoming feeders and with bus coupler open having facility for changeover in the event of failure of either of the incoming circuit breakers.
- 7.5.1.25 Auto changeover scheme shall be provided for incomers and bus couplers on 3.3 KV switch boards. 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.
- 7.5.1.26 Paralleling of two incoming feeders is not foreseen. However, facility for momentary paralleling shall be provided for intentional changeover without interruption of supply.
- 7.5.1.27 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.
- 7.5.1.28 Separate redundant DC control supply shall be provided for each Switchboard.
- 7.5.1.29 Control supply for motor feeders having MPCB & EMPR in 415 V Switchboard etc. shall be taken from panel itself and motor controlled with breaker shall have 110 V DC control supply irrespective of its being HT or LT.
- 7.5.1.30 For motors with auto-starting provision, trip of a running motor will start standby motor automatically.
- 7.5.1.31 All the HT/LT 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.
- 7.5.1.32 Max. 3 runs of 400 sq.mm power HT cable shall be terminated in single panel. For more than 3 runs of cable complete dummy/adaptor panel shall be provided.

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- 7.5.1.33 The CB ON and OFF lamps shall be provided at rear and front side of 3.3kV switchboards.
- 7.5.1.34 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.
- 7.5.1.35 All breakers shall be electrically operable and mechanical operation from the breaker shall be possible locally. Manual breakers are not acceptable.
- 7.5.1.36 Separate Ammeter shall be provided for panel and motor feeder Space heater circuit for each panel.
- 7.5.1.37 The terminal strips used shall be of stud and nut type and control wiring shall be done with ring tong lugs only.
- 7.5.1.38 All LT motor feeders (above 5.5KW) and power feeder above 100A shall have separate earth fault protection through CBCT and Digital earth fault relay with display.
- 7.5.1.39 Feeders feeding switch sockets and outgoing feeders above 100 A shall have CBCT and earth fault relay.
- 7.5.1.40 All external hardware shall be of stainless steel only.
- 7.5.1.41 The control compartment and power compartment shall be separate.
- 7.5.1.42 Following Set of accessories as detailed below shall be provided for 3.3 kV Switchboard :
- Earthing equipment suitable for earthing the bus/cables : Minimum 1 No.
  - Breaker handling trolley
  - Test plug for relays
- 7.5.1.43 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. Lamp indications shall be provided individually for main D.C. supply-1 fail, main D.C. supply-2 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.
- 7.5.1.44 For all other specifications, refer PC150-TS-0803, PC150-TS-0804, PC150-TS- 0805 and PC150-TS-0806.
- 7.5.2 3.3 KV Switchboard.
- 7.5.2.1 The 3.3 KV switchboard shall be indoor, metal enclosed, draw out type, equipped with Vacuum Circuit Breakers (VCBs), stored energy mechanism working on 110 V DC. for all feeders.
- 7.5.2.2 The minimum degree of protection shall be IP4X as per IS/IEC:60529,IEC 60298. Switchgear sizes and configuration shall be rationalized to minimum spare holding.
- 7.5.2.3 Vacuum circuit breakers shall be used for incoming feeders, bus couplers and outgoing feeders.
- 7.5.2.4 Rated short circuit breaking capacity shall be 26.24kA for 3 Sec. HV Switchboard shall be suitable for Internal Arc (AFLR) withstand current of “rated short circuit current” for 1 sec.
- 7.5.2.5 Incoming, bus coupler and outgoing feeders shall be provided with ON, OFF, Trip, Trip Circuit Healthy, Spring Charged indications. Process trip lamp to be provided wherever applicable.
- 7.5.2.6 Control supply shall be 110 V DC.
- 7.5.2.7 Extra anti-condensing space heater shall be provided in Bus –Bar and Cable chamber of 3.3KV Switchboard.

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- 7.5.2.8 HT Breaker rack in rack out facility shall be operable when breaker panel door is closed position.
- 7.5.2.9 Each motor feeder and Spare Motor Feeder shall have Minimum 16 Channel Universal Input Temperature Scanner of suitable power supply, 2 Nos. set point for alarm and trip and 2 nos. relay output for alarm and trip, LED display and Auto/Manual Mode facility. RTDs and BTDS of respective motors shall be connected to these Scanners. When the Temperature of Winding and/or Temperature of Bearings exceed SET value the respective relay of motor shall trip.
- 7.5.3 Low Voltage Switchgears
- 7.5.3.1 The one incomer of existing 415V switchboard shall be feed from 3.3kV switchboard transformer feeder.
- 7.5.3.2 The existing 415V switchboard shall be extended. 1 No. 1000 A ACB Incomer shall be provided.
- 7.5.3.3 The details of the required outgoing feeder (in Extension Panel) shall be as per SLD.  
All outgoing feeders shall be provided Ammeter, 3 CTS and Ammeter Selector Switch.  
The extension Panel shall be of OEM.
- 7.5.3.4 Low voltage switchboards shall be metal clad, arranged with self supporting units and assembled together in a row. The degree of protection shall be IP 52.
- 7.5.3.5 Internal physical separation / segregation of extension of 415 V Switchboards shall be 3 B for Non-ACB feeders and 4 B for ACB feeders.
- 7.5.3.6 The switchboards shall be suitable for extension at both the ends.
- 7.5.3.7 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.
- 7.5.3.8 The horizontal busbars as well as vertical droppers of extended panel of LV switchboards shall have heat shrinkable insulated sleeves.
- 7.5.3.9 Sufficient bus supports shall be given to give adequate mechanical strength during short circuits.
- 7.5.3.10 A continuous ground bus shall be provided at the bottom in the 415 V Switchboards for grounding the 415 V Switchboards.
- 7.5.3.11 Rated short circuit breaking capacity shall be 50 KA for 1 sec.
- 7.5.3.12 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), lockout (86). Lockout relay shall be hand reset type.
- 7.5.3.13 All ACBs shall be without any internal releases. The required protections shall be wired by means of external numerical relays.
- 7.5.3.14 Switchboards shall be provided with thermostatically controlled anti-condensation heaters.
- 7.5.3.15 All units in the 415 V Switchboards shall be completely accessible and removable from front. Both power and control connections shall be stab-in type.
- 7.5.3.16 Bus bar clearances shall conform to relevant Indian Standard/IEC for equipment voltages up to and including 500 V AC.

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- 7.5.3.17 The components to control the equipment like MCCB/MPCB, 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.
- 7.5.3.18 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.
- 7.5.3.19 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.
- 7.5.3.20 Provisions shall be made to manually close/trip circuit breakers on loss of control voltage.
- 7.5.3.21 The 415 V switchboard control supply shall be 240VAC, 50Hz supply tapped internally through redundant Control transformers.
- 7.5.3.22 All low voltage switchboards shall be provided with 20% spare outgoing feeders or minimum one of each rating (fully wired) and with all the components.
- 7.5.3.23 The timers shall be electronic type only. Pneumatic or synchronous type timers are not acceptable.
- 7.5.3.24 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:
- Isolating MPCB & EMPR.
  - Control supply On/Off switch and fuse
  - Power Contactor
  - Electronic Digital Motor Protection Relay with built-in Earth Fault, Overload, Stalling, Single phase protection, etc. Thermal Overload Relay are not acceptable.
  - C.T for metering
  - Overload reset button.
  - Process Trip / ON / OFF indicating lamp with separate indicator fuse.
  - Auxiliary contactors for multiplication / control.
  - Test position limit switch and test PB
  - CT operated Ammeter for all motor feeders above 1.5 KW, all MOV and LOPs at both LCS and Feeder end.
  - Selector switches as per requirement.
- 7.5.3.25 Provision for indication of minimum following electrical parameters in 415V Switchboards shall be made:
- ON OFF, TRIP, TRIP CIRCUIT HEALTHY, TEST, SERVICE Position indication in ACB feeders.
  - The KWH meters on incomers shall have provisions for sealing for tariff purpose, as required.
  - 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.
- 7.5.3.26 The number of modules per tier shall not exceed 6.



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- 7.5.3.27 MCC incomer sizes and configurations rationalised to minimise spares holdings.
- 7.5.3.28 415 V Switchboard shall feed all lighting load, EOT Crane, welding load, DCDB, Marshalling Box of Transformer, HV Switchboards etc.
- 7.5.4 Lighting Sub-distribution Boards / Power Distribution Board
- The Distribution Boards shall be single front, non-draw out wall mounted.
- 7.5.4.1 Generally following shall be covered under Sub-distribution Boards :
- LSDBs for power supply to Indoor lighting fixtures.
  - LSDBs for power supply to Outdoor lighting fixtures.
  - PDB
- 7.5.4.2 The internal wiring shall be carried out by means of single core PVC insulated 4 sq.mm stranded copper conductor cables
- 7.5.4.3 The circuit nos. of outgoing feeders shall be serially indicated as R1, Y1, B1, R2, Y2, B2..
- 7.5.5 Direct Current Distribution Boards
- 7.5.5.1 The Direct Current Distribution Boards (DCDBs) shall be single front, non-drawout type for supply of 110 V DC control power to switchgears and panic lighting.
- 7.6 **Motors**
- 7.6.1 The rating of LV and HV motors shall be selected from the sizes as recommended in relevant Indian Standard/IEC.
- 7.6.2 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%                                    |
- 7.6.3 Voltage Ratings:
- Voltage rating for the motors of different ratings shall be as below:
- |                         |                           |
|-------------------------|---------------------------|
| Upto 150 KW:            | 415 V, 3-phase, 50 Hz AC  |
| Above 150 KW - 1000 KW: | 3.3 KV, 3-phase, 50 Hz AC |
| Above 1000 KW:          | 11 KV, 3-phase, 50 Hz AC  |
- All motors shall be designed for 3-Phase supply only.
- 7.6.4 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.
- 7.6.5 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.
- 7.6.6 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.
- 7.6.7 All motors 30 KW and above shall have space heater provision.
- 7.6.8 All HV motors shall have winding, hot air and bearing RTDs. All the temperature signals shall be terminated to DCS as well as LMS.



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- 7.6.9 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.
- 7.6.10 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 current.
- 7.6.11 The starting current of 3.3 KV motors shall not exceed 550% of FLC. No positive tolerance is acceptable over 550% FLC.
- 7.6.12 Type test certificate of similar motor for use in specified hazardous area (if applicable) shall be furnished.
- 7.6.13 The duty cycle of the motor shall meet the process and driven machine requirement.
- 7.6.14 In case of 11 KV & 3.3 KV motor, the terminal box shall be suitably designed for proper termination of XLPE insulated cables through heat shrink termination kit.
- 7.6.15 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. Generally, all motors, except for application such as crane, hoist, turbine/engine starting, shall be designed for continuous duty with rated load.
- 7.6.16 Motor rated above 30 KW shall have on line greasing provision and for motor rated above 45 KW, grease outlet feature shall be provided.
- 7.6.17 All HV motors shall have safety factor not less than 1.1.
- 7.6.18 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
- 7.6.19 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.
- 7.6.20 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.
- 7.6.21 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.
- 7.6.22 Shaft voltage shall be limited to 200 mV.
- 7.6.23 For all other specifications, refer PC150-TS-0807.
- 7.7 Rectifier-cum-Battery Charger**
- 7.7.1 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 cum Boost charger: To supply continuous load and keep the battery in healthy state.
  - ii) Standby Float cum Load cum Boost charger: To supply continuous load & keep the battery in healthy state in case any abnormality in Main charger.
- 7.7.2 Battery Charger shall have 110 V DC system.
- 7.7.3 Separate Rectifier-Cum-Battery Charger with DC Distribution Board and Battery Bank shall be provided.



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- 7.7.4 Substation shall be provided with redundant battery charger with 2x100% battery banks.
- 7.7.5 The battery and charger combinations shall be such as to ensure continuity of D.C. supply at load terminals without even momentary interruption.
- 7.7.6 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.
- 7.7.7 .For all other specifications, refer PC150-TS-0810.
- 7.8 Battery Sets.**
- 7.8.1 These shall be Ni-Cd Battery Sets shall be rated to meet the total DC power requirement for 1 hour after complete power failure.
- 7.8.2 Battery shall be designed with minimum temperature as 5<sup>0</sup> C.
- 7.8.3 For all other specifications, refer PC150-TS-0811.
- 7.9 FCMA Starter**
- 7.9.1 FCMA Starter shall be provided for 3.3 kV Motors for Water Pumps.
- 7.9.2 The FCMA starters shall be series impedance type soft starter for specified motor and load. The FCMA modules in the Starter, shall act as impedance in series with motor winding and allows reduced voltage to be applied at the motor terminals while starting. The FCMA module shall get bypassed after starting process is complete.
- 7.9.3 FCMA starter shall preferably be installed on the line side.
- 7.9.4 FCMA Starter shall be designed to reduce the starting current upto 200% of rated current. The FCMA impedance value shall be designed to allow the motor to generate adequate starting torque in the motor to overcome the load torque and friction to ensure smooth acceleration.
- 7.9.5 The enclosure shall be fabricated from minimum 2 mm thick sheet steel free standing floor mounted, similar to HV Switchboard, and ingress protection shall be minimum IP 52. Method of cooling shall be natural air. If required suitable louvers for air intake may be provided.
- 7.9.6 The Self standing starter Panel shall be designed such a way that the control section access should be isolated from the power section, Power section and cable termination sections.
- 7.9.7 Starter must be designed with Harmonics free series reactor impedance with pure sinusoidal wave output and variable voltage as function of motor speed and back EMF.
- 7.9.8 **PRINCIPLE OF OPERATION:**
- The motor starting current shall be continuously monitored by an intelligent Microcontroller and the FCMA impedance module is bypassed when the motor current drops below FLC. An additional supervisory timer shall be used to monitor the motor locked rotor or overload condition. This entire process of reduction in current, with gradual increase in motor voltage shall take place in a step less manner from zero to full speed so as to achieve very soft and smooth starting of the load.
- 7.9.9 The Contractor shall super impose the motor torque vs speed curve at reduced voltage (to motor terminals at starting) on torque vs speed characteristics of the driven equipment to confirm correct operation i.e. acceleration to rated speed. The Contractor shall also calculate acceleration time at reduced voltage (based on these torque vs speed curves) required for accelerating the drive, to full rated speed.
- 7.9.10 Motor Series Impedance reactor (FCMA) shall be highly efficient unsaturated air core type to suit mutual induction and field compensation effect and avoid the drawbacks of iron core such as eddy current, core saturation, iron losses, noise and vibration.

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The reactors must be natural air cooled, independent, free standing for each phase, individually accessible, multi-tap for onsite voltage ramp adjustment, Copper wound Class H insulated (temperature rise class B), Vacuum pressure impregnation processed and epoxy casted for all weather and vermin proof IP 65 construction. complete assembly of the reactors must be free from magnetic material including hardware and reactor holding claws.

7.9.11 Shunt Capacitors : Motor Shunt Capacitors (for power factor correction upto 0.98 and/or dynamic Energy compensation during starting to improve starting characteristics and power quality by limiting energy consumption as low as to limit system energy consumption to 120% of motor rated value ) shall be rated for 20 % higher phase voltage and of insulation class F. Shunt capacitors must be suitable as per system voltage.

Capacitor Bank shall improve the p.f. both during starting and running condition of motor.

7.9.12 Bypass switchgear : Starter Bypass device (vacuum Contactor) shall be rated 125 % of motor full load current, AC3 duty or higher, of same or higher short circuit/fault current handling capacity, to ensure failsafe bypass operation, mounted for easy access for service and testing. Control logic and devices :Starter must be equipped with built in devices for close loop, fail safe, self diagnostics type control loop feedback mechanism suitable for industrial control standards.

Interlock of Bypass circuit and upstream breaker shall be provided.

7.9.13 Control Supply Voltage shall be 110 V DC.

7.9.14 Duty Cycle shall be 4 equi spaced starts per hour or two consecutive starts .

7.9.15 CT for metering & protection shall be provided in FCMA Starter .

7.9.16 FCMA Starter shall be suitable for operation at specified site ambient conditions and system details . .

7.9.17 Minimum indication, auxiliaries, control as detailed below shall be provided :

- LED type indication lamps for Auxiliary and Control supply ON, Bypass Mode & Fault Mode, Ready, Dynamic Compensator On.
- Emergency stop Push button
- lock and key arrangement.
- Space heater.
- SMPS for protection against control voltage variations.
- Tinned copper busbar.

7.9.18 Type Test Certificates for FCMA Starter as well as bought-out items shall be provided



#### 7.10 Local Control Stations

7.10.1 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:



7.10.2 LCS shall be made of heavy duty FRP material, 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).

7.10.3 .Provision for pad locking in OFF position shall be provided.

7.10.4 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 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.

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- 7.10.5 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.
- 7.10.6 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.
- 7.10.7 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.
- 7.10.8 All components shall be completely wired up to terminal block and also provided with earthing terminals.
- 7.10.9 Inscriptions on corrosion resistant metal strips giving drive description, mechanism number and functional requirement shall be provided.
- 7.10.10 Two numbers of LCS shall be provided for the motors, which are installed at elevated platforms, such as cooling tower fan etc. One shall be installed at ground level and the other near the motor.
- 7.10.11 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.
- 7.10.12 Complete Push Button along with its actuator mounted on the cover with wiring done through flexible cables with proper protection.
- 7.10.13 Preferably Ring Type lug and suitable TB to be used for connection, to avoid loose connection.
- 7.10.14 All spare hole to be plugged with suitable plugs.
- 7.10.15 For all other specifications, refer PC150-TS-0814.
- 7.11 Switch Sockets**
- 7.11.1 Sufficient number of inter-locked type 125A/63A, 415V, 3 Ph and 16A, 240V, 1 Ph switch sockets shall be provided to facilitate the maintenance work. Supply to switch-sockets shall be taken from 415 V Switchboard through suitably rated RCCB.
- 7.11.2 For all Other Specifications, Refer PC150-TS-0808.
- 7.12 Conduits**
- 7.12.1 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.
- 7.12.2 Conduits entrances to pull boxes and switches shall have double lock nuts & insulating bushings. No running thread shall be used.
- 7.12.3 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 :

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One Cable : 53%

Two Cable : 31%

Three Cables & Up : 40%

### 7.13 Uninterruptible Power Supply System (UPS)

7.13.1 230 V AC UPS System with UPS Distribution Board shall be provided to feed power supply to the instrumentation system etc. This UPS System along with associated Battery and UPS distribution Board shall be located at Substation.

7.13.2 The UPS System shall have IGBT type with touch screen LCD display and shall be backed up by nickel cadmium (Ni-Cd) battery rated for 5 hours at rated capacity of the UPS. Battery (100% Capacity) shall be separate for each Inverter.

7.13.3 UPS system construction shall be such that each charger, inverter module can be made fully isolated for maintenance. No common devices/wiring shall be installed. Further there shall be no common device between main & redundant units ( e.g. master oscillators etc.) in order to ensure that the failure of the same does not cause shutdown of more than one unit.

7.13.4 UPS shall be suitable for 100% step load.

7.13.5 Battery Load cycle test shall be carried out by the vendor at site.

7.13.6 The over load capacity of UPS shall be 200% for 10 cycles, 150% for 60sec & 125% for 10min.

7.13.7 All three sections, i.e. Rectifier-I, Rectifier-II, Bypass shall be fed through three separate feeders of PMCC.

7.13.8 UPS shall be PWM based using IGBT. Each charger and SCVS shall have isolating transformer at the input.

7.13.9 The salient features of the UPS shall be as under:

- a) High Efficiency
- b) Compatible to feed nonlinear, high crest factor loads
- c) Microprocessor based monitoring system for UPS status and
- d) fault indications
- e) High transient performance
- f) Low audible noise

7.13.10 The transfer time of UPS from inverter to bypass, in case of failure of both inverters, shall be so selected that during this transition period, instrumentation etc.. Typically, it shall be as below :

In synchronism : No break transfer i.e. within 6 milliseconds (Maximum)

In asynchronous mode : Within 16 milliseconds (Maximum).

7.13.11 The technical parameters of UPS shall be as under:



Input

- a. Rated Voltage 415 V  $\pm$  10%
- b. Rated Frequency 50 Hz  $\pm$  5%

Output

- a. Rated Voltage 230 V AC
- b. Voltage regulation:

Static (0-100% load)  $\pm$ 1%

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Dynamic for 100% load change:  $\pm 5\%$

7.13.12 Common potential free contact for all the faults/alarms (in UPS / SCVS) shall be made available

7.13.13 Operation Philosophy of UPS:

- 2 sets of rectifiers and inverter shall be provided. Under normal conditions, when AC mains power is available, both the rectifiers shall operate in parallel and supply DC power for float/rapid charging the 2X50% batteries and simultaneously to inverters. In case of failure in one rectifier, the other rectifier shall feed the complete load and the batteries without any interruption.
- In case of Incoming supply failure or failure of both rectifiers the 2X50% batteries shall feed the inverters without any interruption. Each rectifier shall be designed for simultaneously feeding complete inverter load and float/rapid charging of the 2X50% batteries to its rapid capacity. Each rectifier shall be equipped with “ On Line” automatic as well as manual charging facility.
- Normally both the inverters will be synchronised with each other and with stabilised bypass supply. Both inverters shall operate in parallel and share the load equally.
- The load sharing controls shall not be subject to common mode failure and any failure of the load sharing controls shall not result in the loss of the vital power.
- When a disturbance/fault occurs in any of the inverters, the faulty unit shall automatically get disconnected and the entire load shall be fed from the other inverter. In case both the inverters develop a fault, the complete load shall be transferred to stabilized bypass supply through the static switches and retransfer of the load from the stabilized bypass supply to the inverter shall be possible in auto as well as in manual mode.

7.13.14 For all other specifications, refer PC150-TS-0821.

## 8.0 CABLING



8.1.1 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 HT switch gear end including supply of heat shrink type termination kit for HV cables shall be in contractor's scope.

8.1.2 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.

8.1.3 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, 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.

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- 8.1.4 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
- 8.1.5 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.
- 8.1.6 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.
- 8.1.7 All cables shall be armoured and shall have extruded inner and outer sheath.
- 8.1.8 Cables connected in parallel shall be of the same type, cross section and terminations.
- 8.1.9 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.
- 8.1.10 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)	Cable between transformer secondary and Switchboards	0.5%
d)	Cables between HV Switchboard and HV Motor	3%
e)	Cable between PMCC and motor	5%
h)	Cable between Switchboard and Lighting Panel / Power Panel	1 to 1.5%
i)	Circuit between lighting panels and lighting points	4%
j)	DC Supply Circuit (electrical Controls)	5% and/or as per instrumentation requirement
k)	DCDB to Panic Light	2%

In case of difficulty in achieving specified voltage drops in cables up to lighting panel, 5% drop from Switchboard up to lighting points 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

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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 415 V Switchboard	Start-up of large LV motor with other loads on the bus, or reacceleration of a group of 415 V motors.	10%
c)	Cables between HV Switchboard and motor	Motor start-up or reacceleration	5% (Note-a)
d)	Cable between 415 V 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.
- 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 80% of the rated value during start-up or reacceleration.
- e) FCMA Starter shall be considered for starting large HV motors.
- f) Unless otherwise specified as in clause e), all HV motors and 415 V motors shall be suitable for Direct on Line (DOL) starting.

#### 8.1.11 Design Criteria for Cables & Short Circuit Withstand Time:

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.



- a) Short circuit withstand time (seconds) shall be as follows for Breaker controlled feeders.

Feeders to motors and transformer	0.25 sec
Main 3.3 KV primary distribution feeders	0.7 sec
33 KV cable from 33 kV Switchgear to ICOG Panel & transformer	1 sec

8.1.12 The minimum size of power cables shall be 2.5 sq. mm (Cu).

8.1.13 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.

8.1.14 For all other specifications, refer PC150-TS-0812.

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## 8.2 Cable Laying

8.2.1 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. LT power and control cable shall be laid on cable tray in touching formation in single layer.

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 to be considered for access to Electrical / Instrument cables.

8.2.2 The cable racks shall be ladder type, pre-fabricated from suitable heavy duty FRP fire retardant and UV stabilized) material. Maximum cable tray size shall be 600mm wide. Maximum supporting span shall be 2 Mtrs. as per Doc. No. PDS: E 530 attached with the NIT. Cable trays shall be designed considering 25% margin for future use.

All cable racks must be provided with GI flat strip of size 75X10 mm as running earth all along the tray.

FRP Cable Tray shall be as per NEMA FGI-198X. FRP Cable Tray shall be UV exposed as per ASTM G 154 for 1000 Hrs and the mechanical properties shall not be deteriorate more than 5%. Glass content shall be greater than 55%. The run spacing shall be 250mm.

8.2.3 All cables shall be terminated using suitable cable lugs.

8.2.4 All HV terminations and joints shall be of RAYCHEM make only.

8.2.5 Bimetallic lugs shall be provided , as required.

8.2.6 For all other specification of cable racks, refer PC150-TS-0813 & PDS attached.

## 9.0 ILLUMINATION SYSTEM

### 9.1 General

9.1.1 The lighting power upto LSDBs shall be tapped from 415 V Switchboard.

9.1.2 LED type lighting (LED flood light, LED high bay light, LED tube-light, LED bulkhead, LED well glass, LED chemical resistance Light etc.) shall be provided. The average illumination levels in the various sections of the plants shall be as indicated in Annexure-I. Contractor shall calculate the qty. of lighting fixtures and type of lighting fixtures as per desired Lux Level.



9.1.3 All the plants and area lighting shall be energy efficient.

9.1.4 30% of total outdoor Lighting shall be illuminated by LED lighting fixtures suitable for foggy area.

9.1.5 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. All the plants and area lighting shall be energy efficient.

LED shall conform to the following types and standards:-



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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.

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.

9.1.6 The specified illumination level shall be maintained after considering maintenance factor, 0.6 for plant & outdoor areas & 0.7 for indoor areas and utilisation factor as per manufacturer catalogues for size of room & type of fixture.

9.1.7 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.

9.1.8 Voltage drop at the fixture from the MLDB bus shall not exceed 3%.



9.1.9 Normally minimum mounting height of the LED fixtures shall be as follows:-

<u>Wattage of LED</u>	<u>Mounting Height</u>
20W	2.5 M / 3.0 M
24W	3.2M/ 4.0 M
45W	3.2 M/5.0 M/6.0 M
90W	6.0 M/8.0 M

9.1.10 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 RCBOs 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.

9.1.11 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.

9.1.12 In Substation rooms / Pump House 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.

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- 9.1.13 15A plug sockets shall be fed through separate circuit of lighting sub-distribution boards/junction box having ELCB of 30mA.
- 9.1.14 For lighting fixtures and 16 Amp plug socket circuits, 3 core 2.5 sq. mm (Cu) cable shall be used.
- 9.1.15 16A plug sockets shall be fed through separate circuit of lighting sub-distribution boards/junction box.
- 9.1.16 Illuminated exit sign shall be provided in substations / Pump House.
- 9.1.17 Power factor of complete fitting shall be 0.95 min. at 230 V.
- 9.1.18 Lights from LED's shall be soothing to eye and without any bright spots on the floor/objects illuminated by the luminaries.b
- 9.1.19 The driver shall be mounted internally and be replaceable with the aid of commonly available hand tools.
- 9.1.20 The LED module or array shall be designed in such a way that the failure of one LED shall not affect additional LED's.
- 9.1.21 Life expectancy of LED Luminaries shall be minimum of 50000 hrs with greater than 70% of rated lumen output.
- 9.1.22 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  $> 40W$ .
- 9.1.23 Short circuit protection /Open load protection shall be required for LED fixtures.
- 9.1.24 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 luminaires, the Surge Protection Device (SPD) should be series type with fail safe.
- 9.1.25 Color temperature of LED Luminaries: 5700K
- 9.1.26 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.
- 9.1.27 For more details, refer PDS attached..

## 9.2 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.	Life	$\geq 40000$ burning hours
7.	PF	$>0.95$
8.	THD	$<10\%$

## 9.3 Street Lighting And Security Lighting

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9.3.1 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.

9.3.2 Hot dip GI octagonal poles of suitable mounting height shall be used for street light. However, for 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

9.4 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.

## 10.0 EARTHING AND LIGHTNING PROTECTION

### 10.1 Earthing

10.1.1 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.

10.1.2 Complete underground earthing grid & Earth Pit/Lightning Earth Pit shall be in Contractor's scope. Earthing rings shall be provided around sub-station, Transformer Rooms and Pump House. The overall earth resistance (dry) shall be limited to 1 ohm. Minimum size of main grid shall be 75mm×12mm.

Anti-corrosive bituminous paint shall be provided at each joint of earth flat after necessary finishing and priming treatment .



Earthing Grid shall be connected to existing Earthing Grid.

10.1.3 Earthing grid/ring shall comprise of buried GI earth strips and GI pipes/electrodes.

10.1.4 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.

10.1.5 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.

10.1.6 As far as possible, the reinforcement rods inside concrete column shall be connected to the earthing grid/ring to reduce the overall earth resistance.

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- 10.1.7 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.
- 10.1.8 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.
- 10.1.9 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.
- 10.1.10 All steel structures, pipes, pipe joints, valves etc. shall be earthed against static charge accumulation by 50x6 mm GI strip.
- 10.1.11 The pipe structures shall be earthed at not more than 25M apart.
- 10.1.12 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	32mm×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.	-

All GI conductors shall meet the galvanizing requirement as per IS.

- 10.1.13 The main ground grid shall be buried in earth at a minimum depth of 1000 mm below finished grade level unless stated otherwise

## 10.2 Lightning Protection

- 10.2.1 All structure shall be protected against lightning strokes by suitable lightning protection system to be designed and installed as per IS/IEC-62305.

- 10.2.2 The number of down conductors shall be minimum two.



- 10.2.3 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.

### 10.2.4 Air Terminal

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

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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.

#### 10.2.5 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.

### 11.0 CATHODIC PROTECTION SYSTEM

11.1 Entire underground pipe work including those laid in concrete trench and filled with sand, the steel structures (within battery limit), etc. shall be provided with cathodic protection. The scope shall include, site surveying to collect required information, design, supply, installation, commissioning, maintenance, monitoring and performance guarantee of impressed current cathodic protection system as per relevant Indian/IEC/BS/NACE Standards and codes of practices. Contractor shall have to design and engineering of complete CP system. The design life of CP System shall be 30 years.

Following shall be excluded from Cathodic Protection system.

- Underground Pipes with SS material /GRP Material ,
- Above Ground reinforcements bars of reinforced concrete,
- Reinforcements bars of reinforced concrete foundations.
- Reinforcement bars in concrete piles.

11.2 LSTK Contractor shall carryout the detail site survey also to confirm the desired limits of polarized potential as per standard, functionality check , vetting / confirmation of the system by NACE -4 Level certified person having more than 3 years' experience.

11.3 The Scope shall include but not limited to the CP system consisting of TR Units, Various types of anode beds, associated system and for monitoring the parameters SCADA System is provided.

11.4 Shed shall be provided for all Cathodic Protection equipment installed in the field. .

11.5 Solid State Polarization Cell shall have short time fault current withstand capacity:- 5 kA/ 5000 A @ 30 Cycles and Lightning Surge Current rating : 50000 A Crest for 8 to 20 μ seconds with DC Blocking voltage range of - 3.0 V to + 1.0 V.

11.6 Surge over voltage diverter shall be provided across each monolithic isolation joint.



11.7 Cathodic Protection System shall be designed considering 132/ 33 kV Overhead lines above the underground Pipeline.

11.8 For all other specifications, refer PC150-TS-0818, PC150-TS-0819, PC150-TS-0820.

### 12.0 CAPACITOR BANKS

12.1 The Contractor shall ensure that the power factor remains minimum 0.95 lag (inductive).

Capacitor bank shall be installed at 3.3kV voltage level in the substation.

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The capacitor bank shall utilize the Automatic Power Factor Controllers to maintain the power factor of individual plant. Under no circumstances power factor shall become leading (capacitive) and all necessary protections to avoid this shall be used

12.2 For all other specifications, refer PC150-TS-0817.

### 13.0 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.

### 14.0 PAINTING

14.1 The equipment surface to be painted shall be pre-treated to remove all dust, scale and foreign adhering matter by suitable treatment.

14.2 All metal surfaces shall be painted with two coats of suitable anti-rust paint followed by two coats of anticorrosive epoxy paints.

14.3 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.

14.4 Unless otherwise specified, the finishing shade shall be light gray having No.631 as per IS-5.

### 15.0 SPARES

#### 15.1 Commissioning Spares

Contractor shall supply commissioning spares for all the equipments, free of cost. 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 start up of the package system. Item wise list of commissioning spares with recommended quantity shall be furnished for information..

#### 15.2 Spares for 2 Years Operation

Item wise unit prices of spares as indicated in SOR for two years of operation and maintenance shall be quoted..

15.3 All spare parts shall be identical to the parts used in the equipments.

15.4 Any other spare parts or special tools not specified, but required, shall also be quoted along with the offer.

### 16.0 VENDORS' SERVICES



16.1 The Contractor shall consider the services of major equipment suppliers during installation and commissioning in their scope as required.

16.2 The services of engineers of following equipments' manufacturers are envisaged and required during installation and commissioning:



- Switchgears
- DC Panels
- FCMA Starter
- OLTC
- Battery Charger

### 17.0 TESTING & INSPECTION

17.1 All equipment shall be tested in accordance to relevant IEC/BIS codes / standards 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.



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- 17.2 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.
- 17.3 The Contractor shall submit the certificates of routine and acceptance tests conducted on the purchased equipments.
- 17.4 All the routine/acceptance tests shall be performed at the manufacturer's works in the presence of owner's representative.
- 17.5 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.
- 17.6 The equipment shall be dispatched from works only after receipt of Owner written approval of the test reports.
- 17.7 The Contractor shall intimate the owner 4 weeks in advance of the tests and submit the detailed schedule of tests.
- 17.8 The owner's inspection shall, however, not absolve the contractor from his responsibility for making good any defect, which may be noticed subsequently.
- 17.9 In addition, the equipment shall be inspected at site for final acceptance.
- 17.10 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the Owner.
- 17.11 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.
- 17.12 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.
- 18.0 DOCUMENTATION**
- 18.1 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.
- 18.2 Sizing of Electrical Equipments shall be submitted during detailed engineering stage.
- 18.3 The software shall be used for preparing and updating the various documents such as general arrangement drawings, cable schedules, single line diagrams, control system drawings and equipment specifications etc.
- 18.4 Contractor shall ensure that following shall be mentioned in each sheet of drawings/ documents in the order mentioned below:
- Logo and Name of the client
  - Logo and Name of the consultant
  - Logo and Name of the Contractor
  - Logo and Name of the Manufacturer on the drawings prepared by manufacturer, if applicable
  - Name of the Project for which drawings are applicable
  - Title of the drawing (Title shall indicate the details shown in the drawing)
  - Drawing/ document number with sheet number and number of total sheets in the drawing (Drawings having different title shall be assigned different drawing number)



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- (h) All sheets of each drawing shall bear same title, same document number and same revision number
- 18.5 At the time of handing over of the installation, the Contractor shall supply as built drawings taking into consideration the actual execution carried out at site.
- 18.6 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.
- 18.7 Operation & Maintenance Manuals for each of the equipment/ system being shall be in bound book format and shall be 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.
  - (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.





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- 18.8 Drawings/ documents to be submitted with inspection call of equipment:
- Type test certificate for identical equipment
  - Sub-supplier's/ vendor's catalogue/technical literature
  - Test reports for internal inspection
  - Test certificates of components
  - Technical specification & data sheets of equipment
  - All drawings as applicable of category 'Approved', 'Approved with comments' and drawings 'For information/ Reference' including comments thereon
- 18.9 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.
- 19.0 **TOOLS & TACKLES**
- The Contractor shall supply at least one set of all special tools 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.
- 20.0 **REVIEW OF DRAWINGS & DOCUMENTS BY OWNER/ CONSULTANT**
- 20.1 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.
- 20.2 Template for name plate of drawings, documents and drawing/ document numbering system shall also be submitted by contractor and approval obtained.
- 20.3 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
- 20.4 The responsibility for delay in approval/ review of drawings/ documents due to
- Submission of incomplete drawings/ documents not meeting the requirement of project/ stipulations of order
  - Non-compliance of comments made earlier
  - Drawings are not submitted in requisite copies; and consequent delay in project shall be that of contractor.
- 20.5 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.
- 20.6 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.

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- 20.7 The drawings/ documents shall be submitted in sizes in which those are prepared. Photocopies in reduced sizes shall not be accepted.
- 20.8 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.
- 20.9 All sheets of a drawing shall be assigned same title and drawing number. Drawings having different title shall be assigned different drawing numbers.
- 20.10 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.
- 20.11 Revision shall be clearly marked on all subsequent issue of drawings and documents.
- 20.12 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.
- 20.13 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.
- 20.14 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.
- 20.15 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
- 20.16 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.
- 20.17 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
- 20.18 Contractor shall furnish, if requested, additional drawings, calculations, information to the Owner/ Consultant to enable him to examine/ study the drawings submitted.
- 20.19 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.
- 21.0 **VENDOR LIST**
- 21.1 Make of all electrical equipment shall be as per Annexure-III.

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- 21.2 Any other vendor shall be subject to Owner/Consultant's approval.
- 21.3 Bidder shall indicate the make of all the equipments in their offer.
- 21.4 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.
- 22.0 INSTALLATION, TESTING AND COMMISSIONING**
- 22.1 The Contractor shall undertake installation of all electrical equipment in accordance with latest code of practices, in conformity with recommendation of the respective equipment manufacturers, drawings approved by the owner or owner's representative, direction of engineer-in-charge, statutory regulations and to the entire satisfaction of the owner.
- 22.2 The Contractor shall arrange all the necessary erection tools and tackles, testing and measuring instruments and shall supply the required erection materials including structural steel.
- 22.3 Contractor shall furnish field inspection and test data sheets for all equipments for owner's approval.
- 22.4 The Contractor shall obtain the necessary certificate of compliance/completion certificate with test results from statutory authorities as required. All necessary drawings and test certificates as required by them shall be furnished by the vendor.
- 22.5 The erection work shall be supervised by competent supervisors holding relevant supervisory license from the Government.
- 22.6 Installation of Equipment
- a. The equipment shall be installed in switchgear rooms, MCC rooms, control rooms and at shop floors.
  - b. The scope of work of Contractor under installation shall be inclusive of but not limited to the following:
  - c. Physical inspection and handling
  - d. Assembly and interconnection of shipping sections, if any, as per manufacturer's instructions. Supply of materials, fabrication and installation of supporting frames/ brackets for proper support of equipment/ panels/ devices/ cable trays etc..
  - e. Installation on foundation/ supports/ brackets.
  - f. Alignment, leveling and clamping/ welding/ fixing/ grouting with supports/ foundation bolts as required.
  - g. Mounting loose supplies and connection of wiring.
  - h. Conducting pre-energisation tests/ checks to ensure that installation is carried out as per manufacturer's instructions/ direction of supervising engineer and is healthy/ fit for energisation.
- 22.7 Cable Installation
- 22.7.1 General
- (a) Cables shall be laid generally on overhead cable supporting structures within covered shop areas and on racks to be provided in underground concrete cable trenches in open areas. Cables may be laid in ground where number of cables to be laid are less and do not justify use of concrete cable trenches.
  - (b) All the cable tray structures shall be painted with two coats of primer and two coats of final paint after necessary surface preparation.

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- (c) Cable OD 40 MM and above shall be clamped individually.
- (d) Cables shall be clamped only after the cables are neatly arranged, dressed tailored and kept in position. Support of cables on edges of cable trays/ structural steelwork shall be avoided.
- (e) Power cables shall be laid in one layer only. Control and other cables may, however, be laid in two layers. More than two layers shall not be permitted.
- (f) All the cable tray network shall be earthed by a continuous earth strip.

22.7.2 Cable laying in Trench/ on Racks/ Trays/ Cleated on Wall/ Structure. For proper support, access and neatness of appearance of installation; cables shall be laid on racks or cable trays or cleated on wall and/ or structure taking following into consideration:

- (a) Cable racks/ trays shall be 250 mm apart.
- (b) Ladder type GI cable trays shall be used for laying power cables.
- (c) Perforated type GI cable trays shall be used for laying control, signal, and communication etc. cables.
- (d) Cable racks around cooling tower areas shall be of heavy duty FRP (fire retardant and UV stabilized) material.
- (e) Coaxial cables for data transfer from/ to microprocessor based equipments shall be laid in GI conduits with pull boxes fixed to cable supporting racks.
- (f) Top tray shall be used/ left vacant for communication, signaling and fire alarm cables.
- (g) Cables shall be laid in separate trays according to voltage and noise classification. Fire proof partition shall be provided between HV and LV cables.
- (h) Power, control and lighting cables shall be laid in separate cable trays.
- (i) Large size cables shall be clamped individually. Small size cables may be bunched together provided that in any bunch all cables have sheath of same material.
- (j) Cables in trays shall be clamped at not more than every 1500 mm for horizontal run and 800 mm for vertical run and near bends.
- (k) Cable racks/ trays shall be planned in such a way so that at least 20 % or one rack/ tray (whichever is more) can be added in future and at least 20 % free space shall be left in each cable tray for cable laying in future..
- (l) Support to cable trays shall be provided at intervals as required for proper support but at interval not more than 1000 mm.
- (m) Support to trays shall also be provided at each joint of tray irrespective of it's distance from adjacent support.
- (n) GI trays shall be fixed using nuts and bolts as welding will not be permitted.

22.7.3 Cable laying in conduits

- (a) Cables shall be laid in GI conduits while laying on or crossing floors/ wall/ railway lines/ roads.
- (b) While laying on floor or wall or crossing roads conduits shall be embedded in concrete/wall.
- (c) When laid on floor the top cover shall be minimum 10 mm.
- (d) At rail/ road crossings, the conduits shall be laid not less than 1 meter below top surface of the road.

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- (e) Mechanical protection by G.I. Pipe shall be provided to all cables up to 1200 mm from ground/ floor level.
- (f) Minimum diameter of G.I. pipes used for laying/ protection of cables shall be 1.6 times the cable diameter.
- (g) Only one cable shall be laid in one conduit.
- (h) Conduit shall be sealed after cable laying.
- (i) Standard bends or fabricated bends shall not be used. wherever required, conduits shall be bent using bending machine. Bending radius shall not be less than 10 times the diameter of conduit.
- (j) Jointing of the conduits shall be done using sockets which may be welded from top to avoid ingress of water.
- (k) Ends of conduits shall be made smooth to avoid damage to cables.

#### 22.7.4 Cable Jointing



- (a) Joints in cable length less than standard drum length shall not be allowed.
- (b) Joints, if unavoidable, shall be made at most suitable places.
- (c) Joints shall not be made at passageways or under rail/ road crossings.
- (d) Joints shall be segregated by not less than 2 meters so as to reduce the possibility of one joint failure affecting the other.
- (e) Individual cores in cables shall always be joined number to number or colour to color of the insulation over the conductors.
- (f) Continuity and current carrying capacity for earth conductor and/ or armour shall be provided.
- (g) Cable jointing shall be done by joiners who possess certificate of competency for carrying out particular joint.
- (h) Minimum 2 meters cable loops shall be kept near each joint.

#### 22.7.5 Cable Termination

- (a) Double compression heavy type glands/ heat shrinkable termination kits and bi-metallic/ copper lugs shall be used for termination of cables.
- (b) Paint of the gland plate at the contact point of gland shall be removed for proper contact.
- (c) Cable glands/ termination kits shall be earthed.
- (d) Cables to individual cubicles shall be neatly laid out and supported.
- (e) Cables shall be clamped at a distance of 400 mm from gland/ termination.
- (f) Conductors of control cables shall be neatly arranged in compact group. The entire group shall be placed and tied with nylon straps.
- (g) Spare cores shall be terminated with sufficient length to permit future connection to the terminal block associated with control cables.

#### 22.7.6 Identification



- (a) Cable tags shall be made of non- corrodible material.
- (b) Voltage, cable number etc shall be engraved on each tag.
- (c) Cable tags shall be tied to each cable at

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- (i) All termination (outside as well inside panel/ box.)
- (ii) All bends.
- (iii) All points before and after which their route cannot be easily identified.
- (iv) Entry and exit from conduits.
- (v) All joints.
- (vi) Every 15 meter for straight run.

### 23.0 TESTING OF INSTALLATION AFTER ERECTION

- 23.1 The Contractor shall carryout tests/ checks after erection of equipment/ cables to check, ensure and demonstrate the conformity of equipment supplied and installation done with the specification and statutory requirement.
- 23.2 Prior to starting the test, the Contractor shall satisfy himself and ensure that
- a. The installation is strictly in accordance with the specification, drawings and statutory requirement.
  - b. Any automatic controls that might vitiate the tests have been relaxed.
  - c. All instruments to be used for testing are suitable for the purpose and have been calibrated by a recognised laboratory within the last 12 months and copy of the calibration certificates have been submitted to the Owner/ Consultant.
  - d. The testing, commissioning, operation and maintenance manuals are available to the testing engineer and Owner/ Consultant.
  - e. Formats for recording test results have been finalised with the Owner/ Consultant and copies have been distributed to all concerned.
- 23.3 The skilled manpower to test all the equipment, cables, earthing etc deputed by Contractor is well aware of and prepared to perform checks/ tests.
- 23.4 The tests shall be witnessed by the representatives of Owner/ Consultant.
- 23.5 The Contractor shall compile and tabulate all the test results in agreed formats and submit to Owner/ Consultant for approval prior to acceptance of installation.
- 23.6 Testing and checking shall be carried out to demonstrate and record prior to completion, that supply and installation meets the requirement/ performances specified. The installation shall be tested in presence of Owner/ Consultant.
- 23.7 The Contractor shall give at least 24 hours notice to Owner/ Consultant to enable them to witness the test.
- 23.8 The Contractor shall submit to Owner/ Consultant test record sheets on daily basis.
- 23.9 Equipment or any part of the installation shall be energised only after all pre-energisation tests are completed and test results are approved by Owner/ Consultant.
- 23.10 Failure to submit test results as tests are completed may render the Contractor for carrying repeat tests.
- 23.11 The Contractor shall supply six (6) bound and indexed copies of all tests in agreed formats prior to preliminary acceptance and handing over of the equipment/ installation, duly signed by representatives of the Owner/ Consultant who have witnessed the tests.
- 23.12 It will be the responsibility of the Contractor to supply/ arrange at his own cost all necessary testing equipment and measuring equipment required for conducting the tests as per applicable standards.
- 23.13 Should any of the tests reveal any discrepancy or non-conformity, the same shall be attended to and retested before proceeding with any other tests.

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23.14 All tests shall be conducted in accordance with this specification, standard specifications of Bureau of Indian Standards, recommendations of IEC and IE Rules.

23.15 Tests checks to done at site shall be inclusive of but not limited to the following:

- |     |   |   |  |
|-----|---|---|--|
| a.  | Physical Check & Verification                       | : | All Equipment/Cables etc                               |
| b.  | Tightness of connections                            | : | All Equipment/Cables etc                               |
| c.  | Checking for cleanliness                            | : | All Equipment/Cables etc                               |
| d.  | Size & No. of Earth connection                      | : | All Equipment/Cables etc                               |
| e.  | Erection, alignment, mounting height and clearances | : | All Equipment/Cables etc                               |
| f.  | Insulation Resistance test                          | : | All Equipment/Cables etc                               |
| g.  | Earth continuity test                               | : | All Equipment/Cables etc                               |
| h.  | Earth Resistance test                               | : | All Equipment/Cables etc                               |
| i.  | Earth loop impedance test                           | : | All Equipment/Cables etc                               |
| j.  | No load & rated load current                        | : | All Motors/ Loads                                      |
| k.  | No load & rated load P.F.                           | : | All Motors/ Loads                                      |
| l.  | No load & rated load Power                          | : | All Motors/ Loads                                      |
| m.  | Functional checks                                   | : | All Equipment & Controls                               |
| n.  | Primary injection test                              | : | All switchgear   |
| o.  | Secondary injection test                            | : | All protective relays/ devices                         |
| p.  | Ratio and polarity test                             | : | CTs  |
| q.  | Power frequency HV test                             | : | Power & Control circuit                                |
| r.  | Phase sequence checks                               | : | /C & bus couplers                                      |
| s.  | Winding resistance test                             | : | Motors & Transformers                                  |
| t.  | Direction of rotation                               | : | All motors   |
| u.  | Free running for 2 Hrs                              | : | All motors   |
| v.  | Under voltage tests                                 | : | All U/V Devices  |
| w.  | Calibration Checks                                  | : | All instruments  |
| x.  | Load and Performance tests                          | : | UPS, PLC, & Variable Frequency equipment, Battery Bank |
| y.  | Checking of Voltage, current                        | : | UPS, PLC, & Variable Frequency equipment               |
| z.  | Checking of specific gravity and acid level         | : | Battery  |
| aa. | Illumination levels                                 | : | All areas  |

23.16 It is anticipated that following equipment will be necessary to perform testing of the installation. The Contractor shall, therefore, arrange these as well as any other equipment for testing of the installation.

- a. HV Testing Set
- b. Primary Injection Set

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- c. Secondary Injection Set
- d. IR Testers
- e. Earth Continuity testers
- f. Soil resistivity Testers
- g. Earth resistance Testers
- h. Phase to earth loop impedance testers
- i. Mili volt drop testers
- j. Micro-ohm meter
- k. Phase sequence testers
- l. Clip-on ammeters
- m. Voltmeters
- n. Power factor meter
- o. Frequency meter
- p. 3 Ph 4 wire unbalance load kWh meter
- q. Cable fault location equipment
- r. Digital multi-meter suitable for testing IC voltage and current levels
- s. Analogue Multi-meters
- t. Portable multi-range precision ammeters, voltmeters complete with CTs, PTs for AC/DC circuits.
- u. Protection relay test plugs
- v. Portable earthing equipment
- w. Dual beam oscilloscope with storage facility.
- x. UV recorder
- y. Illumination level meter
- z. Thermometers

23.17 At least 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.



- a) Insulation Test
- b) Continuity Test
- c) High Voltage Test
- d) Simulation Test
- e) Earth Resistance Test

#### 24.0 **QUALITY ASSURANCE**



24.1 All equipment, components, materials proposed 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 15 days of from order; Quality Assurance Plan (QAP) for all the equipment/ panels/ cables/ motors/ devices etc. under their scope of supply.





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- 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.
- 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 The 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.
- 25.2 All civil works connected with electrical installation shall be under the Contractor's scope.
- 26.0 DEVIATIONS**
- 26.1 Deviations, if any from this standard (clause wise) shall be clearly indicated in the offer with reasons thereof. In the absence of any such deviation the compliance to the clauses shall be deemed automatically.

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- 26.2 Successful Bidder shall also note that all those deviations mentioned in bid but not accepted by Owner/Consultant in writing shall be considered as withdrawn by bidder.
- 26.3 Any and all deviations mentioned anywhere else in the bid but not specifically and unambiguously mentioned under specific section 'List of deviations' shall not be considered.



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### ANNEXURE-I

#### ILLUMINATION LEVELS

Average illumination levels (Mean Lux) for various areas shall be as follows:



SI. No.	AREA	LUX
<b>1.0</b>	<b><u>ROADS</u></b>	
1.1	Plant roads	20
1.2	Security roads	20
<b>2.0</b>	<b><u>YARD</u></b>	
2.1	Marshalling yard	20
2.2	Loading/unloading areas	20
2.3	Open areas	20
<b>3.0</b>	<b><u>PLANT</u></b>	
3.1	Operating platforms	100
3.2	Non-operating platform/ general process areas & walk ways	50
3.3	Pump house/Pump bay	250
3.4	Area near large rotating equipment/plant	200
<b>4.0</b>	<b><u>SUB-STATION</u></b>	
4.1	Switch room - Front of panel	250
	- Back of panel	150
	- Battery room	150
4.2	Transformer room, cable room.	100
4.3	Outdoor/transformer bay	70
<b>5.0</b>	<b><u>CONTROL ROOMS</u></b>	
5.1	Front of panel	500
5.2	Back of panel	200
6.0	<b>OFFICES</b>	300
7.0	<b>STORES, BATH ROOM</b>	100
<b>8.0</b>	<b><u>STAIR CASES</u></b>	
8.1	Safe areas	100
<b>9.0</b>	<b>PANIC LIGHTING</b>	10

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## ANNEXURE-II

### DOCUMENTATION FOR ELECTRICAL SYSTEM

SL NO	DESCRIPTION	With Bid	For Approval	For Information	Final
1	Specification sheets and Technical Particulars	N	Y	-	Y
2	Load List indicating normal and peak loads at different voltages	N	Y	-	Y
3	Single Line distribution diagram	N	Y	-	Y
4	Feeder Details of Switchboards i.e. HV Switchboard, 415V Switchboard, DCDB.	N	Y	-	Y
5	Calculation for Bus-bar sizing for HV Switchboard, 415V Switchboard.	N	Y	-	Y
6	Drawings and documents asked for each equipment as per respected TS.	N	Y	-	Y
7	Sketch , detail specification , weight for lighting poles	N	Y	-	Y
8	Cable Schedule	N	Y	-	Y
9	Cable Rack & Trench layout	N	Y	-	Y
10	Power Layout	N	Y	-	Y
11	Schematic Drawing	N	Y	-	Y
12	Interconnection diagram.	N	Y	-	Y
13	Earthing and Lightning protection layout.	N	Y	-	Y
14	Lighting Layout and Distribution diagram.	N	Y	-	Y
15	Dimensional drawing for complete Transformer, Marshalling Box, disconnecting chamber, terminal chambers etc.	N	Y	-	Y
16	Schematic/wiring and terminal arrangement Diagram for Transformers, HV Switchboard, 415V Switchboard, DCDB, LSDB etc.	N	Y	-	Y
17	GA Drawing of Transformers, NER, HV Switchboard, 415V Switchboard, DCDB, LSDB, Switch Sockets etc.	N	Y	-	Y
18	Interconnection & Terminal wiring diagram (as built)	N	Y	-	Y
19	Characteristic curves of Motor				
	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



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	f) Voltage Vs Thermal Withstand time	N	Y	-	Y
	g) Starting current Vs Time	N	Y	-	Y
20	Terminal Box drawings for motor	N	Y	-	Y
21	Illustrative and Descriptive Literature/ Catalogue	N	N	Y	Y
22	Catalogue of brought out items	N	N	Y	Y
23	Bill of materials.	N	N	Y	Y
24	I.O.M. Manual	N	N	Y	Y
25	Spare parts List.	N	N	Y	Y
26	Type Test Certificates.	N	N	Y	Y
27	Routine Test Certificates.	N	Y	N	Y
28	Guarantee Certificates.	N	N	Y	Y
29	Installation, Operation & Maintenance Manual	N	N	Y	Y
30	Installation, Termination and Jointing Instructions	N	N	Y	Y
31	Sketch showing mounting arrangement of Lighting Fixtures with dimensions.	N	N	Y	Y

Note:

- 1) 4 hard copies and 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 dispatch of the equipments. These shall be made in sets and supplied in fine plastic coated folder.



Y-Yes, N-No

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### ANNEXURE-III

#### Make of Electrical Equipment/Item

<b>Transformers – 33 kV &amp; Below</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	Crompton Greaves Ltd	India
3.	Emco Limited	India
4.	Bharat Bijlee Ltd	India
5.	Kirloskar Electric Company Ltd.	India
6.	Voltamp Transformers Ltd.	India
7.	BHEL (Electrical Machines Divn.)	India
<b>Neutral Earthing Resistor</b>		
1.	Elecmech Corporation	India
2.	Lotus Powergear Pvt Ltd	India
3.	Resitech Electricals Private Limited	India
4.	RSI Switchgear Private Ltd.	India
5.	S R Narkhede Engineering Pvt. Ltd.	India
<b>ICOG Panel (33 kV)</b>		
1.	Asea Brown Boveri Ltd	India
2.	Siemens Ltd	India
3.	Schneider Electric	India
4.	BHEL (Electrical Machines Divn.)	India
<b>HV Switchboard (3.3 kV)</b>		
1.	Asea Brown Boveri Ltd	India
2.	Crompton Greaves Ltd	India
3.	Siemens Ltd	India
4.	BHEL (Electrical Machines Divn.)	India
5.	Schneider Electric	India
<b>415 V SWITCH BOARD(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.	Crompton Greaves Ltd	India
<b>Floor 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



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5.	Elecmec 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	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.	Elecmec 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	India
<b>Protective Relays (other than BMR)</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	Asea Brown Boveri Ltd.	India
3.	Schneider – MICOM Model	India
4.	SEL – Schweitzer Engineering Laboratories	India
5.	Woodward	India
6.	Siemens Ltd.- SIPROTEC Model	India
<b>Vacuum Circuit Breakers (VCB)</b>		
1.	Alstom Limited ( Areva T & D)	India
2.	Asea Brown Boveri Ltd.	India
3.	BHEL (Electrical Machines Divn.)	India



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4.	Siemens Ltd.	India
5.	Schneider	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
9.	Schneider Electric	India
<b>Low Voltage Industrial Switches/Isolators</b>		
1.	Asea Brown Boveri Ltd.	India
2.	GE Power Controls India Pvt. Ltd.	India
3.	Havells India Ltd.	India
4.	Kaycee Industries Ltd	India





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5.	Larsen & Toubro Ltd.(El.Products Divn)	India
6.	Siemens Ltd.	India
7.	Schneider Electric	India
<b>Current Transformers (33kV, 3.3 kV)</b>		
1.	Anant Powertech	India
2.	Asea Brown Boveri Ltd.	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 (33 kV 3.3 kV)</b>		
1.	Anant Powertech	India
2.	Asea Brown Boveri Ltd.	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
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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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>Induction Motors – HV (3.3 kV)</b>		
1.	BHEL (Electrical Machines Divn.)	India
2.	Crompton Greaves Ltd	India
3.	Kirloskar Electric Company Ltd	India
4.	Jeumont Industrie	France
5.	Fuji Electric Systems Co. Ltd	Japan
6.	Mitsubishi Corporation	Japan
7.	Toshiba Corporation	Japan
8.	Toshiba Mitsubishi Electric Industrial Systems Corporation (Excluding Flame-proof motors of frame size more than 900)	Japan
9.	Peebles Electrical Machines	UK
10.	Siemens	India / Germany
11.	Marathon Electric Motors India Limited	India
<b>Induction Motors – LV (415 V) ( Safe Area)</b>		
1.	Asea Brown Boveri Ltd	India
2.	Bharat Bijlee Ltd	India
3.	Crompton Greaves Ltd	India
4.	Kirloskar Electric Company Ltd	India
5.	Siemens Ltd	India
6.	Jeumont Industrie	France
7.	Siemens AG, Germany	Germany
8.	Fuji Electric Systems Co. Ltd.	Japan
9.	Mitsubishi Corporation	Japan
10.	Toshiba Corporation	Japan
11.	Asea Brown Boveri	Sweden
12.	General Electric Co.	USA
<b>Industrial Type Sw. Socket &amp; Plug</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Chloride Power Systems and Solutions Ltd. (formerly CALDYNE)	India

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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
10.	Legrand S.A.	France
11.	BBC-Brown Boveri & Cie AG	Germany
12.	R Stahl Schaltgerate Gmbh	Germany
13.	Weidmuller Ltd.	Germany
14.	CORTEM S.p.A.	Italy
<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>Lighting Poles</b>		
1.	Bharti Exports	India
2.	Metalite Industries	India
3.	Premier Power Products (Calcutta) Pvt. Ltd.	India
4.	Sadhana Engineering Corporation	India
5.	Surya Roshni Ltd.	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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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2.	HBL Nife Power Systems Ltd.	India
3.	Fuji Electric Systems Co. Ltd.	Japan
4.	Hitachi Limited	Japan
<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
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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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
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 Termination/Jointing Kits</b>		
1.	Raychem RPG Ltd.	India
<b>Pre-Fabricated G.I. Cable Trays</b>		
1.	Globe Electrical Industries	India
2.	Indiana Engg Works Pvt Ltd	India
3.	Indmark Formtech Pvt. Ltd.	India
4.	Jamna Metal Company	India
5.	Kanade Anand Udyog Pvt. Ltd.	India
6.	Maheshwari Electrical Mfrs. (P) Ltd.	India
7.	Metalite Industries	India
8.	Parekh Engineering Company	India
9.	Premier Power Products (Calcutta) Pvt. Ltd.	India
10.	Rukmani Electricals & Components Pvt Ltd	India
11.	Sadhana Engineering Corporation	India
12.	Slotco Steel products Pvt. Ltd.	India
13.	Sree Atreya Enterprises	India
14.	Stealite Engg Co	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
<b>Hose proof Junction Boxes</b>		
1.	Baliga Lighting Equipments Limited	India
2.	Bhartia Industries Ltd. (Divn. Bch)	India
3.	Ex-protecta	India

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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 / Belt Monitoring 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>FCMA Starter</b>		
1.	Jayashree Electron Pvt. Ltd	India
2.	Asea Brown Boveri Ltd	India
3.	Schneider Electric	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.	Asea Brown Boveri Ltd.	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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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3.	Jayant Metal Mfg. Co.	India
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>Cathodic Protection</b>		
1.	M/s Raychem RPG Ltd	India
2.	M/s Consultech	India
3.	M/s Afcons Corrosion protection Pvt Ltd (Formerly SSS Electricals (I) Pvt Ltd.)	India

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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4.	M/s Corrosion Control Services (Bombay) Pvt Ltd	India
5.	M/s Corrtch, Ahmedabad	India
6.	M/s CTS Private Limited	India
7.	M/s Corrtch International Pvt Ltd	India
8.	SARK EPC Projects pvt. Ltd.	India

<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 Limited	India
2.	Alstom Power	India
3.	Bhartia Cutler Hammer	India
4.	Siemens Ltd	India

<b>Control Switches</b>		
1.	Alstom Power	India
2.	Kaycee	India
3.	Larsen & Toubro Ltd. (El. Products Divn.)	India
4.	Siemens Ltd.	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>FRP Cable Trays</b>		
1.	Enercon	India
2.	Ercon Composites (Upto 600 Mm Wide)	India
3.	Kemrock	India
4.	Satyam Industries	India
5.	Sintex Industries Ltd.	India
6.	Sumip Composites Pvt Ltd.	India



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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<b>Transfer Rectifier unit</b>		
1.	Advance Electronic Systems	India
2.	Raychem	India
3.	Canara Eelctricals	India
4.	Corrpro Systems	India
5.	Kristons Systems	India

<b>Test Stations/ Anode Junction Box/ Cathode Junction Box / Surge Arrestor Junction Box/ Reference Electrode Junction Box (REJB) / Earthing Junction Box (EJB)</b>		
1.	Corrpro Systems	India
2.	Advance Electronic Systems	India
3.	FCG	India
4.	FEPL	India
5.	Flexpro	India
6.	Baliga	India



<b>Permanent Reference Electrode )</b>		
1.	Advance Electronic Systems	India
2.	Borin,	USA
3.	M C Miller	USA
4.	Cer Anode	USA
5.	Harco	USA
6.	Advance Electronic Systems	USA

<b>Surge Diverter for MIJS</b>		
1.	Advance Electronic Systems	India
2.	DEHN	Germany
3.	Hockway	Germany
4.	OBO Betterman	Germany



<b>Monolithic Isolating Joints</b>		
1.	Advance Electronic Systems	India
2.	Alfa Engineering	India
3.	SRL	Italy
4.	Zunt Italy	Italy
5.	RMA Italy	Italy
6.	Advance Products,	USA

<b>Calcined Petroleum Coke Breeze</b>		
1.	Goa Carbon	India
2.	India Carbon (Calcutta)	India
3.	Petro Carbon & Chem. Company	India



<b>Zinc Grounding Electrode/ Cell/ Zinc Ribbon Anode Magnesium Anodes (For TCP)</b>		
1.	Sargam Metals Chennai	India
2.	Advance Electronic Systems	India
3.	Corrpro Systems	India
4.	Scientific Metals Karaikudi	India
5.	Corrtech Metals	India

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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<b>Deep Anode Ground Bed (MMO type)</b>		
1.	Corrpro System	
2.	Ceranode	USA
3.	LIDA	USA
4.	Titanor Components	USA
5.	Berry Plastic	USA
6.	Mactor	USA
<b>Digital Multimeter</b>		
1.	Beckmann	
2.	Fluke	
3.	Motwane	
<b>DC clip-on meter</b>		
1.	HCK	Germany
2.	Kyoritsu Elect	Japan
<b>Long Line Conductive Polymer Anode Flex x 1500 Anode flex Splice Kit</b>		
4.	Tyco Adhesives (Formally Raychem Corporation USA)	
<b>Cu/CuSO4 permanent reference cells</b>		
3.	Borin	USA
4.	Mc-Miller	USA
5.	Harco	USA
<b>Reference Electrode (Zinc) / Zinc Reference Cell</b>		
1.	Scientific Metal Engineers	India
2.	Karaikudi	India
3.	Sargam Metal Chennai	India
<b>Solid-State type Polarization cells</b>		
1.	Dairy Land,	USA
2.	Rustrol	USA
3.	Advanced Electronics Systems	India
4.	Kirk	USA
5.	Corrpro	USA
<b>Insulating Flange Gasket Kit Joints</b>		
1.	ALFA	Italy
2.	ZUNT	Italy
3.	IGP	India
<b>Monitoring Junction Box (MJB) Remote Monitoring Unit</b>		
1.	Raychem	
2.	Advanced Electronics Systems	
3.		

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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<b>Vendors for UPS System</b>		
1	VERTIV Energy Private Limited" (formally known as Emerson Network Power (India) Pvt. Ltd)	India
2	GE Power Controls India Pvt. Ltd	India
<b>Vendors for Soft Starter</b>		
1	Danfoss Industries Pvt. Ltd.	India
2	Jayashree Electron Pvt. Ltd.	India
3	Kimo Electronics Pvt. Ltd	India
4	Siemens Ltd.	India

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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## SPECIFICATION SHEET

### 33 kV ICOG Breaker Panel

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System			
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 :			
Maker's Ref. No. :				Vapour : 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"/>			
<b>TESTS:</b>		Routine <input checked="" type="checkbox"/>		Type <input type="checkbox"/> Others <input type="checkbox"/>			
<b>BASIC DATA</b>							
		Description		33kV ICOG Panel			
<b>REFERENCE DRAWINGS</b>		Single Line Diagram					
		Feeder Details		Sh. No. -- of this specification			
		P.T. Bus Arrangement		--			
<b>SYSTEM DETAILS</b>		Rated Voltage with variation		33 kV ± 10%			
		Rated Frequency with variation		50Hz ± 5%			
		Highest System Voltage		36 kV			
		Combined V & F Variation		± 10%			
		No. of Phases & Wires		3 Phase, 3 Wire			
		Insulation Level		170 kVp/ 70kV BIL			
		Fault Level		1800 MVA for 3 sec.			
		Earthing Mode		Non effectively earthed through resistor			
<b>BUS BARS</b>		<b>Rating</b>		Continuous			
				Short Time for 3 sec.			
		Type of Insulation		Insulating heat shrinkable Sleeved			
<b>CIRCUIT BREAKER</b>		Type		Vacuum Circuit Breaker			
		<b>Breaking Capacity</b>		Symmetrical			
				% DC Component			
		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 Req'd. 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 Req'd. for a Period of		2 Years			



**\*\* NOTE:**

- 110V DC power required shall be provided by the DC System.
- 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.



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**TECHNICAL PARTICULARS**  
**33 KV ICOG Panels**



CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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					

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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Shrouding Material for Joints		
Bus Bar Phase Identification Mark		
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	

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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 :		

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.





	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### SPECIFICATION SHEET - 33 / 3.45 KV TRANSFORMERS

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
<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-1180, IS-2026, IEC-60076			
Quantity : 2 Nos.		Encl. Docs. :			
Description : Transformers		Vendor :			
Code No. :		Vendor's Ref. No. :			
<b>TEST TO BE WITNESSED :</b> Routine : <input checked="" type="checkbox"/> Heat Run : <input checked="" 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 $\pm$ % : 33KV $\pm$ 10% / 3.3KV $\pm$ 10%			Temp. - Max./Min./Design Ref. : 46 / 1 / 50°C		
Highest System Voltage : 36 / 3.6 KV			Rel. Humidity : 100 %		Alt. above Sea < 1000M
Number of phases : 3 Ph / 3 W			<b>Atmospheric Pollution</b>		
Rated Frequency with $\pm$ : 50 Hz $\pm$ 5%			Dusts : _____		
Combined V & F Variation : $\pm$ 10 %			Vapour : Highly Corrosive		
Fault MVA : 1800 MVA / 150 MVA			<b>Location</b>		
Earthing Mode : Non-Effectively earthed Through NER.			Indoor : <input type="checkbox"/> Outdoor : <input checked="" type="checkbox"/>		
			<b>AUX. POWER SUPPLY</b>		
			<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 : 5 MVA			W		
No Load Voltage Ratio : 33 KV / 3.45 KV			X Z		
Highest Voltage for Eqpt. : 36 KV / 3.6 KV			Y		
Insulation level Pri.-/ Sec			Impulse : 170 KV / 40 KV		
			Power Freq. : 70 KV / 10 KV		
Impedance at 75° C: 7% (without negative tolerance as per IS)			Shall be provided later.		
Vector Group : Dyn 11			<b>TERMINAL CONNECTIONS</b>		
Cooling System : ONAN			<b>PRI.</b>		
Motor I Start & T Start : Shall be suitable for starting of 3 <sup>rd</sup> Pump Motor when 2 Nos. Pump Motors and other loads are running.					
<b>TAP CHANGER</b>			<b>SEC.</b>		
Type of Taps On Load : <input checked="" type="checkbox"/> Off Ckt. : <input type="checkbox"/>					
Range of Taps : -5% TO +5%			<b>Arrangement</b>		
No. of Taps : 5 @ 2.5 %					
<b>C.T. REQUIREMENTS</b>			<b>Bus cond.</b>		
<b>Differential Protection</b>					
3 nos. on Trf. : <input type="checkbox"/>			<b>Control Cable</b>		
3 nos. Loose : <input type="checkbox"/>					
<b>Restricted earth fault Protection</b>			<b>Earth Conductor</b>		
1 no. on Trf. : <input checked="" type="checkbox"/> CI-PS					
3 nos. Loose : <input type="checkbox"/>			<b>Cable Gland Type &amp; Material</b>		
<b>Standby earth fault Protection</b>					
1 no. on Trf. : <input checked="" type="checkbox"/> CI-5P10			<b>PAINTING</b>		
<b>ADDITIONAL FITTINGS</b>					
1. LV Neutral terminal box			<b>SPARE PARTS</b>		
2. Thermometer pocket with cover					
3. Tank magnetic oil level gauge			Type : EPOXY BASED		
4. Bi-directional roller			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.
  - Mounting arrangement for REF CT shall be provided in the transformer.



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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- Impedance value indicated is tentative, final Impedance shall be indicated at the time of Technical Clarification Meeting.

### SPECIFICATION SHEET - 3.3 / 0.433 KV TRANSFORMERS



CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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-2026, IEC-60076			
Quantity : 1 No.		Encl. Docs. :			
Description : Transformers		Vendor :			
Code No. :		Vendor's Ref. No. :			
TEST TO BE WITNESSED : Routine : <input checked="" type="checkbox"/> Heat Run : <input checked="" 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 $\pm$ % : 3.3KV $\pm$ 10% / 0.415KV $\pm$ 10%			Temp.- Max./Min./Design Ref. : 46 / 1 / 50°C		
Highest System Voltage : 3.6 / 0.457 KV			Rel. Humidity : 100 %		Alt. above Sea < 1000M
Number of phases : 3 Ph / 3 W + N			<b>Atmospheric Pollution</b>	Dusts :	
Rated Frequency with $\pm$ : 50 Hz $\pm$ 5%			<b>Location</b>	Vapour : Highly Corrosive	
Combined V & F Variation : $\pm$ 10 %			Indoor : <input type="checkbox"/>	Outdoor : <input checked="" type="checkbox"/>	
Fault MVA : 150 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 : 500 KVA				W	
No Load Voltage Ratio : 3.3 KV / 0.433 KV			X		Z
Highest Voltage for Eqpt. : 3.6 KV / 0.457 KV				Y	
Insulation level Pri.-/ Sec			Impulse : 28 KV / -- Power Freq. : 10 KV / 3 KV		
Impedance at 75 ° C: 5% (without negative tolerance as per IS)			Shall be provided later.		
Vector Group : Dyn 11			<b>TERMINAL CONNECTIONS</b>		
Cooling System : ONAN			<b>PRI.</b>	Arrangement	O/H bushing : <input type="checkbox"/>
Motor I Start & T Start : Shall be informed later					Bus Duct : <input type="checkbox"/>
<b>TAP CHANGER</b>			<b>SEC.</b>	Arrangement	Cable : <input checked="" type="checkbox"/>
Type of Taps	On Load : <input type="checkbox"/>	Off Ckt. : <input checked="" type="checkbox"/>			Type : 3.3KV XLPE-A-FRLS-PVC (Al) UE
Range of Taps : -5% TO +5%					No. & Size : 1R-3CX240 mm <sup>2</sup> (Al)
No. of Taps : 5 @ 2.5 %					O/H bushing : <input type="checkbox"/>
<b>C.T. REQUIREMENTS</b>					Bus Duct : <input type="checkbox"/>
<b>Differential Protection</b>	3 nos. on Trf. : <input type="checkbox"/>				Cable : <input checked="" type="checkbox"/>
	3 nos. Loose : <input type="checkbox"/>				Type : 1.1 KV XLPE-A-FRLS-PVC (Al)
<b>Restricted earth fault Protection</b>	1 no. on Trf. : <input checked="" type="checkbox"/> CI-PS				No. & Size : 3R-3.5CX400 mm <sup>2</sup> (Al)
	3 nos. Loose : <input type="checkbox"/>				Type : 1.1 kv XLPE-A-FRLS PVC (ST2) (Cu)
<b>Standby earth fault Protection</b>	1 no. on Trf. : <input checked="" type="checkbox"/> CI-5P10				No. & Size : 19X2.5 mm <sup>2</sup> , 2CX10 mm <sup>2</sup> , 5X2.5 mm <sup>2</sup>
					Body : 2-75X10 GI strip
<b>ADDITIONAL FITTINGS</b>					Neutral : 2-1CX185 mm <sup>2</sup> XLPE-UA-FRLS PVC (Al), 1.1 kv
1. LV Neutral terminal box					Primary : } Double
2. Thermometer pocket with cover					Secondary } compression
3. Tank magnetic oil level gauge					Control : } Rolled Al
4. Bi-directional roller					
<b>PAINTING</b>					
Type : EPOXY BASED					
Shade : 631 OF IS : 5					
<b>SPARE PARTS</b>					
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.
  - Mounting arrangement for REF CT shall be provided in the transformer.
  - Impedance value indicated is tentative, final Impedance shall be indicated at the time of Technical Clarification Meeting.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### TECHNICAL PARTICULARS TRANSFORMERS

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
<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. :			
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 Lag					
Maxm. Efficiency & Load at which it occurs					
Full Load Regulation at CosΦ - Unity / 0.8 Lag					
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					

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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Ref. Standard	
Rated Voltage	
Rated Current	
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 in line with NIT/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### SPECIFICATION SHEET 3.3 KV SWITCHBOARD

CLIENT: M/s TFL, Talcher				PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System		
<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>				
Ref. Stds. :		IS <input checked="" type="checkbox"/>	IEC <input 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 :		
Maker's Ref. No. :						Vapour : Highly Corrosive		
				<b>LOCATION</b>		Indoor <input checked="" type="checkbox"/>	Outdoor <input type="checkbox"/>	
						Gr. Floor <input checked="" 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"/>				
<b>TESTS:</b>		Routine <input checked="" type="checkbox"/>	Type <input type="checkbox"/>	Others <input type="checkbox"/>				
<b>BASIC DATA</b>								
<b>TAG NO. &amp; QTY.</b>	Item No.							
	Switch board No.							
	Description		3.3KV Switch Board					
<b>REFERENCE DRAWINGS</b>	Single Line Diagram		Drg. No.					
	Feeder Details		Sh. No. -- of this specification					
	Auto Trip Alarm Scheme		PDS:E 452					
	Non Trip Alarm Scheme		PDS:E 453					
	Trip Ckt. Supervision Scheme		PDS:E 455					
	Auto C/O Scheme		--					
	P.T. Bus Arrangement							
<b>SYSTEM DETAILS</b>	Rated Voltage with Variation		3.3 KV ± 10%					
	Rated Frequency with Variation		50Hz ± 5%					
	Highest System Voltage		3.6KV					
	Combined V & F Variation		± 10%					
	No. of Phases & Wires		3 Phase, 3 Wire					
	Insulation Level		40KV					
	Fault Level		150MVA					
	Earthing Mode		Non effectively earthed through resistor					
<b>BUS BARS</b>	<b>Rating</b>	Continuous		1600A				
		Short Time for 3 sec.		26.24KA				
	Type of Insulation		Heat Shrinkable Raychem Sleeved					
<b>CIRCUIT BREAKER</b>	Type		Vacuum Circuit Breaker					
	<b>Breaking Capacity</b>	Symmetrical		26.24KA				
		% DC Component		20% (Min.)				
	Making Capacity ( peak )		66.81KA					
	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 Req'd.		Yes / No		No			
	Width of Dummy Panel		--					
	No. of Dummy Panel		--					
	<b>PAINTING</b>	Type		Epoxy Based				
		Shade		631 of IS: 5				
Spares Parts Req'd. for a Period of		2 Years						



\*\* NOTE: 110V DC power required shall be provided by the DC System.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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- 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.

### FEEDER DETAILS (3.3KV Switchboard)

SWITCH BOARD DESCRIPTION: 3.3 KV Switch Board		CODE NO. :		
<b>GENERAL</b>	Feeder No.			
	Feeder Description		Incomer with Line PT	
	Eqpt. Code No.		I/C-1 & 2	
	Load in KW / Amp		--	
	Ref. Scheme Drg.		--	
<b>C. B.</b>	Type		VCB	
	Rating (Amp)		1600 A	
	Operating Mechanism		MWS	
<b>CURRENT TRF.</b>	Ratio		1000 / 1 / 1A♦	
	<b>Metering</b>	Remote ammeter		--
		Local ammeter		Yes
		KWH meter		--
	O/C & E/F / Combined Motor Protn.		Yes / --	
	Restricted Earth Fault (REF)		Yes	
	Stand By Earth Fault (SBEF)		Yes	
	Differential Protn.		Yes	
<b>V. T.</b>	Nos & Burden		3 & As reqd. subject to 100VA/Ph (Min.)	
	Ratio		3300/√3 / 110/√3 / 110/√3	
	Connection : Bus / feeder		-- / Yes	
	Sec. Wdg. connection		Star	
<b>METERS</b>	Ammeter: Nos & Range		1 No. & 0-1000A	
	Voltmeter: Nos & Range		1 No. & 0-3.6 KV	
	KWH / Trivectormeter with MDI		-- / Yes	
	MW / KW Meter		-- / Yes	
	Hour meter		--	
	Frequency Meter / PF Meter		-- / --	
	Voltage / Frequency Recorder		--	
	Ammeter for motor space heater (48 x 48 mm)		--	
	Voltage / Current / Power Transducers (Dual output)		-- / -- / --	
	Electronic multifunction meter		Yes	
	<b>PROTECTIVE RELAY</b>	<b>Overcurrent</b>	- IDMTL	Yes
- High set INST.			--	
Combined Motor Protn. (Microprocessor)		--		
<b>Earth Fault</b>		- Res. IDMTL	Yes	
		- Res. INST.	--	
		- SBEF	Yes	
		- Restricted	Yes	
Stalling / single phasing		-- / --		
Neutral displacement		--		
Differential		Yes		
Under Voltage / Synchrocheck / Overvoltage		Yes / Yes / Yes		
<b>AUX. RELAY</b>	<b>Tripping Relay</b>	Elect. Fault	Yes	
		Process Fault	--	
	Trip Ckt. Supervision		Yes	
	Others as required to meet system		Yes	
<b>CONTROL SWITCH</b>	Trip - Neutral - Close / Off-Auto-On		Yes / --	
	Auto - Manual / Emergency Trip/ TSS		-- / -- / --	
	Local - Remote / Local - Remote - Auto		Yes / --	
	Equipment Selection - ASS / VSS		Yes / Yes	
<b>PUSH BUTTON</b>	Emg. Trip / Close / Trip (T) / Test (Te) / Momentary paralleling		-- / -- / -- / Yes/Yes	
	Alarm Accept (Ac) / Reset (R)		Yes / Yes	
	Defeat Interlock		Yes	
<b>SIGNAL LAMPS</b>	On (G) / Off (R) / ready for test / ready for service / CB Fault / ON-OFF on back of breaker feeder		Yes / Yes / Yes / Yes / Yes / Yes / Yes / Yes	

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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	Non Trip (B) / Auto Trip (A) / CB interlocked	-- / Yes / Yes	-- / Yes / Yes
	Trip Ckt. Healthy (W)	Yes	Yes
	Space heater On (Y) / (Motor/Panel)	-- / Yes	-- / Yes
	R, Y, B Phase indication	Yes	--
<b>AUX. EQPT.</b>	Annunciator	--	--
	Limit Switch : Service / Test	Yes / Yes	Yes / Yes
	Panel Illumination Lamp	Yes	Yes
	MCB/TOG. SW./10A SOCKET/SP. HTR./THERMOSTAT	Yes/Yes/Yes /Yes/Yes	Yes/Yes/Yes /Yes/Yes
	Others as required	Yes	Yes
<b>CABLING DATA</b>	Power (3.3KV, XLPE-A-FRLS PVC)	4-3x400mm <sup>2</sup> (Al)	-
	Control (XLPE-A-FRLS PVC)	2 -5x 2.5mm <sup>2</sup> 2-12 x 2.5 mm <sup>2</sup>	2 -3x 2.5mm <sup>2</sup> 1-12 x 2.5 mm <sup>2</sup>

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### FEEDER DETAILS (3.3KV Switchboard)

SWITCH BOARD DESCRIPTION: 3.3 KV Switch Board		CODE NO. :		
<b>GENERAL</b>	Feeder No.			
	Feeder Description		Outgoing Transformer Feeder	
	Eqpt. Code No.		--	
	Load in KW / Amp		-- / 1600A	
<b>C. B.</b>	Ref. Scheme Drq.		--	
	Type		VCB	
	Rating (Amp)		1600 A	
<b>CURRENT TRF.</b>	Operating Mechanism		MWS	
	Ratio		150 / 1 / 1A $\blacklozenge$	
	<b>Metering</b>	Remote ammeter	--	--
		Local ammeter	Yes	--
		KWH meter	--	--
	O/C & E/F / Combined Motor Protn.		Yes / --	-- / --
	Restricted Earth Fault (REF)		Yes	--
	Stand By Earth Fault (SBEF)		Yes	--
Differential Protn.		--	--	
<b>V. T.</b>	Nos & Burden		1 / 100 VA	
	Ratio		3300/ $\sqrt{3}$ / 110/ $\sqrt{3}$ / 110/ $\sqrt{3}$	
	Connection : Bus / feeder		Bus / --	
	Sec. Wdg. connection		Star	
<b>METERS</b>	Ammeter: Nos & Range		1 No. & 0-150A	
	Voltmeter: Nos & Range		--	
	KWH / Trivectormeter with MDI		Yes / --	-- / --
	MW / KW Meter		-- / Yes	-- / --
	Hour meter		--	--
	Frequency Meter / PF Meter		-- / --	-- / --
	Voltage / Frequency Recorder		-- / --	-- / --
	Electronic multifunction meter		Yes	--
<b>PROTECTIVE RELAY</b>	<b>Overcurrent</b>	- IDMTL	Yes	--
		- High set INST.	Yes	--
	Combined Motor Protn. (Microprocessor)		--	--
	<b>Earth Fault</b>	- Res. IDMTL	Yes	--
		- Res. INST.	Yes	--
		- SBEF	Yes	--
		- Restricted	Yes	--
	Stalling / single phasing		-- / --	-- / --
	Neutral displacement		--	--
	Differential		--	--
Under Voltage / Synchrocheck / Overvoltage		--	Yes / -- / --	
<b>AUX. RELAY</b>	<b>Tripping Relay</b>	Elect. Fault	Yes	--
		Process Fault	--	--
	Trip Ckt. Supervision		Yes	--
Others as required to meet system		Yes	--	
<b>CONTROL SWITCH</b>	Trip - Neutral - Close / Off-Auto-On		Yes / --	--
	Auto - Manual / Emergency Trip		-- / --	-- / --
	Local - Remote / Local - Remote - Auto		Yes / --	-- / --
<b>PUSH BUTTON</b>	Equipment Selection - ASS / VSS		Yes / --	-- / Yes
	Emg. Trip / Close / Trip (T) / Test (Te)		-- / -- / -- / Yes	-- / -- / -- / --
	Alarm Accept (Ac) / Reset (R)		Yes / Yes	-- / --
<b>SIGNAL LAMPS</b>	Defeat Interlock		Yes	--
	On (G) / Off (R) / ready for test / ready for service / CB Fault / ON-OFF on back of breaker feeder		Yes / Yes / Yes / Yes / Yes / Yes	--/--/Yes / Yes / -- / --
	Non Trip (B) / Auto Trip (A) / CB interlocked		Yes / Yes / Yes	-- / -- / --
	Trip Ckt. Healthy (W)		Yes	--
	Space heater On (Y) / (Motor/Panel)		-- / Yes	-- / Yes
<b>AUX. EQPT.</b>	Annunciator		--	-
	Limit Switch : Service / Test		Yes / Yes	Yes / Yes
	Panel Illumination Lamp		Yes	Yes
	MCB for Motor Space Heater		--	--
<b>CABLING</b>	Others as required		Yes	Yes
	Power (3.3KV, XLPE-A-FRLS PVC)		1-3x240mm <sup>2</sup> (Al)	-





	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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<b>DATA</b>	Control (XLPE-A-FRLS PVC)	2-5x2.5 mm <sup>2</sup> (Cu) 1-19X2.5 mm <sup>2</sup> (Cu)	2-3x2.5 mm <sup>2</sup> (Cu) 1-12X2.5 mm <sup>2</sup> (Cu)
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### FEEDER DETAILS (3.3KV Switchboard)

SWITCH BOARD DESCRIPTION: 3.3 KV Switch Board		CODE NO. :		
<b>GENERAL</b>	Feeder No.			
	Feeder Description	Outgoing Feeder for Capacitor Bank	Motor Feeder	
	Eqpt. Code No.	--	--	
	Load in KW / Amp	500 KVAR / --	750 KW / --	
	Ref. Scheme Drg.	--	--	
<b>C. B.</b>	Type	VCB	VCB	
	Rating (Amp)	1600 A	1600 A	
	Operating Mechanism	MWS	MWS	
<b>CURRENT TRF.</b>	Ratio	150 / 1 / 1A♦	200 / 1 / 1A♦	
	<b>Metering</b>	Remote ammeter	--	Yes
		Local ammeter	Yes	Yes
		KWH meter	--	Yes
	O/C & E/F / Combined Motor Protn.	Yes / --	-- / Yes	
	Restricted Earth Fault (REF)	--	--	
	Stand By Earth Fault (SBEF)	--	--	
Differential Protn.	--	--		
<b>V. T.</b>	Nos & Burden	--	--	
	Ratio	--	--	
	Connection : Bus / feeder	-- / --	-- / --	
<b>METERS</b>	Sec. Wdg. connection	--	--	
	Ammeter: Nos & Range	1 No. & 0-150A	1 No. & 0-200-1200A + Ammeter for Motor Space Heater	
	Voltmeter: Nos & Range	1 No. & 0-3.6 KV	--	
	KWH / Trivectormeter with MDI	-- / --	Yes/ --	
	MW / KW Meter	-- / --	-- / --	
	Hour meter	--	Yes	
	Frequency Meter / PF Meter	-- / Yes	-- / --	
	Voltage / Frequency Recorder	-- / --	-- / --	
	Electronic multifunction meter	Yes	Yes	
	<b>PROTECTIVE RELAY</b>	<b>Overcurrent</b>	- IDMTL	Yes
- High set INST.			Yes	--
Combined Motor Protn. (Microprocessor)		--	Yes	
<b>Earth Fault</b>		- Res. IDMTL	Yes	--
		- Res. INST.	Yes	Yes
		- SBEF	--	--
		- Restricted	--	--
Stalling / single phasing		-- / --	Yes / Yes	
Neutral displacement		Yes	--	
Differential		--	--	
Under Voltage / Synchrocheck / Overvoltage	Yes / -- / Yes	Yes / -- / --		
<b>AUX. RELAY</b>	<b>Tripping Relay</b>	Elect. Fault	Yes	Yes
		Process Fault	--	Yes
	Trip Ckt. Supervision	Yes	Yes	
Others as required to meet system	Yes	Yes		
<b>CONTROL SWITCH</b>	Trip - Neutral - Close / Off-Auto-On	Yes / --	Yes / --	
	Auto - Manual / Emergency Trip	-- / --	-- / Yes	
	Local - Remote / Local - Remote - Auto	-- / --	-- / Yes	
	Equipment Selection - ASS / VSS	Yes / Yes	Yes / --	
<b>PUSH BUTTON</b>	Emg. Trip / Close / Trip (T) / Test (Te)	Yes / -- / Yes / Yes	-- / -- / -- / Yes	
	Alarm Accept (Ac) / Reset (R)	Yes / Yes	Yes / Yes	
	Defeat Interlock	Yes	Yes	
<b>SIGNAL LAMPS</b>	On (G) / Off (R) / ready for test / ready for service / CB Fault / ON-OFF on back of breaker feeder	Yes / Yes / Yes / Yes / Yes / Yes / Yes	Yes / Yes / Yes / Yes / Yes / Yes / Yes	
	Non Trip (B) / Auto Trip (A) / CB interlocked	Yes / Yes / Yes	-- / Yes / Yes	
	Trip Ckt. Healthy (W)	Yes	Yes	
	Space heater On (Y) / (Motor/Panel)	- / Yes	Yes / Yes	
<b>AUX. EQPT.</b>	Annuciator	--	--	

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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<b>CABLING DATA</b>	Limit Switch : Service / Test	Yes / Yes	Yes / Yes
	Panel Illumination Lamp	Yes	Yes
	MCB for Motor Space Heater	--	Yes
	Others as required	Yes	Yes
	Power (3.3KV, XLPE-A-FRLS PVC)	1-3x240mm <sup>2</sup> (Al)	1-3x240mm <sup>2</sup> (Al)
Control (XLPE-A-FRLS PVC)	2-3x2.5 mm <sup>2</sup> (Cu) 2-12X2.5 mm <sup>2</sup> (Cu) 1-19X2.5 mm <sup>2</sup> (Cu)	2-3x2.5 mm <sup>2</sup> (Cu) 1-19X2.5 mm <sup>2</sup> (Cu)	

- ♦ CT CORE-1 shall be for metering & of accuracy class1/0.2S.  
CORE-2 shall be for protection & of accuracy class 5P20.  
Separate CT shall be provided for Differential Protection.
- Final cable size shall be provided at the time of drawing approval.
- CT ratios are tentative and shall be finalised during drawing approval stage.
- Contact multipliers as required for safe and satisfactory operation of the system is included in vendor's scope.
- 1 no. loose CT of PS class for REF (having exactly same technical parameters as installed in the incomer panel) shall be mounted in transformer neutral terminal box.
- 3 no. loose CT of PS class for Differential (having exactly same technical parameters as installed in the incomer panel) shall be mounted in 33 KV ICOG Panel.



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### TECHNICAL PARTICULARS 3.3 KV SWITCHBOARD



CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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					

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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	



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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 $\mu$ sec. wave )		
Residual Voltage at Rated Discharge Current		
Power Frequency Spark Over Voltage		
1.2/50 $\mu$ 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 :		

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**SPECIFICATION SHEET**  
**415V SWITCHBOARD (Extension of Existing Switchboard)**

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System		
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 :			<b>Atmospheric</b> Dusts :			
Vendor Ref. No. :			<b>Pollution</b> Vapour : Highly Corrosive			
			<b>Location</b> Indoor <input checked="" type="checkbox"/> Outdoor <input type="checkbox"/>			
			Gr. Floor <input checked="" 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>						
<b>TAG NO.</b>	Item No.					
	Description		POWER & MOTOR CONTROL CENTRE			
	Code No.		--			
<b>REFERENCE DRAWINGS</b>	Single Line Diagram					
	Feeder Details		Sheet -- of this specification			
	Auto Trip Alarm Scheme		Refer attached PDS: E			
	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		1000 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		ST		
	<b>Other Feeders</b>	Single front / Double front		Single Front		
		Fixed / Drawout		Fixed		
	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		240 V AC			
	Space Heater		240 V 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 shall be provided by the DC System.

- 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>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### FEEDER DETAILS

#### 415V SWITCHBOARD (Extension of Existing Switchboard)

CLIENT: M/s TFL, Talcher    PROJECT: Coal Based Fertilizer Plant    PLANT: Permanent Raw Water Supply System							
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>							
SWITCH BOARD DESCRIPTION: 415V Switch Board						CODE NO.:	
Feeder No.	Feeder Description and Code No.	Rating		Ref. Scheme Drg.	Fdr.Type	Power Cable Size (mm <sup>2</sup> )	Remarks
		KW	Amp.				
1	EOT 1	--	63A	PDS: 8485	SF (Power Feeder)	LATER	
2	Feeder for Battery Charger	--	63A	- Do -	- Do -	- Do -	
3	Feeder for Battery Charger	--	63A	- Do -	- Do -	- Do -	
4	33 kV ICOG Panel	--	32A	- Do -	- Do -	- Do -	
5	3.3 kV Switchboard	--	32A	- Do -	- Do -	- Do -	
6	OLTC	--	63A	- Do -	- Do -	- Do -	
7	OLTC	--	63A	- Do -	- Do -	- Do -	
8	To LSDB	--	63A	- Do -	- Do -	- Do -	
9	To LSDB	--	63A	- Do -	- Do -	- Do -	
10	To PDB 1	--	63A	- Do -	- Do -	- Do -	
11	Welding Socket	--	63A	- Do -	- Do -	- Do -	
12	Welding Socket	--	63A	- Do -	- Do -	- Do -	
13	Marshalling Box	--	32A	- Do -	- Do -	- Do -	
14	Marshalling Box	--	32A	- Do -	- Do -	- Do -	
15	Marshalling Box	--	32A	- Do -	- Do -	- Do -	
16	Spare Power Feeder	--	63A	- Do -	- Do -	- Do -	
17	Spare Power Feeder	--	63A	- Do -	- Do -	- Do -	
18	Spare Power Feeder	--	125A	- Do -	- Do -	- Do -	
19.	Power Feeder for UPS		63 A	- Do -	- Do -	- Do -	
20	Power Feeder for UPS		63 A	- Do -	- Do -	- Do -	
21	Power Feeder for UPS		63 A	- Do -	- Do -	- Do -	
22	Spare Power Feeder 63 A		63 A	- Do -	- Do -	- Do -	

SF – Power Feeder shall be MCCB with CTs, Ammeter and ASS as per attached PDS 8485.





	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**FEEDER DETAILS**  
**415V SWITCHBOARD (Extension of Existing Switchboard)**  
**(BREAKER CONTROLLED FEEDERS)**

<b>CLIENT:</b> M/s TFL, Talcher	<b>PROJECT:</b> Coal Based Fertilizer Plant	<b>PLANT:</b> Permanent Raw
<b>ISSUED FOR :</b> PROPOSAL <input type="checkbox"/>	ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/>
<b>SWITCH BOARD DESCRIPTION:</b> 415V Switchboard		<b>CODE NO.:</b>



<b>GENERAL</b>	Feeder No.		
	Feeder Description		Incomer from 3.3/0.433 kV Transformer
	Eqpt. Code No.		--
	Load in KW / Amp		- / 1000A
<b>C. B.</b>	Rating		1000 A (ACB)
	Operating Mechanism		MWS
<b>CURRENT TRF.</b>	Ratio		1000/1 A
	Metering		YES
	Protection		YES
	O/C & E/F / Combined Motor Protn.		YES / --
	Restricted Earth Fault Protn.		--
<b>V. T.</b>	Ratio		415/√3/110/√3
	Connection : Bus / Feeder		--/YES
<b>METERS</b>	Ammeter		YES (0-1000A)
	Voltmeter		YES (0-500V)
	KWH/KW		YES/YES
	PF Meter		YES
	Frequency Meter		YES
<b>PROTECTIVE RELAY</b>	Combined Motor Protn.		--
	<b>Over current</b>	IDMTL	YES
		High Set Inst.	--
	<b>Earth Fault</b>	Res. IDMTL	YES
		Inst.	--
		Restricted	YES
		Stand by	YES
	Under Voltage with Timer / Over Voltage		YES / YES
PT Fuse Failure		YES	
Stalling / Single Phasing		--	
<b>AUX. RELAY</b>	<b>Tripping Relay</b>	Elect. Fault	YES
		Process Fault	--
	Trip Circuit Supervision		YES
	Buchholz Alarm / Trip		--
	WTI / OTI Alarm		--
	Low Oil Level Alarm		--
	Alarm / Alarm Cancellation		--
Others as required		YES	
<b>CONTROL SWITCH</b>	Trip - Neutral - Close / off-auto-On		YES / --
	Auto - Manual / Local - Remote		-- / YES
	ASS / VSS		YES / YES
	Local-Remote-Auto		--
<b>PUSH BUTTON</b>	Emg. Trip (T) / Test (Te)		-- / Yes
	Alarm Accept (AC) / Reset I		YES / YES
	Defeat Interlock or Momentary Paralleling		YES
	Emg. Trip of HVCB		--
<b>SIGNAL LAMPS</b>	On(R)/ Off(G)/ Ready for Service(W) /Ready For Test / Interlocked		YES/ YES/ YES/ YES/ --
	Non Trip (B) / Auto Trip (A)		-- / --
	Trip Ckt. Healthy (W)		YES
	Panel Space Heater ON / Motor Space Heater ON		YES / --
	Ready for Service / Test		YES / YES
<b>AUX. EQPT.</b>	Limit Switch: Service / Test		YES / YES
	MCB for Motor Space Heater		--
	Others as required		YES
<b>CABLING</b>	Power Cable: 1.1KV, XLPE-A-FRLS PVC		3R-3.5Cx400 mm <sup>2</sup> (Al)
	Space Heater:1.1KV, XLPE-A-FRLS PVC		--

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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<b>DATA</b>	Control Cable: 1.1KV, XLPE-A-FRLS PVC	--
-------------	---------------------------------------	----



**Note:**

- A. Metering CT shall be of accuracy class 1/0.2S.
- B. Protection CT shall be of accuracy class 5P20.
- C. Contact multipliers as required for safe and satisfactory operation of the system is included in Bidder's scope.
- D. CT ratios are tentative & shall be finalized during drawing approval stage.
- F. Ratings are indicative and final ordered ratings shall be informed once these are finalized.



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**TECHNICAL PARTICULARS**  
**415V SWITCHBOARD (Extension of Existing Switchboard)**



CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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>	Meters				
	C.B. Feeders				
<b>SINGLE FRONT / DOUBLE FRONT</b>		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>					

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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	



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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Ratio	
Rated Burden	
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	

 <b>पी डी आई एल</b> <b>PDIL</b>	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp;  COMMISSIONING OF PERMANENT RAW WATER SUPPLY  SYSTEM AND ALLIED FACILITIES  TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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Ref. Standard	
Contact Rating	
Utilisation Category	
<b>SIGNAL LAMPS</b>	
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/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### NEUTRAL EARTHING RESISTOR

CLIENT: M/s TFL, Talcher				PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System			
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 : 2 Nos.				Encl. Docs. :					
Description : NGR FOR 4.0 MVA Power Transformer				Vendor :					
Code No. :				Vendor's Ref. No. :					
TESTS : Routine : <input checked="" type="checkbox"/>		Type Test ( Heat Run ) : <input type="checkbox"/>		Type: <input type="checkbox"/>		Others : <input type="checkbox"/>			
<b>SERVICE CONDITIONS</b>									
<b>SYSTEM DETAILS</b>				<b>AMBIENT CONDITIONS</b>					
Nom. Voltage with $\pm$ % : 3.3 KV $\pm$ 10%				Temp.- Max./Min./Design Ref. : 46 / 1 / 50°C					
Highest System Voltage : 3.6 KV				Rel. Humidity : 100% Alt. above Sea < 1000M					
Rated Frequency with $\pm$ % : 50 Hz $\pm$ 5 %				<b>Atmospheric Pollution</b>		Dusts :			
						Vapour : Highly Corrosive			
				<b>Location</b>		Indoor : <input type="checkbox"/> Outdoor : <input checked="" type="checkbox"/>			
<b>BASIC DATA</b>									
<b>RATING</b>				<b>TERMINAL CONNECTIONS</b>					
Rated Voltage : 3.45 KV / $\sqrt{3}$ (Ph. to Neutral)				<b>INCOMING</b>		Arrangement : Bushing <input type="checkbox"/> Cable box <input checked="" type="checkbox"/>			
Short Time Current : 400 Amp for 10 sec., 80 A Continuous						CABLE / COND.		Type : XLPE 3.3 KV (AI), UA	
Total Resistance : 4.98 Ohms								No. & Size :2-1CX185 mm <sup>2</sup>	
<b>CURRENT TRANSFORMER</b>				<b>OUTGOING</b>		Arrangement : Bushing <input type="checkbox"/> Cable box <input checked="" type="checkbox"/>			
SBEF Protn. Req'd. : <input type="checkbox"/> Ratio : Not req'd.						CABLE / COND.		Type : XLPE 3.3 KV (AI), UA	
REF Protn. Req'd. : <input type="checkbox"/> Ratio : Not req'd.								No. & Size: 2 -1CX185 mm <sup>2</sup>	
<b>PAINTING</b>				<b>BODY EARTHING CONDUCTOR</b>		Material : G.I. EARTH STRIP			
Type : EPOXY BASED		Shade : 631 of IS: 5				Size : 75X10 mm			
<b>SPARE PARTS</b>				<b>ISOLATING DEVICE</b> : Switch <input type="checkbox"/> Link <input checked="" type="checkbox"/>					
Req'd. <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.
- The cable sizes indicated are tentative and shall be finalised during drawing approval.

### TECHNICAL PARTICULARS



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### NEUTRAL EARTHING RESISTOR

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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>RESISTOR</b>					
Material of element :					
Construction :		Punched <input checked="" type="checkbox"/>		Formed <input type="checkbox"/>	
Temp. rise over ambient :					
Continuous current rating :					
Duration for short time rating :					
No. of elements per Bank :					
<b>NUMBER OF BANKS IN</b>	Series :				
	Parallel :				
Resistance of each Element :					
Temp. Co-efficient per ° C :					
Specific Resistance :					
<b>BUSHING / SUPPORT INSULATORS</b>					
Make & Maker's Type :					
Ref. Stds.:					
Rated Voltage :					
Material of Construction :					
<b>INSULATION LEVEL</b>	Impulse :				
	Power Freq. :				
Min. Clearance to Earth :					
Min. Creepage distance :					
<b>ISOLATING SWITCH</b>					
Make & Maker's Type :					
Ref. Stds. :					
Rated Voltage :					
Rated Current :					
No. of Aux. Contacts :					
<b>CURRENT TRANSFORMER</b>					
Make & Maker's Type :					
Ref. Stds. :					
Accuracy Class :					
Burden ( VA ) :					
<b>INTERCONNECTING STRIP</b>					
Material of connecting Strip :					
Rated Current :					
Arrangement of connection :					
<b>HOUSING</b>					
Degree of Protection :					
Thickness of sheet steel :					
Material of Ext. Hardwares ≤ 8mm/ >8mm :					
Temp. Rise over Ambient :					
Size ( LXBXH ) :					
Total Weight :					
<b>CABLE GLAND</b>					
Make :					
Type of Material :					

NOTE : Completely filled in Technical Particulars Sheet in line with NIT/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.





	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**SPECIFICATION SHEET**  
**LIGHTING SUB DISTRIBUTION BOARD / POWER DISTRIBUTION BOARD**

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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		Dusts :
Vendor Ref. No. :					Vapour : Highly Corrosive
<b>SYSTEM DETAILS</b>			Area		Safe <input checked="" type="checkbox"/> Hazardous <input type="checkbox"/>
Nominal Voltage with ± % : 415V ± 10%,			Hazardous		Zone : Encl. Gr. :
Rated Frequency with ± % : 50 Hz ± 5%,			Area Class		Temp. Class :
Combined V & F Variation : ± 10%,			Location		Indoor <input type="checkbox"/> Outdoor <input type="checkbox"/>
No. of Phases & Wires : 3-Phase, 4-wire					
TESTS TO BE WITNESSED: Routine <input checked="" type="checkbox"/>			Type <input type="checkbox"/>		Others <input type="checkbox"/>
<b>BASIC DATA</b>					
Item No. :					
Quantity :					
Description :					
Code No.					
Incoming & Outgoing feeders		1 No. Incoming (63 A 4 P MCCB) and 3 nos. feeder circuit of 63A DP RCBO having 9 Nos. outgoing of 16 A DP RCBO (i.e. 3 nos. 16 A DP RCBO per circuit) (Refer SLD Drg. No. PC150-1204)			
Degree of Protection :		IP55			
Addl. Degree of Protection :		--			
Cable Type & Size		Incoming (Al) 1.1 KV, 3.5X50 sq. mm (Al) XLPE-A-FRLS PVC			
		Outgoing (Cu) Later			
Painting Type & Shade :		Epoxy based, 631of IS:5			
Period for which Spares required :		2 years			
<b>MAKE OF COMPONENTS</b>					
SWITCH		: Refer Make of Electrical Items			
M.C.B.		: -do-			
CABLE GLANDS		: -do-			
TERMINAL BLOCKS		: -do-			
<b>TECHNICAL PARTICULARS</b>					
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 :				

NOTE: Completely filled in Technical Particulars Sheet in line with NIT/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### SPECIFICATION SHEET - INDUCTION MOTOR

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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 : 01 No.		Encl. Docs. :		<input type="checkbox"/>	
Description : Motor for Construction Water Pump		Make :			
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 $\pm$ % :		3.3 KV $\pm$ 10%		Temp. Max./Min./Design Ref.: 46 / 1 / 50°C	
No. of phases :		3		Relative Humidity: 100%; Alt. <input type="checkbox"/> Relative Humidity: 100%;	
Rated Frequency With $\pm$ % :		50 Hz $\pm$ 5%		<b>Atmospheric</b>	
Combined V & F variation :		$\pm$ 10%		<b>Pollution</b>	
Fault Level :		150 MVA		<b>Area</b>	
Space Heater Supply :		240 V, 1 PH, AC		Safe <input checked="" type="checkbox"/> Hazardous <input type="checkbox"/>	
Low Voltage Heating Supply :				<b>Haz. Area class:</b>	
		Location :		Indoor <input type="checkbox"/> Outdoor <input checked="" type="checkbox"/>	
<b>INSTRUMENT</b>		A.C. :		<b>COOLING WATER</b>	
<b>CONTACT RATING</b>		D.C. : 2A at 110V		Inlet Press. : kg/sq.m .	
Aux. Motor Supply :				Inlet Temp. °C	
				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 : Continuous			Absorbed Power :		
Rotor Type : Squirrel Cage			Coupling :		
Starting Method : DOL			Torque-Starting / Max. :		
Max I Start/I Rated : FCMA Starter			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>					
Degree of Protection : IPW 55			Foundation Bolt <input checked="" type="checkbox"/>		
Addl. Degree of Protection :			Space Heater <input checked="" type="checkbox"/>		
Mounting Arrangement :			Lifting Eye Bolt <input checked="" type="checkbox"/>		
Direction of Rotation :			Cable Glands <input checked="" type="checkbox"/>		
Insulation Class : 'F' with temp. rise limited to 'B'			Diff. C.T.s <input type="checkbox"/>		
Cooling Method : IC411 / IC611 / IC511			C.W. Flow Indicator <input type="checkbox"/>		
Stator Connection : Star			RTDs for Wdgs. <input checked="" type="checkbox"/>		
			Hot Air <input checked="" type="checkbox"/>		
			Bearings <input checked="" type="checkbox"/>		
			Thermometer For Hot Air <input checked="" type="checkbox"/>		
			Bearings <input type="checkbox"/>		
			Earthing Terminals On Body <input checked="" type="checkbox"/>		
			In T.B. <input checked="" type="checkbox"/>		
<b>CABLING DATA</b>					
Power cable : 3.3KV, XLPE-A-FRLS PVC (3C x 240 sqmm)			Name Plate : <input checked="" type="checkbox"/>		
Heater cable : 1.1KV, 3x2.5 mm <sup>2</sup> (Cu) XLPE-A-FRLS PVC			Addl. Name Plate : <input type="checkbox"/>		
C.T. cable :			Rain Protecting Hood : <input type="checkbox"/> Thermistor <input type="checkbox"/>		
R.T.D. cable : LATER			<b>SPARE PARTS</b>		
Alarm cable :			Required <input checked="" type="checkbox"/>		
			For Period of 2 Years		
			Bearings <input checked="" type="checkbox"/>		
			Bearing Accessory <input checked="" type="checkbox"/>		
			Thermometer <input checked="" type="checkbox"/>		
			Cooling Fan <input checked="" type="checkbox"/>		
			Grease Nipple & Plug <input checked="" type="checkbox"/>		
			Space Heater <input checked="" type="checkbox"/>		
			Inner & Outer covers for DE & NDE bearings <input checked="" type="checkbox"/>		
			Terminal Stud with bushing & star link <input checked="" type="checkbox"/>		
<b>PAINTING</b>					
Type : Epoxy					
Shade : 631 of IS : 5					

**Notes:**



- 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>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### TECHNICAL PARTICULARS - INDUCTION MOTOR



CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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 Drg.					
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					

Note : Completely filled in Technical Particulars Sheet in line with NIT/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**SPECIFICATION SHEET  
LOCAL CONTROL STATIONS**



CLIENT: M/s TFL, Talcher PROJECT: Coal Based Fertilizer Plant PLANT: Permanent Raw Water Supply System			
ISSUED FOR : PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>			
GENERAL		AMBIENT CONDITION	
Ref. Stds. : IS/IEC		Temp.- Max / Min / Design ref.: 46 / 1 / 50°C	
Encl. Docs. :		Max Relative Humidity 100%	Alt. above sea : <1000 M 100%
Vendor :		Atmospheric	Dusts :
Vendor Ref. No. :		Pollution	Vapour : Highly corrosive
		Area	Safe : <input checked="" type="checkbox"/> Hazardous : <input type="checkbox"/>
Sample : Reqd. : Not Reqd. :		Haz. Area	
Tests : Routine : <input checked="" type="checkbox"/> Others :		Class	
		Location :	Indoor <input type="checkbox"/> Outdoor <input checked="" type="checkbox"/>
			As per SOR (supply)
Rated Control Voltage with ± %		<b>240V ± 10%</b>	
Rated Frequency with ±			
Material		FRP	
<b>Provisions required in LCS</b>			
PUSH BUTTON			--
			--
			--
			--
CONTROL SWITCH	Lock / Service		--
	TRIP/NEUTRAL/CLOSE		Yes
	Local-OFF-Remote		Yes
INDICATION LAMP	ON		Yes
	OFF		Yes
	Ready for Service		Yes
	Space Heater ON		Yes
	Trip		Yes
METERS	Ammeter		Yes
	Range		0-250A
	C.T. Sec. Current		1 Amp
RAIN HOOD			Yes
			--
Control Cable Size XLPE-A-FRLSPVC (Cu)		19 CX2.5 mm <sup>2</sup>	
Painting Type & Shade		Epoxy, 631as per IS-5, Light grey	
Period For which Spares Reqd.		2 Years	

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**TECHNICAL PARTICULARS  
LOCAL CONTROL STATIONS**

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
ISSUED FOR :		PROPOSAL <input type="checkbox"/>	ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/>	FINAL <input type="checkbox"/>
<b>GENERAL</b>					
<b>CONSTRUCTIONAL FEATURES</b>					
Material of Construction					
Thickness of Enclosure					
IP Class of Enclosure					
Mounting Arrangement					
Door hinged or not					
Gasketing Material					
External Hardware					
Rainhood reqd. or not					
<b>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					
<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					
or					



Note : Completely filled in Technical Particulars Sheet in line with NIT/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### SPECIFICATION SHEET CAPACITOR BANK

CLIENT: M/s TFL, Talcher PROJECT: Coal Based Fertilizer Plant PLANT: Permanent Raw Water Supply System			
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. :		Max Relative Humidity 100%	Alt. above sea : <1000 M
Make :		<b>Atmospheric Pollution</b>	Dusts :
Maker's Type. :			Vapours : Highly corrosive
		Location : Indoor <input checked="" type="checkbox"/>	Outdoor <input type="checkbox"/>
<b>SERVICES</b>			
Erection, Testing & Commissioning : <input checked="" type="checkbox"/>			
Supervision of Erection & Commissioning :			
TESTS : Routine <input checked="" type="checkbox"/> Type <input checked="" type="checkbox"/> Other <input checked="" type="checkbox"/>			
<b>BASIC DATA</b>			
<b>TAG NO.</b>	Item No.		
	Description		CAPACITOR BANK
	Code No.		
<b>CAPACITOR BANK / SUB-BANK</b>	Rating of Cap. Bank		500 KVAR
	Qty. of Cap. Bank		2 Nos.
	Rating of Cap. Sub-bank		2 x 250 KVAR in each Bus
	Qty. of Cap. Sub-bank		2 Nos in each Bus
<b>CAPACITOR CONTROL PANEL</b>	Required		Required
	Not required		
	P.F. Range		Upto 0.96
<b>SYSTEM DETAILS</b>	Rated Voltage with $\pm$ %		3.3 KV $\pm$ 10 %
	Rated Frequency with $\pm$ %		50 HZ $\pm$ 5 %
	Highest system Voltage		3.6 KV
	Combined V & F variation		$\pm$ 10%
	No. of Phases		3 Ph
	Earthing Mode		NON EFFECTIVELY EARTHED THROUGH RESISTANCE
	Fault Level		150 MVA
<b>CONTROL VOLTAGE</b>	Contactor		
	Cont. panel Space Heater		
	Indication		
<b>PROTECTION PROVIDED IN SWITCHGEAR</b>	IDMTL Over Current		
	Inst. Short Circuit		Yes
	Inst. Earth Fault		Yes
	Inst. Over-voltage with timer		Yes
	Neutral Voltage Displacement		Yes
<b>CABLING DATA</b>	Fuse		--
	Capacitor Bank		3.3 KV GRADE XLPE; 3X240 sq mm ( AL).
	Capacitor Sub-bank		
	<b>Control Panel</b>	Incoming	
		O/G to each sub-bank	
	Residual P.T.		TO BE INDICATED BY CONTRACTOR
Door Limit Switch		1.1KV GRADE 3X2.5 sq mm (CU).	
<b>MISC. DATA</b>	<b>Painting</b>	Type	Epoxy based
		Shade as per IS:5	631
	Period for which spares required		2 Years operation and maintenance



Note :

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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- 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.

### TECHNICAL PARTICULARS CAPACITOR BANK

CLIENT: M/s TFL, Talcher PROJECT: Coal Based Fertilizer Plant PLANT: Permanent Raw Water Supply System	
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.	
<b>CAPACITOR BANK</b>	
Ref. Stds.	
Make	
Maker's Type	
Rated Output in KVAR	
Rated Voltage / Current	
Permissible Over Voltage / Over Current	
Inrush Current	
Rated Frequency	
No. of Phases / Connection	
Upper Limit of Temp. Category	
Insulation Level	
Discharge Device	
No. of Bushings	
Outline Dimensions ( LXBXH )	
Total Weight	
<b>CAPACITOR UNIT</b>	
Rated Output in KVAR	
Rated Voltage	
Permissible Over Voltage / Over Current	
Impregnation	
Dielectric	
Foil Material	
Insulation Level	
Protective Fuse Rating	
Discharge Device	
Residual Voltage / Time to achieve it	
Dielectric Loss / Loss angle	
<b>SERIES REACTOR</b>	
Ref. Stds.	
Make / Maker's Type	
Rated Voltage / Current	
Rated Frequency / No. of Phases	
Rated KVAR	
Rated Short Time Current / Duration	
Insulation Level	
Reactance per Phase ( ohms )	
Type of Core	
Type of Cooling	
Temp. Rise : Oil / Winding	
Outline Dimensions ( LXBXH )	
Total Weight	
Volume of Oil in Litres	
<b>RESIDUAL P.T.</b>	
Ref. Stds.	
Make / Maker's Type	
Voltage Ratio / Burden	
Rated Frequency	
No. of Phases / Connection	
Earthing Mode	
Residual Voltage	
Insulation Level	
Name of Auxiliaries	
Location of Fuse : Built - in / External	
Outline Dimensions ( LXBXH )	
Total Weight	



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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CLIENT: M/s TFL, Talcher    PROJECT: Coal Based Fertilizer Plant    PLANT: Permanent Raw Water Supply System	
<b>ISSUED FOR :</b> PROPOSAL <input type="checkbox"/> ENQUIRY <input checked="" type="checkbox"/> ORDER <input type="checkbox"/> FINAL <input type="checkbox"/>	
<b>CAPACITOR CONTROL PANEL</b>	
Make & Maker's type	
Ref. Standards	
Rated Operational Voltage with $\pm$ %	
Rated Insulating Voltage	
Rated Current	
Short Circuit Rating	
<b>EXECUTION</b>	Degree of Protection
	Type of Sheet Steel
	Thickness of Sheet Steel
Material of Gasket	
Material of External Hardware	
Operating Height : Max. / Min.	
<b>COMPONENTS</b>	
<b>SWITCHES</b>	Make & Maker's type
	Ref. Standards
	Rated Voltage
	Utilisation Category
	Suitable for Capacitor Duty
<b>FUSES</b>	Make & Maker's type
	Ref. Standards
	Rated Voltage
	Category of Duty
	Prospective Breaking Current
<b>CONTACTORS</b>	Make & Maker's type
	Ref. Standards
	Rated Operational Voltage
	Utilisation Category
	Coil Voltage
<b>INSTRUMENTS AND METERS</b>	Make & Maker's type
	Ref. Standards
	Accuracy
	Size
	Type of Mounting
<b>SELECTOR SWITCHES</b>	Make & Maker's type
	Ref. Standards
	Contact Rating
	Utilisation Category
<b>PUSH BUTTONS</b>	Make & Maker's type
	Ref. Standards
	Contact Rating
	Utilisation Category
<b>SIGNAL LAMPS</b>	Make & Maker's type
	Ref. Standards
	Rated Voltage / Wattage
	Rating of Safety Resistor
	Type of Lamp Holder
	Type of Globe
<b>CABLE GLANDS</b>	Material
	Type
<b>TERMINAL BLOCKS</b>	Make
	Type
	Current Rating
<b>DOOR LIMIT SWITCH</b>	Ref. Standards
	Make / Maker's Type
	Contact rating
	Utilisation Category



NOTE: Completely filled in Technical Particulars Sheet in line with NIT/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### SPECIFICATION SHEET - ELECTRICAL EQUIPMENT FOR CRANE & HOIST

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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. :			
<b>TESTS:</b>		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.- Max / Min / Design ref.: 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 : Ammonia Vapours : Urea		
Combined V & F variation : ± 10 %					
Fault Level :			<b>AREA *</b>		Safe <input checked="" 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)			<b>Location :</b> Indoor <input type="checkbox"/> Outdoor <input checked="" 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 :		<b>SPARE PARTS</b>	
		size :			
			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 :		Refer Vendor List for Electrical Items			
Switch :		Refer Vendor List for Electrical Items			
Contactor :		Refer Vendor List for Electrical Items			
Fuse :		Refer Vendor List for Electrical Items			
Push Button :		Refer Vendor List for Electrical Items			
Limit Switch :		Refer Vendor List for Electrical Items			
Brake :		Refer Vendor List for Electrical Items			
Cable :		Refer Vendor List for Electrical Items			
Control Transformer :		Refer Vendor List for Electrical Items			
Lighting fixture :		Refer Vendor List for Electrical Items			
Junction Box :		Refer Vendor List for Electrical Items			
Terminal Block :		Refer Vendor List for Electrical Items			
Control Panel :		Refer Vendor List for Electrical Items			

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### TECHNICAL PARTICULARS - ELECTRICAL EQUIPMENT FOR CRANE & HOIST

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
ISSUED FOR :		PROPOSAL <input type="checkbox"/>	ENQUIRY <input checked="" type="checkbox"/>	ORDER <input type="checkbox"/>	FINAL <input type="checkbox"/>
<b>POWER CONTROL PANEL</b>					
<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				

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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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/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**SPECIFICATION SHEET**  
**HT CABLES**

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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 :		
			Vapour : 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.	1		2		3
Ref. Stds.	IS:7098 (PART-2)		IS:7098 (PART-2)		IS:7098 (PART-2)
Voltage Grade	33 KV POWER CABLE		3.3 KV POWER CABLE		3.3 KV EARTHING CABLE
System Earthing	UE		UE		E
Type of Cable	POWER		POWER		EARTHING
<b>CONDUCTOR</b>	ALUMINIUM/ COPPER	ALUMINIUM		ALUMINIUM	
	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	YES		YES	
	Not Required	--		--	
Material of Conductor Screen	AS PER IS		AS PER IS		--
<b>ARMOURING</b>	Required	YES		YES	
	Material	GALVANISED STEEL STRIP		GALVANISED STEEL STRIP	
	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	INSULATION SCREEN REQUIRED		INSULATION SCREEN REQUIRED		--
Drum Material	STEEL		WOOD		WOOD
<b>BILL OF QUANTITY</b>					
Item No.	No. of Core & Cross-Sectional Area in sq. mm.	Qty. in Mtr.	Preferred Drum Length	Remarks	
<b>33 KV XLPE insulated, armoured, FRLS PVC outer sheathed power cable of following sizes:</b>					
1.		Refer SOR	LATER		
<b>3.3 KV XLPE insulated, armoured, FRLS PVC outer sheathed power cable of following sizes:</b>					
2.		Refer SOR	LATER		
<b>Single Core XLPE insulated, 11/3.3KV grade unarmoured FRLS PVC outer sheathed cable for earthing of following sizes:</b>					
3.		Refer SOR	LATER		

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**SPECIFICATION SHEET**  
**LT POWER & CONTROL CABLES**



CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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.	<b>1</b>		<b>2</b>		<b>3</b>
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
<b>BILL OF QUANTITY</b>					
Item No.	No. of Core & Cross-Sectional Area in Sq. mm.	Qty. in M.	Preferred Drum Length	Remarks	
<b>1.1 KV XLPE insulated, armoured, FRLS PVC outer sheathed, Power cables of following sizes:-</b>					
1.		Refer SOR	LATER		
			LATER		
<b>1.1 KV XLPE insulated, armoured, FRLS PVC outer sheathed, Control cables of following sizes:-</b>					
2.		Refer SOR	LATER		
<b>Single Core 1.1 KV XLPE insulated, unarmoured FRLS PVC outer sheathed cable for earthing of following sizes:-</b>					
3.		Refer SOR	LATER		

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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### TECHNICAL PARTICULARS CABLES

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
ISSUED FOR : 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/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**SPECIFICATION SHEET**  
**INTERLOCKING SWITCH SOCKET & PLUG**

CLIENT: M/s TFL, Talcher PROJECT: Coal Based Fertilizer Plant PLANT: Permanent Raw Water Supply System			
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 : Vapour : Highly Corrosive
Vendor Ref. No. :		Area	Safe <input checked="" type="checkbox"/> Hazardous <input type="checkbox"/>
Sample Req. :		Hazardous Area Class	Zone : Encl. Gr. :
		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.		Refer SOR (Supply)	
Quantity			
Rated Voltage & Frequency		415V ± 10 %, 50Hz ± 5%	240V ± 10 %, 50Hz ± 5%
Rated Current		63 Amp	15 Amp
No. of Phases & Pins		3 Ph, 4 Pin	1 Ph, 3 Pin
Degree of Protection		IP55	IP55
Addl. Degree of Protection		--	--
Cable Size	Supply	3.5CX50 mm <sup>2</sup> (Al)	3CX2.5 mm <sup>2</sup> (Al)
	Plug	3.5CX25 mm <sup>2</sup> (Al)	3CX2.5 mm <sup>2</sup> (Al)
Period for which Spares required		2 Years	2 Years
<b>MAKE OF COMPONENTS</b>			
SWITCH :		Refer Make of Electrical Items	
FUSE:		-do-	
SOCKETS :		-do-	
PLUG :		-do-	
CABLE GLANDS :		-do-	
TERMINAL BLOCKS :		-do-	
<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/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**SPECIFICATION SHEET**  
**LIGHTING FIXTURES AND ACCESSORIES**

CLIENT: M/s TFL, Talcher    PROJECT: Coal Based Fertilizer Plant    PLANT: Permanent Raw Water Supply System						
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 :			
Vendor Ref. No. :		Pollution	Vapour : Highly Corrosive			
<b>SYSTEM DETAILS</b>		Area	Safe : <input checked="" type="checkbox"/> Hazardous : <input checked="" type="checkbox"/>			
Nominal Voltage : 240V ± 10%		Haz. Area class	Zone    Encl. Gr. :			
Rated Frequency: 50Hz ± 5%			Temp. Class :			
Combined V & F variation : ± 10%		Location: Indoor <input checked="" type="checkbox"/>	Outdoor <input checked="" type="checkbox"/>			
TESTS TO BE WITNESSED : Routine <input checked="" type="checkbox"/> Acceptance <input type="checkbox"/> Type <input type="checkbox"/> Others <input type="checkbox"/>						
<b>BASIC DATA</b>						
Item no.	1		2-3		4	
Degree of Protection	IP65		IP65		IP20	
Addl. Degree of Protection	--		--		--	
Material of Housing	Cast Aluminium alloy		Cast / Sheet Aluminium		CRCA sheet steel	
CONTROL	Separate	Yes		--		
GEAR	Integral	--		Yes		
Cable Type & Size	3 x 2.5 mm <sup>2</sup> (Cu)		3 x 2.5 mm <sup>2</sup> (Cu)		3 x 2.5 mm <sup>2</sup> (Cu)	
Looping facility	Required in control gear box only		Required in control gear box only		No	
CABLE	Required	Yes		Yes		
GLANDS	Type	Rolled Al		Rolled Al		
MOUNTING	Required	Yes		Yes		
BRACKET	Not Required	--		--		
PAINTING	Type	Epoxy		Epoxy		
	Shade	631 as per IS: 5		631 as per IS: 5		
LOCATION	Indoor	--		Yes		
	Outdoor	Yes		Yes		
SAMPLE	Required	--		--		
	Not Required	Not Required		Not Required		
Period for which Spares Required	2 years		2 years		2 years	
<b>BILL OF QUANTITY</b>						
Item No.	Lamp Type & Wattage	Description of Fixtures			Qty.	Remarks
1.	90W LED	Street Lighting			Refer SOR (Supply)	
2.	45W LED	Street Lighting				
3.	2X20W LED tube	Channel/Rail Mounting Industrial				





	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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**TECHNICAL PARTICULARS**  
**LIGHTING FIXTURES AND ACCESSORIES**

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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				
<b>Pre - treatment</b>	Ext. Hardwares <8mm/>8mm				
	Housing				
<b>Thickness of material</b>	Reflector				
	Control Gear Box				
	Housing				
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/PO, shall be submitted after award of order for Owner/Consultant approval, before commencement of manufacturing.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TECHNICAL SPECIFICATION - ELECTRICAL SYSTEM</b>	PC150/E/121/SecVI-5.0	0	
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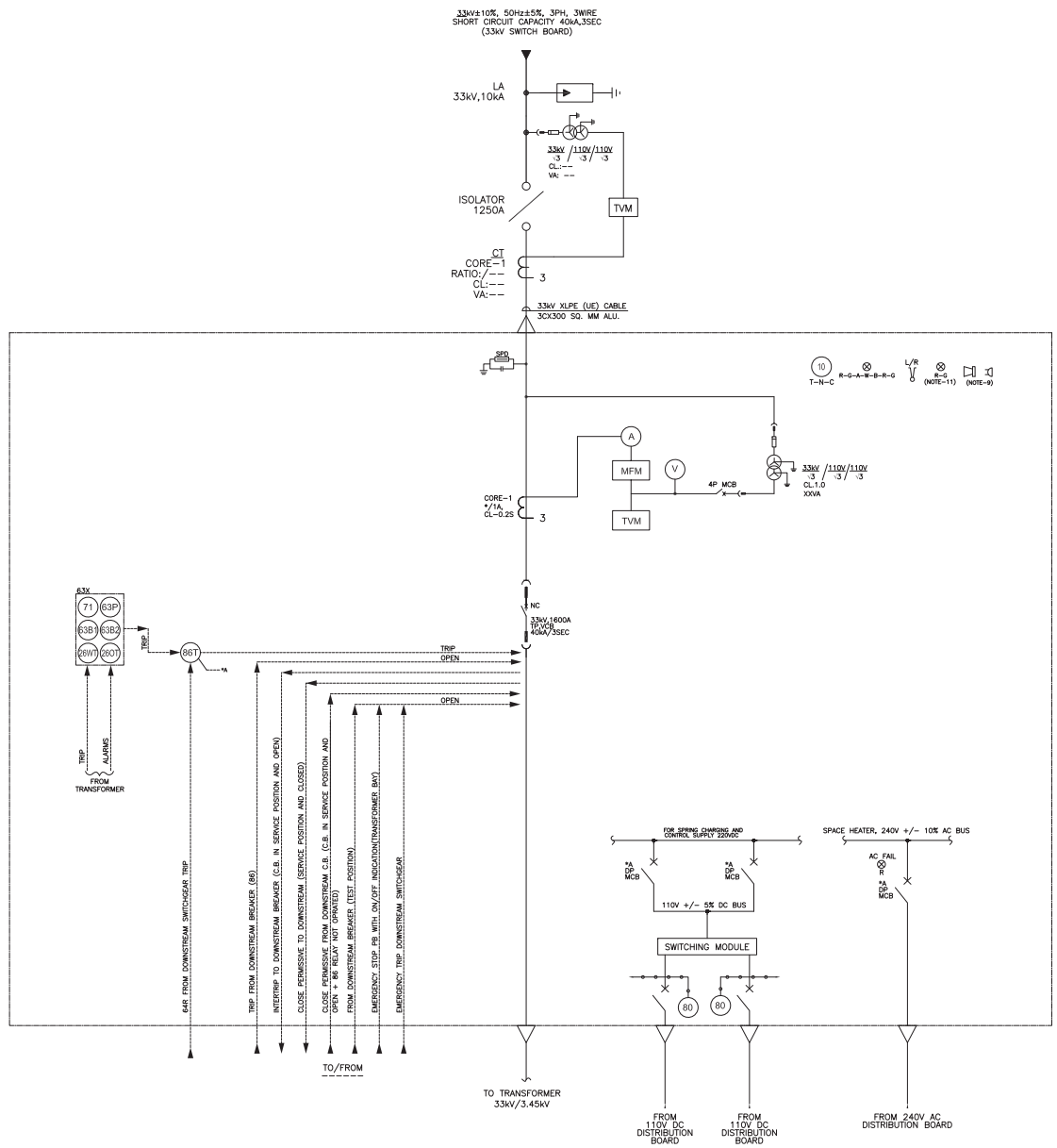
**SPECIFICATION SHEETS**  
**JUNCTION BOX**

CLIENT: M/s TFL, Talcher		PROJECT: Coal Based Fertilizer Plant		PLANT: Permanent Raw Water Supply System	
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	UREA (CORROSIVE)			
	Vapours	--			
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.	1				
Quantity	Refer SOR				
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	LM-6				
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				
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 for Owner/Consultant approval, before commencement of manufacturing.





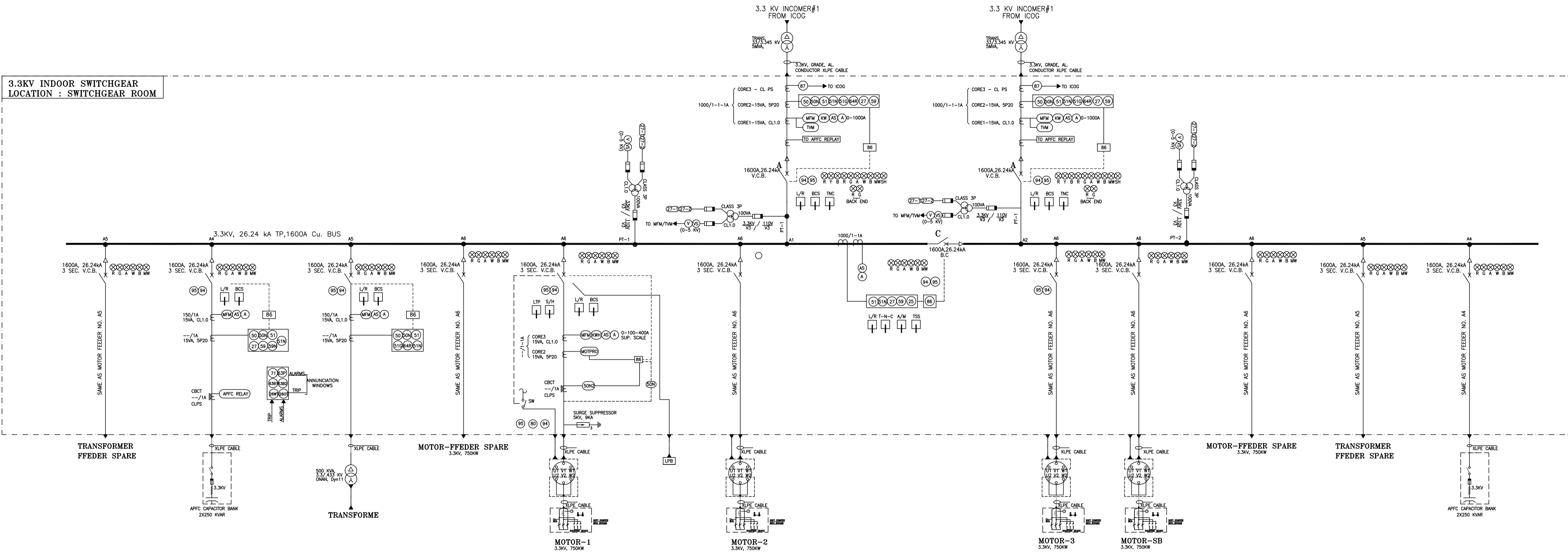
LEGENDS:-			
□	MULTIFUNCTION METER	○	VOLTMETER ALONG WITH VES
○	OVER CURRENT RELAY	○	AMMETER ALONG WITH AFS
○	DIFFERENTIAL RELAY	○	POWER FACTOR METER
○	TRIP CIRCUIT SUPERVISION RELAY	○	UNDER VOLTAGE RELAY
○	UNDER VOLTAGE RELAY	○	5
○	TRIP	○	6
○	SPRING CHECK RELAY	○	7
○	LINE DIFFERENTIAL RELAY	○	8
○	PROTECTION OVER CURRENT RELAY	○	9
○	PROTECT OVER FULT RELAY	○	10
○	LOCK OUT RELAY	○	11
○	THE SWITCH	○	12
○	ON LOCAL INDICATOR WITH CONTACTS	○	13
○	PROTECT RELAY SUPERVISOR	○	14
○	TRIP RELAY FOR BREAKER	○	15
○	TRIP RELAY FOR OIL	○	16
○	LOCK OUT RELAY/RESET - TRANSFORMER	○	17
○	BEHIND OVER CURRENT	○	18
○	BEHIND OVER CURRENT GROUND FAULT RELAY CONNECTED IN FEDERAL WAY	○	19
○	OVER VOLTAGE RELAY	○	20
○	DC SUPPLY FAILURE	○	21
○	UNDER VOLTAGE RELAY TO INHIBIT MOTOR FOR TRIP	○	22
○	OFF FAILURE	○	23

NOTE:-

1. COMMUNICATION PROTOCOL SHALL BE AS FOLLOWS:-  
 a. NUMERICAL RELAY (ICGR1850)  
 b. MULTIFUNCTION METER (MFM)-MODBUS RTU
2. FOLLOWING MINIMUM METERING SHALL BE PROVIDED ON MULTIFUNCTION METER :-  
 -3 PHASE CURRENT  
 -LINE VOLTAGES  
 -POWER FACTOR & FREQUENCY  
 -KW,KVAR,KVA,KWH, & KVARH  
 -HOUR RUN (ONLY FOR MOTOR FEEDER)
3. LAMP TEST PUSH BUTTON SHALL BE PROVIDED.
4. ALL RELAYS SHALL BE NUMERICAL TYPE UNLESS SPECIFICALLY MENTIONED IN SLD AND EXCEPT THE FOLLOWING:-  
 -FT FUSE FAILURE RELAYS(80)  
 -AC/DC SUPPLY SUPERVISION RELAY (80)  
 -TRANSFORMER LOCKOUT RELAY (88T)  
 -TRIP CIRCUIT SUPERVISION RELAY (95)  
 -ALL FEEDER  
 86 ELECTRICAL TRIP (HAND RESET)
5. SIGNALS/INDICATIONS TO/FROM 33kV ICQG ARE INDICATIVE, AND SHALL BE CONFIRMED DURING DETAIL ENG.
6. 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".

0	20.12.19	Issued for Tender	SS	RK/SS	SKB
REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
		CLIENT:- <b>TALCHER FERTILIZER LIMITED</b>	REV. 0	0	0
PROJECT:-		COAL BASED FERTILIZER PROJECT PERMANENT RAW WATER SYSTEM	SCALE: N.T.S.		
TITLE:-		TYPICAL SINGLE LINE DIAGRAM 33KV ICQG	DRG. NO.- PC150-7411B-0985A		
		प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा	PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA		

**3.3KV INDOOR SWITCHGEAR**  
LOCATION : SWITCHGEAR ROOM



**NOTE:-**

- TRIP CIRCUIT SUPERVISION RELAY SHALL BE PART OF NUMERICAL RELAY.
- COMMUNICATION PROTOCOL SHALL BE AS FOLLOWS:-  
a. NUMERICAL RELAY-IEC61850  
b. MULTIFUNCTION METER (MFM)-MODBUS RTU
- AUTO CHANGE OVER LOGIC BETWEEN INCOMERS AND BUS COUPLER SHALL BE DEVELOPED IN NUMERICAL RELAY
- TNC SWITCH SHALL BE ABLE TO CLOSE ONLY IN TEST POSITION FOR ALL MOTOR FEEDERS
- FOLLOWING MINIMUM METERING SHALL BE PROVIDED ON MULTIFUNCTION METER :-  
-3 PHASE CURRENT  
-LINE VOLTAGES  
-POWER FACTOR & FREQUENCY  
-KW, KVAR, KVA, KWH, & KVARH
- COMMON ALARM CIRCUIT FOR HOOTER & BUZZER SHALL BE PROVIDED IN BUS COUPLER.
- LAMP TEST PUSH BUTTON SHALL BE PROVIDED.
- ALL RELAYS SHALL BE NUMERICAL TYPE UNLESS SPECIFICALLY MENTIONED IN SLD AND EXCEPT THE FOLLOWING:-  
-PT FUSE FAILURE RELAY(80)  
-AC/DC SUPPLY SUPERVISION RELAY (80)  
-TRANSFORMER LOCKOUT RELAY (88T)  
-TRIP CIRCUIT SUPERVISION RELAY (95)  
-BUS BAR DIFFERENTIAL SUPERVISION RELAY (95B1 & 95B2)  
-86-1 FOR ELECTRICAL TRIP (HAND RESET)  
-86-2 FOR PROCESS TRIP (SELF RESET)  
-ALL FEEDER  
-86 ELECTRICAL TRIP (HAND RESET)  
-HOUR RUN (ONLY FOR MOTOR FEEDER)
- SIGNALS/INDICATIONS TO/FROM DCS SHOWN INN SLD ARE INDICATIVE, AND SHALL BE CONFIRMED DURING DETAIL ENG.
- 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'.
- THE PANEL SHOULD BE EXTENDIBLE ON BOTH SIDE IN FUTURE.
- AN ELECTRICAL INTERLOCK SHOULD BE PROVIDED IN THE BREAKERS A, B & C (2 INCOMERS & 1 BUS-COUPLER), SUCH THAT ANY TWO OF THEM CAN BE CLOSED AT A TIME.
- TRIP COIL CIRCUITS OF ALL CIRCUIT BREAKERS WILL BE PROVIDED WITH TRIP SUPERVISION RELAY TO SUPERVISE THE CIRCUIT IN BOTH OPEN AND CLOSE POSITION OF THE CIRCUIT BREAKER.
- SURGE SUPPRESSOR WILL BE PROVIDED FOR ALL OUTGOING FEEDERS.
- 3.3KV SWITCH GEAR PANEL WILL BE PROVIDED WITH ALARM ANNUNCIATION AND TRIP INDICATION ON THE RESPECTIVE MODULE. AUXILIARY RELAY WILL BE PROVIDED, IF REQUIRED FOR CONTACT MULTIPLICATION.
- IF ALL PROTECTION INDICATED ARE NOT COVERED ON A SINGLE RELAY, SEPARATE RELAYS MAY BE PROVIDED.
- TRANSDUCER SHALL BE PROVIDED AS UNDER.  
A) 3.3 KV I/C-A,V,POWER  
B) 3.3 KV MOTOR-A,POWER
- CAPACITOR BANK SHALL BE 2X250KVAR. VACUUM CONTACTORS SHALL BE PROVIDED FOR SWITCHING OF INDIVIDUAL CAPACITOR SUB-BANK THROUGH APFC RELAY. ALSO ALL PROTECTION OF CAPACITOR BANKS SHALL BE PROVIDED.
- HOUR RUN METER IN ALL MOTOR FEEDERS INCLUDING SPARE ONE.
- SEPARATE ANALOGUE TYPE VOLTMETERS WITH SELECTOR SWITCH AND ANALOGUE TYPE AMMETERS WITH SELECTOR SWITCH SHALL BE PROVIDED FOR INCOMERS.
- AMMETER (SIZE 48X48 MM) SHALL BE PROVIDED IN SPACE HEATER CIRCUIT OF BREAKER FED HV & MV MOTORS.

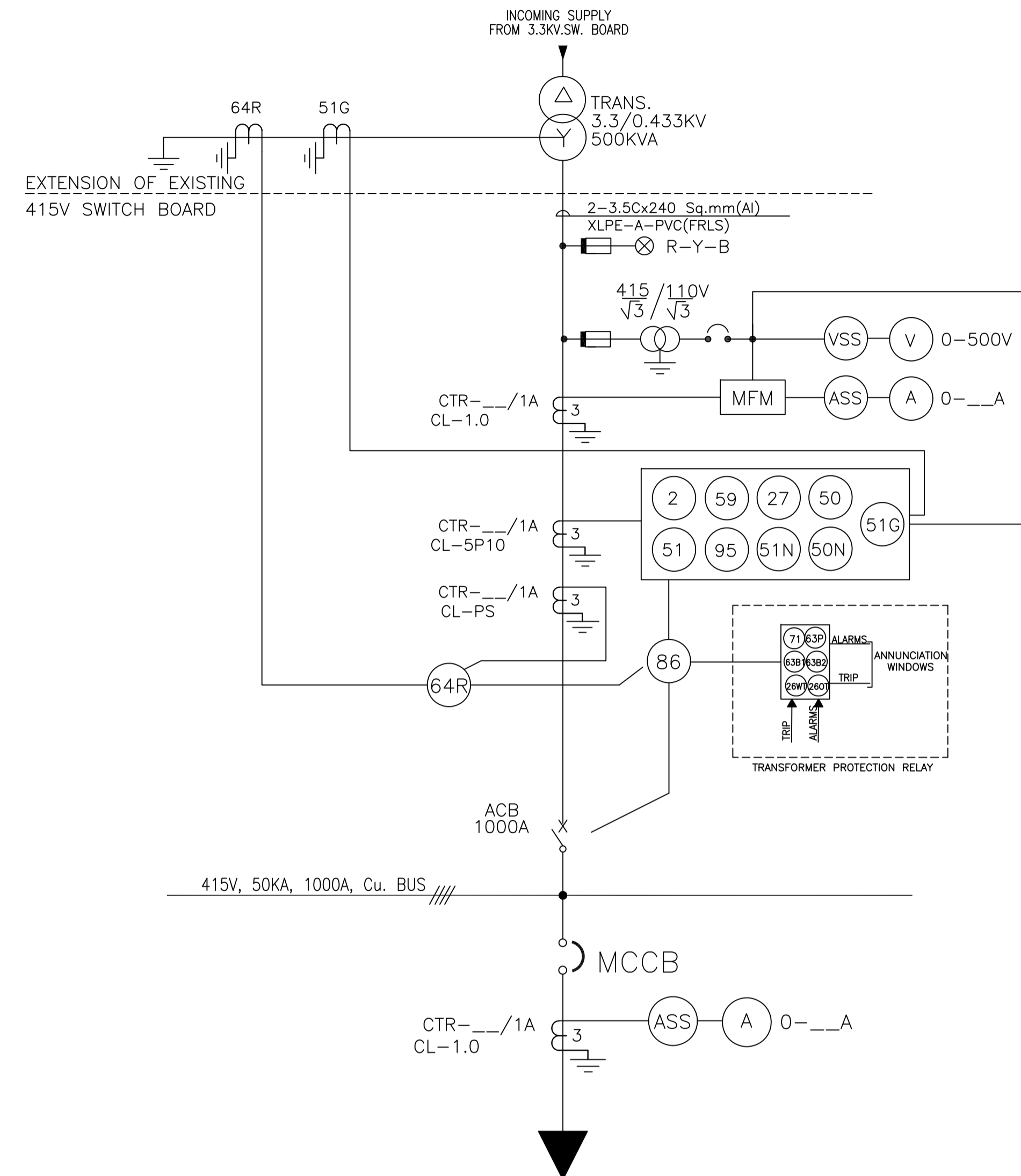
**LEGEND**

1		SURGE SUPPRESSOR	17		HAND RESET LOCKOUT RELAY
2		CURRENT TRANSFORMER NO.INDICATES NO.OF CORES	18		ANTI-PUMPING RELAY
3		CORE BALANCE CURRENT TRANSFORMER	19		TRIP CIRCUIT SUPERVISION RELAY
4		CIRCUIT BREAKER	20		DIFF.PROTECTION
5		TRANSFORMER	21		MOTOR PROTECTION RELAY
6		AMMETER/AM.SELECTOR SWITCH	22		VOLTMETER/AM.SELECTOR SWITCH
7		MULTI FUNCTION METER	23		INDICATING LAMP BREAKER ON
8		LOCAL REMOTE SWITCH	24		INDICATING LAMP BREAKER OFF
9		BREAKER CONTROL SWITCH	25		INDICATING LAMP AUTO/TRIP, E/F
10		HRC FUSES	26		INDICATING LAMP TRIP CKT HELTHY
11		TIMER	27		INDICATING LAMP SPRING CHARGE
12		UNDER VOLTAGE RELAY	28		INDICATING LAMP VCB SERVICE POSITION
13		NO VOLTAGE RELAY	29		INDICATING LAMP DC FAIL
14		AC INST.O.C./E.F. RELAY	30		LAMP TEST PUSH BUTTON
15		IDMT O.C./E.F. RELAY	31		SPACE HEATER ON/OFF SWITCH
16		INSTANTENIOUS EARTH FAULT	32		DC FAIL RELAY
			33		OVER VOLTAGE
			34		NEUTRAL DISPLACEMENT RELAY

1	04.03.20	ISSUED FOR TENDER	SS	RK/SS	SKB
0	14.01.20	ISSUED FOR TENDER	SS	RK/SS	SKB
REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
		CLIENT:-	REV. 1		
		TALCHER FERTILIZER LIMITED	SHEET 1 OF 1		
PROJECT:-		COAL BASED FERTILIZER PROJECT	SCALE: N.T.S.		
		PERMANENT RAW WATER SYSTEM	DRG. NO.-		
TITLE:-		TYPICAL SINGLE LINE DIAGRAM 3.3KV SWITCH BOARD	PC150-7411B-0985A		
			FILE:		

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LEGEND	
	PHASE SEQUENCE VOLTAGE RELAY
	INST. OVER CURRENT RELAY
	INST. EARTH FAULT RELAY
	DFPT OVER CURRENT RELAY
	DFPT EARTH FAULT RELAY
	LOCK OUT RELAY
	TRIP CIRCUIT SUPERVISION RELAY
	MULTI FUNCTION METER
	AMMETER
	VOLTMETER
	AMMETER SELECTOR SWITCH
	VOLTMETER SELECTOR SWITCH
	AIR CIRCUIT BREAKER
	MCCB
	TWO WINDING TRANSFORMER
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER
	INDICATION LAMP





S.NO	DESCRIPTION	RATING (KW/A)
01	POWER FEEDER FOR EOT-1	-/63A
02	POWER FEEDER FOR BATTERY CHARGER-1	-/63A
03	POWER FEEDER FOR BATTERY CHARGER-2	-/63A
04	FOR 33KV ICOG PANEL	-/32A
05	FOR 3.3KV ISWITCH BOARD	-/32A
06	FOR OLTC	-/63A
07	FOR OLTC	-/63A
08	FOR LSDB-1	-/63A
09	FOR LSDB-2	-/63A
10	FOR PDB-1	-/63A
11	FOR WELDING SOCKET	-/63A
12	FOR WELDING SOCKET	-/63A
13	FOR MARSHALLING BOX	-/32A
14	FOR MARSHALLING BOX	-/32A
15	FOR MARSHALLING BOX	-/32A
16	FOR UPS	-/63A
17	FOR UPS	-/63A
18	FOR UPS	-/63A
19	SPARE POWER FEEDER	-/63A
20	SPARE POWER FEEDER	-/63A
21	SPARE POWER FEEDER	-/63A
22	SPARE POWER FEEDER	-/125A

**GENERAL NOTES:**



- EQUIPMENT RATINGS / NOS. OF FEEDERS ARE TENTATIVE WHICH SHALL BE CONFIRMED LATER
- INTER TRIPPING OF PRIMARY & SECONDARY CIRCUIT BREAKER OF TRANSFORMER SHALL BE PROVIDED FOR ALL FAULTS THROUGH LOCKOUT RELAY.
- ALL CB & BUS BAR AMPERE RATING IS "IN PANEL" RATING. NOMINAL RATING SHALL BE SELECTED ACCORDINGLY.
- ALL PROTECTIVE RELAY OF BREAKER CONTROLLED FEEDERS WILL BE MICROPROCESSOR BASED WITH IEC 61850 PROTOCOL HAVING SERIAL COMMUNICATION FACILITY.
- SWITCHGEAR SHALL HAVE FACILITY FOR FUTURE EXTENSION ON BOTH ENDS.
- WELDING SOCKET FEEDER AND OUTGOING FEEDERS OF ABOVE 100A. SHALL HAVE EARTH FAULT PROTECTION WITH CBCT. AND DIGITAL E/F RELAY WITH DISPLAY.

1	04.03.20	ISSUED FOR TENDER	SS	RK/SS	SKB
0	14.01.20	ISSUED FOR TENDER	SS	RK/SS	SKB
REV.	DATE	DESCRIPTION	PPD.	CKD.	APPD.
		CLIENT:- TALCHER FERTILIZER LIMITED	REV.	1	
			SHEET 1 OF 1		
			SCALE: N.T.S.		
PROJECT:-		COAL BASED FERTILIZER PROJECT PERMANENT RAW WATER SYSTEM	DRG. NO.- PC150-7411B-0985C		
TITLE:-		TYPICAL SINGLE LINE EXT. OF EXISTING 415V SW. BOARD	FILE:		
			प्रोजेक्ट्स एंड डेवलपमेंट इंडिया लिमिटेड नोएडा PROJECTS & DEVELOPMENT INDIA LTD.-NOIDA		

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## TECHNICAL SPECIFICATION



### POWER TRANSFORMERS

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - POWER TRANSFORMERS (PC150-TS-0801)</b>	PC150/E/121/SecVI-4.0	0	
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8.0	PAINTING
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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 Technical Specification – Electrical System.

## 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 Technical Specification – Electrical System.

### 3.2 System Details

These shall be as indicated in Technical Specification – Electrical System.

## 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 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.
- 4.4 The transformer shall be designed to be loaded as per IS 6600.
- 4.5 The transformer shall be so designed as to operate in parallel satisfactorily with similar transformers.

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## 5.0 GENERAL DESIGN FEATURES

5.1 The design of the transformers shall be in accordance with the latest practice.

### 5.2 Rated Voltage, Frequency and Phase Connection

These shall be as indicated in Technical Specification – Electrical System.

5.3 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.

### 5.4 Tap Changing Gear

5.4.1 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.

5.4.2 The range of tap changer shall be as indicated and arranged in steps of 2.5%.

5.4.3 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.

5.4.4 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 guaranteed.



#### 5.4.5 ON-LOAD TAP-CHANGING MECHANISM (O.L.T.C.)

5.4.5.1 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 guaranteed. 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.



5.4.5.2 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.

5.4.5.3 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.

5.4.5.4 The local electrical control switches shall be mounted in the out door cubicle.

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- 5.4.5.5 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.
- 5.4.5.6 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.
- 5.4.5.7 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.
- 5.4.5.8 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.
- 5.4.5.9 A five-digit counter shall be fitted to the tap changing mechanism to indicate the number of operations completed by the equipment.
- 5.4.5.10 A permanently legible lubrication chart shall be fitted within the driving mechanism chamber.
- 5.4.5.11 The ON-LOAD Tap Changer shall include the following :-
- 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.
  - Motor driven mechanism.
  - Control and Protection devices.
  - Local and remote tap-changer position indicator.
  - Manual operating device.
- 5.4.5.12 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.
- 5.4.5.13 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.
- 5.4.5.14 The tap changer shall be capable of permitting parallel operation with other transformers for which necessary wiring and accessories, if any, shall be provided.

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5.4.5.15 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.

5.4.5.16 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.

5.4.5.17 Necessary interlock, blocking independent control when the units are in parallel, shall be provided.

5.4.5.18 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.

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5.4.5.19 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.

5.4.5.20 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.
- 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.

5.4.5.21 The OLTC shall be provided on the conservator side of the Power Transformer and not in front of H.V. Bushings.



5.4.5.22 OLTC shall be suitable for bi-directional power flow.

## 5.5 Impedance Voltage

The impedance voltage of the transformer at 75°C shall be as per relevant IS / IEC. This shall be guaranteed within limits specified in relevant IS / IEC at principal tap position.

## 5.6 Losses

The losses under the full load condition, at the rated voltage and frequency shall be indicated by the vendor at 75°C. These shall be guaranteed within the tolerable limits specified in IS: 2026 at principal tap position. The purchaser has the right to impose

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penalty charges or reject the transformer in case of any difference in the test and guaranteed values.

#### 5.7 **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.

#### 5.8 **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.

#### 5.9 **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.

5.10 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.

5.11 The short circuit test results for similar transformers shall be furnished.

5.12 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. Due attention shall be given in the design for the suppression of harmonics.

5.13

#### 5.14 **Cooling System**



5.14.1 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.

5.14.2 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..

5.14.3 Transformer shall have multiple cooling units with standby cooling units.



5.14.4 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.

5.14.5 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 when all oil pumps are simultaneously put into service. The pumps shall

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be so designed that on failure of power supply to the pump motor, the pump impeller will not limit the natural circulation of oil.

- 5.14.6 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.
- 5.14.7 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.
- 5.14.8 The coolers and theirs accessories shall be hot dip galvanized or corrosive resistant painted.
- 5.14.9 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.
- 5.14.10 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.
- 5.14.11 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.
- 5.14.12 Means shall be provided for pad locking of valves in the open and closed position.
- 5.14.13 Every valve shall be provided with indicator to show clearly the position of the valve whether open or closed.
- 5.14.14 All valves shall be provided with flanges having machined faces.
- 5.14.15 The drilling of valve flanges shall comply with the requirements of IS:3639.
- 5.14.16 **CONTROL OF COOLER OPERATION**
- 5.3.15.1 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.
- 5.3.15.2 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.
- 5.3.15.3 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.

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- 5.3.15.4 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.
- 5.3.15.5 All contacts and other parts which may require renewal, adjustment or inspection shall be readily accessible.
- 5.3.15.6 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.
- 5.3.15.7 Alarm indication for failure of group of fans and oil pump shall be provided.
- 5.3.15.8 Alarm indication shall be provided to indicate failure of power supply.
- 5.3.15.9 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.
- 6.1.2 The temperature of the core shall not exceed that permitted in IS.



### 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
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.



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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 Means for lifting and jacking of the transformer shall be provided.

### 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 The winding assembly shall be dried and impregnated in the vacuum with tested insulating oil. The insulation resistance and polarization index of the winding measured after impregnation shall be furnished in the test certificate.

6.3.3 For transformers rated 20 MVA and above vapour phase drying shall be adopted.

6.3.4 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.

### 6.4 Insulation Materials

6.4.1 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.



6.4.2 The mineral oil shall comply with IS: 335. 10% extra oil shall be supplied along with the transformer in non-returnable drums.

6.4.3 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.

### 6.5 Bushing



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.

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.

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## 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.
- 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 **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.
- 7.10 **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.
- 7.11 **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.
- 7.12 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.

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### 7.13 **Marshalling Box**

- 7.13.1 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.
- 7.13.2 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.
- 7.13.3 Suitable heavy duty double compression type rolled Aluminium cable glands for all incoming and outgoing cables shall be provided..

### 7.14 **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.

### 7.15 **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.



- 7.16 **All** bought out items shall be of reputed make to be approved by Consultant/ Purchaser.

## 8.0 **NITROGEN INJECTION FIRE PREVENTION AND EXTINGUISHING SYSTEM**

- 8.1 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.

- 8.2 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.
- 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 1410C 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.

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- 8.3 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.

#### 8.4 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.



##### 8.4.1 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.

8.4.2 Manual Mode (Local/Remote) : Tripping of all connected breakers is a pre-requisite for initiation of system activation.

8.4.3 Manual Mode (Mechanical) : Tripping of all connected breakers is a pre-requisite for initiation of system activation.

#### 8.5 General Description of NIFPES

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#### 8.5.1 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.

#### 8.5.2 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 from conservator tank, thus isolating it & preventing aggravation of fire.

#### 8.5.3 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.

#### 8.5.4 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.

#### 8.6 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\*

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- Oil drain valve closed\*
- Gas inlet valve closed\*
- PNRV closed^
- Fire Detector Trip^
- Buchholz Relay Trip^
- Oil drain valve open^
- Extinction in pressure^
- Cylinder pressure low^
- Differential relay trip^
- PRV/RPRR trip^
- Transformer trip^
- 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.

#### 8.7 **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.



#### 8.8 **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).

#### 8.9 **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.

#### 8.10 **Cables**

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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.

#### 8.11 Pipes

Pipes, complete with connections, flanges, bends, tees etc. shall be supplied alongwith the system.



#### 8.12 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.

#### 8.13 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.

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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..

8.14

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.

8.15

In general, following Fire Extinguishing 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

Fire extinguishing cubicle for lighting 230VAC

8.16

The following information in detail shall be provided :

- The maintenance and testing schedule for NIFPES.
- All the steps required to be undertaken for restarting the transformer and connected equipment after operation and mal-operation (if any) of the NIFPES.
- The process of venting nitrogen in case nitrogen pressure in the cylinder exceeds the stipulated maximum value.

9.0

## PAINTING

9.1

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.

9.2

All steel surfaces in contact with insulating oil shall be painted with heat resistant oil insoluble insulating varnish.



9.3

All steel surfaces exposed to outside shall be painted with suitable anti-rust and anticorrosive paints. Epoxy paints shall be used.

9.4

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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9.5 Unless otherwise specified, the finishing shade shall be light grey Shade No. 631 as per IS 5.

9.6 1 litre of paint per transformer shall be supplied for touch up at Site.

#### 10.0 TESTS AND INSPECTION

10.1 All transformers shall be routine tested as per IS 2026. Transformer oil shall be tested as per IS 335.

10.2 Additional tests, wherever specified, shall be carried out on one transformer of each rating.

10.3 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.

10.4 These inspections shall, however, not absolve the Vendor from their responsibility for making good any defect which may be noticed subsequently.

#### 11.0 DRAWINGS AND DOCUMENTS

11.1 The drawings and documents as per Annexure-III shall be furnished, unless otherwise specified.

11.2 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

11.3 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. Bushing shall be wrapped in straw ropes or similar material and complete transformer shall be packed in wooden crates.

11.4 The packing box shall contain a copy of the installation, operation and maintenance manual.

11.5 All loose pieces shall be separately wrapped in moisture resistant paper and marked with identification mark of the corresponding transformer.



#### 12.0 SPARES

12.1 Spares for operation and maintenance



Item wise unit prices of spare parts shall be quoted.

12.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - POWER TRANSFORMERS (PC150-TS-0801)</b>	PC150/E/121/SecVI-4.0	0	
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- 12.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.
- 12.4 All spare parts shall be identical to the parts used in the equipment.
- 13.0 **PACKING**
- 13.1 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.
- 13.2 The packing box shall contain a copy of the installation, operation and maintenance manual.
- 13.3 All loose pieces shall be separately wrapped in moisture resistant paper and marked with identification mark of the corresponding transformer.
- 14.0 **DEVIATIONS**
- 14.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES TALCHER FERTILIZERS LIMITED TECHNICAL SPECIFICATION - POWER TRANSFORMERS (PC150-TS-0801)</b>	PC150/E/121/SecVI-4.0	0	
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## 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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - POWER TRANSFORMERS (PC150-TS-0801)</b>	PC150/E/121/SecVI-4.0	0	
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**. ANNEXURE - II**



**DOCUMENTATION FOR POWER 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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - NEUTRAL EARTHING RESISTORS (PC150-TS-0802)</b>	PC150/E/121/SecVI-4.0	0	
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## TECHNICAL SPECIFICATION

### NEUTRAL EARTHING RESISTOR

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - NEUTRAL EARTHING RESISTORS (PC150-TS-0802)</b>	PC150/E/121/SecVI-4.0	0	
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	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - NEUTRAL EARTHING RESISTORS (PC150-TS-0802)</b>	PC150/E/121/SecVI-4.0	0	
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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 Neutral Earthing Resistor for earthing the neutral of power transformers / generators for limiting the line to ground fault current.
- 1.2 This standard shall be read in conjunction with the relevant part of Technical Specification – Electrical System.

## 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 3043, 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 the provisions of 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 Technical Specification – Electrical System.

### 3.2 System Details

These shall be as indicated in Technical Specification – Electrical System.



## 4.0 OPERATING REQUIREMENTS

- 4.1 The neutral earthing resistor shall be suitable for carrying the rated current for duration of 30 seconds under the specified ambient conditions and voltage and frequency variations without the temperature exceeding 350°C.
- 4.2 The resistor shall be designed to carry continuously 20% of the rated short time current without any harmful effect.
- 4.3 The housing shall be sized such that temperature rise of the metal parts through which current is not required to pass, when rated current is passed for the specified period, shall not exceed 40°C.

## 5.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

### 5.1 Resistors

- 5.1.1 The resistance bank shall be of heavy duty non-inductive type having high specific resistance and low temperature co-efficient.

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- 5.1.2 The resistor elements shall be made of joint-less, non-corroding, sturdy and oxidation resistant AISI 304 / AISI 406 stainless steel of punched / formed construction.
- 5.1.3 The contact between elements shall be made by individually bolting the terminals of two adjacent elements and connecting them in series, parallel or combination of both to achieve the specified resistance. The interconnecting link shall be zinc plated copper of uniform cross section throughout.
- 5.1.4 The resistance grid shall be properly supported so that damage due to vibration and thermal or mechanical stresses is avoided.
- 5.1.5 Porcelain / Epoxy insulators rated for the highest system voltage shall be used to insulate the resistor elements from the body of the housing.
- 5.1.6 Insulation level for resistor bank shall be as follows:

Highest system voltage	Power frequency withstand voltage	Impulse withstand Voltage
Up to 3.6 KV peak	10 KV RMS	40 KV
7.2 KV peak	20 KV RMS	60 KV

## 5.2 Metal clad housing

- 5.2.1 The housing shall be fabricated out of 3 mm thick sheet steel fitted on a 6 mm thick mild steel frame work. This shall be floor mounting type and rectangular in shape.
- 5.2.2 It shall be suitable for outdoor installation and shall have minimum degree of protection IP: 43 as per IS 2147. Ventilating louvers, if provided, shall be covered by fine wire mesh from inside and shall be such that the above degree of protection for the enclosure is not altered. Top cover of the housing shall be slopping construction to prevent accumulation of water.
- 5.2.3 All external hardware below 8 mm size shall be of stainless steel and those of higher size of mild steel cadmium plated or zinc passivated.



## 5.3 Isolation Arrangement

- 5.3.1 An isolator shall be provided on the incoming side to isolate the resistors from the main equipment.
- 5.3.2 The isolating switch shall be single pole knife type having a rating of 1.5 times the rated current of the resistor. The switch shall have four sets of potential free auxiliary contacts, 2 NO and 2 NC for remote indication, wired to a terminal block. An external handle, suitably insulated and lockable both in the ON and OFF positions, shall be provided for the switch. The handle shall preferably be mounted at a height of 1.5 meters from the base of the housing.

## 5.4 Current Transformers

Epoxy moulded current transformer of accuracy 5P for stand by earth fault protection and PS for restricted earth fault protection shall be provided, as per requirement. The CT connections shall be brought to separate terminal box with shorting arrangement.



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## 5.5 Terminal Arrangement

- 5.5.1 For incoming connection, either bushing or cable box arrangement shall be provided. In case of bushing connection, the bushing shall be provided on top of the housing. In case of cable box connection, the same shall be mounted on the side of the housing.
- 5.5.2 For the outgoing connection, cable box arrangement is to be considered in all cases. The cable box shall be mounted on the side of the housing.
- 5.5.3 Heavy duty double compression type rolled aluminium cable glands shall be provided for all the incoming and outgoing cables.
- 5.5.4 The equipment terminals shall be anti loosening type and complete with tinned copper cable lugs suitable for cables of specified size. For bushing connections, suitable tinned copper conductor shall be provided as per conductor size specified.

## 6.0 ACCESSORIES

- 6.1 The equipment shall be complete with cable glands, cable lugs, drain plug, lifting hook, name plate, foundation bolts and all other accessories required to make the equipment complete in all respects.



### 6.2 Name Plate

- 6.2.1 Name plate shall be of stainless steel with letters embossed on them.
- 6.2.2 The name plate shall contain all the required details and shall include at least the following:
- i) Make
  - ii) Description of code no. of equipment
  - iii) Short time rating
    - a) Current
    - b) Duration
  - iv) Rated voltage
  - v) Maximum temperature rise over ambient
  - vi) Total resistance at ambient temp.
  - vii) Materials of resistors
  - viii) Degree of protection of enclosure

## 7.0 PAINTING

- 7.1 The enclosure, after suitable pre-treatment shall be painted with two coats of antirust paint followed by two coats of anti-corrosive paints.
- 7.2 Epoxy based paints shall be used.
- 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 The finishing paint shall be light grey shade no. 631 as per IS 5.

## 8.0 TESTS AND INSPECTION

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - NEUTRAL EARTHING RESISTORS (PC150-TS-0802)</b>	PC150/E/121/SecVI-4.0	0	
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8.1 Following tests shall be carried out on the neutral earthing resistors:

8.1.1 Routine Tests

- i) Resistance value measurement at room temperature.
- ii) Power frequency high voltage test for one minute.
- iii) Insulation resistance test.

8.1.2 Type test

- i) Heat run test.

8.2 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.

8.3 The purchaser's inspection shall, however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.

## 9.0 DRAWINGS AND DOCUMENTS

9.1 The drawings and documents as per Annexure-I shall be furnished unless otherwise specified.

9.2 All drawings and documents shall have following descriptions written boldly.

- Name of the client
- Name of consultant
- Enquiry / order number with plant / project name
- Equipment code no. and Description.

## 10.0 SPARES

10.1 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

10.2 Commissioning Spares



Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

10.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

10.4 All spare parts shall be identical to the parts used in the equipment.

## 11.0 PACKING

11.1 The neutral earthing resistor shall be properly packed to safeguard against weather conditions and handling. It shall be wrapped in polythene bag with an additional wrapping of bitumen paper to make it completely waterproof before the equipment is packed in wooden crates.



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11.2 A sign to indicate the upright position of the panel for placing during transport and storage shall be clearly marked.

11.3 Packing box shall include one copy of the installation operation and maintenance manual

**12.0 DEVIATIONS**

12.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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## ANNEXURE - I



### DOCUMENTATION FOR NEUTRAL EARTHING RESISTORS

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	N	Y	Y
4.	Illustrative and descriptive catalogues	N	N	Y
5.	Installation, Operation and maintenance manual	N	N	Y
6.	Test Certificates	N	N	Y
7.	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

### 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

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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.



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### 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.

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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.

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- 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.

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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.

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- 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.

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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.

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.

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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.

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## 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.



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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

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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 :
- 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**

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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.
- 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

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- Enquiry / Order Number with Project / Plant Name
- Code No. & Description

### 11.0 SPARES

11.1 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

11.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

11.4 All spare parts shall be identical to the parts used in the switch boards.

### 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.

### 13.0 DEVIATIONS

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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### ANNEXURE - I


#### DOCUMENTATION FOR MEDIUM VOLTAGE SWITCHBOARDS

Sl.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:**



- 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

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## TECHNICAL SPECIFICATION

### HIGH 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 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.





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## 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, 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



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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.
  - 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

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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

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 panels, shall be so protected that failure of a circuit in one panels 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.

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## 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 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.

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## 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

### 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

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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 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.

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### 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 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

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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.

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.



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### 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.
- 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 Spares for operation and maintenance  
Item wise unit prices of spare parts shall be quoted.
- 11.2 Commissioning Spares  
Commissioning Spares, as required, shall be supplied with the main equipment. Item

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wise list of recommended commissioning spares shall be furnished for approval.

11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

11.4 All spare parts shall be identical to the parts used in the equipments.

## 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.

## 13.0 DEVIATIONS

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.



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**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:**

- 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

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## TECHNICAL SPECIFICATION

### SHEET STEEL DISTRIBUTION BOARDS

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ANNEXURE - I	DOCUMENTATION FOR 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.



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- 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 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**

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- 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 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.



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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.

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

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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.
- 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.

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- 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.
- 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 resetable 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.

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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.

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.

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**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.

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 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

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11.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

11.4 All spare parts shall be identical to the parts used in the equipments.

**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.

**13.0 DEVIATIONS**

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - SHEET STEEL DISTRIBUTION BOARDS (PC150-TS-0805)</b>	PC150/E/121/SecVI-4.0	0	
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### 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

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## TECHNICAL SPECIFICATION



### LIGHTING SUB DISTRIBUTION BOARDS



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	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - LIGHTING SUB DISTRIBUTION BOARDS (PC150-TS-0806)</b>	PC150/E/121/SecVI-4.0	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-54 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)**
- 7.2.1 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 CCurve Type.
- 7.2.2 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,

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armoured and PVC sheathed 1.1 KV grade incoming and outgoing cables shall be provided.

## 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 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 Spares for operation and maintenance  
Item wise unit prices of spare parts shall be quoted.
- 11.2 Commissioning Spares  
Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.
- 11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.
- 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.

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12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

**13.0 DEVIATIONS**

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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### ANNEXURE - I



#### DOCUMENTATION FOR LIGHTING SUB DISTRIBUTION BOARDS

SL.N O.	Description	Documents Required (Y / N)		
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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>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - INDUCTION MOTOR (PC150-TS-0807)</b>	PC150/E/121/SecVI-4.0	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.
- 4.1.3 Vertical motors for outdoor installation shall be provided with a rain protective hood.

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- 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.
- 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.

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- 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 must be guaranteed to ensure a smooth operation and a life not shorter than 30,000 hrs.
- 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 guaranteed life of the bearings shall not be less than 20,000 hours.

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- 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.
- 4.9.9 Separate terminal boxes shall be provided for connection of power, control and space heater cables.

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- 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 500% of FLC.
- 5.1.4 The motors shall be suitable for the following starting cycle:
- With the motor at ambient temperature - 2 successive starts and 3rd start after 5 minutes.
  - 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**

- 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.

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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  $\pm 6\%$  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.

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.

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## 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

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.

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#### 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.
- 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.



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## 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 Spares for operation and maintenance  
Item wise unit prices of spare parts shall be quoted.
- 14.2 Commissioning Spares  
Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.
- 14.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.
- 14.4 All spare parts shall be identical to the parts used in the motors.

## 15.0 DEVIATIONS

- 15.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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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:**

- 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



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## TECHNICAL SPECIFICATION INTERLOCKING SWITCH SOCKET AND PLUG

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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.

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- 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 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.

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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.

### 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.

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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 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.

## 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 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

12.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.





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12.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

12.4 All spare parts shall be identical to the parts used in the equipment.

### 13.0 DEVIATIONS

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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### 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:**



- 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

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## TECHNICAL SPECIFICATION

### BATTERY CHARGER

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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 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

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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.
- 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

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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.
- 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**

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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.

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.



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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.

#### 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

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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

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Abnormal	Flashing	ON
Acknowledge	Steady ON	OFF
Return to normal	OFF	OFF
Test	Steady ON	ON

## 7.0 ACCESSORIES

7.1 The supply shall include the following accessories:

### 7.1.1 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.

### 7.1.2 Name Plates

7.1.2.1 The board shall have a large name plate on the top to indicate its name and designation.

7.1.2.2 Each cubicle shall be provided with a name plate.

7.1.2.3 All control switches, push buttons, lamps etc. shall have function identification labels.

7.1.2.4 Name plate shall be of black perspex with white engraving of minimum 3 mm thickness.

### 7.1.3 Fuse Puller

7.2 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.

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.

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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 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

11.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

11.4 All spare parts shall be identical to the parts used in the equipments.

## 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.

## 13.0 DEVIATIONS



13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - BATTERY CHARGER</b> <b>(PC150-TS-0810)</b>	PC150/E/121/SecVI-4.0	0	
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### 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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - BATTERY CHARGER</b> <b>(PC150-TS-0810)</b>	PC150/E/121/SecVI-4.0	0	
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Sl. No.	Description	To be mounted on		
		Float cum Load Charger	Standby Float cum Load Charger	Boost Charger
1	2	3	4	5
4.	<b>Common Items</b> i) Droper Diodes ii) Solid State facia annunciator for : -- Automatic changeover from one charger to another -- Rectifier fuse failure in float/standby float/boost -- Incoming supply failure float/standby float/boost -- DC output under voltage -- Earth fault -- Single phasing and phase reversal -- Filter fuse failure float/standby float/boost iii) Battery isolating switch and HRC fuses iv) Battery under voltage relay v) Battery earth fault relay vi) DC Contactor	Yes  Yes	Yes	Yes          Yes Yes Yes Yes

**NOTE:** Any other components as required for satisfactory operation of the battery charger shall be provided.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - BATTERY CHARGER</b> <b>(PC150-TS-0810)</b>	PC150/E/121/SecVI-4.0	0	
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## 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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION – BATTERY (PC150-TS-0811)</b>	PC150/E/121/SecVI-4.0	0	
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## TECHNICAL SPECIFICATION



### BATTERY



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION – BATTERY (PC150-TS-0811)</b>	PC150/E/121/SecVI-4.0	0	
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3.0	SERVICE CONDITIONS
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6.0	ACCESSORIES
7.0	TESTS AND INSPECTION
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10.0	PACKING
11.0	DEVIATIONS
ANNEXURE - I	DOCUMENTATION FOR BATTERY

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION – BATTERY (PC150-TS-0811)</b>	PC150/E/121/SecVI-4.0	0	
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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 lead acid plante type and rated for 220V. Each battery bank shall consist of 110 number of cells.
- 5.2 Each cell shall be contained in a closed top container preferably transparent and unbreakable and shall incorporate positive plates, negative plates and separators of adequate dimensions. Lead acid battery shall be of plante plate type (positive plate).

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- 5.3 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.
- 5.4 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:-

- |     |        |    |   |
|-----|--------|----|---|
| (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.

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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

## 9.0 SPARES

Item wise unit prices of spare parts shall be quoted.



9.1 Any other spare parts required, but not specified, shall also be quoted.

## 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.

## 11.0 DEVIATIONS

11.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION – BATTERY (PC150-TS-0811)</b>	PC150/E/121/SecVI-4.0	0	
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## 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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - CABLES (PC150-TS-0812)</b>	PC150/E/121/SecVI-4.0	0	
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## TECHNICAL SPECIFICATION

### CABLES

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - CABLES (PC150-TS-0812)</b>	PC150/E/121/SecVI-4.0	0	
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6.0	SPECIAL PURPOSE CABLES
7.0	CABLE DRUM
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ANNEXURE - I	DOCUMENTATION FOR CABLES

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - CABLES (PC150-TS-0812)</b>	PC150/E/121/SecVI-4.0	0	
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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.



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## 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.

### 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.

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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 |
| - | 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:

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- 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

### 10.0 DEVIATIONS

10.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - CABLES (PC150-TS-0812)</b>	PC150/E/121/SecVI-4.0	0	
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**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>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - PREFABRICATED LADDER TYPE CABLE RACKS (PC150-TS-0813)</b>	PC150/E/121/SecVI-4.0	0	
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## TECHNICAL SPECIFICATION

### PREFABRICATED LADDER TYPE CABLE RACKS

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6.0	DRAWINGS AND DOCUMENTS
7.0	DEVIATIONS
ANNEXURE - I	DOCUMENTATION FOR PREFABRICATED LADDER TYPE CABLE RACKS

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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.

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- 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 along with 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.
- 3.12 Tolerances in various dimension shall be follows:
- |           |    |              |
|-----------|----|--------------|
| Length    | -- | $\pm 5$ mm   |
| Width     | -- | $\pm 2$ mm   |
| Height    | -- | $\pm 1$ mm   |
| Bend      | -- | $\pm 1$ mm   |
| Thickness | -- | $\pm 0.2$ mm |
- Positive tolerance on total quantity upto  $\pm 5\%$  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).



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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.

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

## 7.0 DEVIATIONS

7.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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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



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - LOCAL CONTROL STATION (PC150-TS-0814)</b>	PC150/E/121/SecVI-4.0	0	
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## TECHNICAL SPECIFICATION LOCAL CONTROL STATION

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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 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.

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- 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 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.

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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.

### 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:603947. The contact shall be rated to make, break and carry inductive

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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.

## 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.



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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 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

11.2 Commissioning Spares



Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

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.

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12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.

**13.0 DEVIATIONS**

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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### 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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - JUNCTION BOX (PC150-TS-0815)</b>	PC150/E/121/SecVI-4.0	0	
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## TECHNICAL SPECIFICATION

### JUNCTION BOX

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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.



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- 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 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.

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- 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.
- 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 Duly wired prototype samples for junction boxes shall be submitted for scrutiny as and when called for.
- 5.10 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.



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## 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 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

10.2 Commissioning Spares



Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

10.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

10.4 All spare parts shall be identical to the parts used in the equipment.

## 11.0 DEVIATIONS

11.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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## 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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ANNEXURE - I	DOCUMENTATION FOR 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.

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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.

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.



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- 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.
- 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:
- Disconnecting links shall be provided where necessary.
  - All cable lugs and terminals shall be numbered in a permanent form corresponding to the wiring diagram.
  - 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.

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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)

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.



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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 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.

5.6.3 The rating of the transformers shall be at least 2.5 times the continuous load.

#### 5.7 Junction Box

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Junction boxes shall be of cast aluminium construction and adequately sized to enable easy termination of cables.

## 5.8 Hand Lamps

5.8.1 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.

5.8.2 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.

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.

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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.



## 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.

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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 Spares for operation and maintenance  
Item wise unit prices of spare parts shall be quoted.

13.2 Commissioning Spares  
Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.



13.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

13.4 All spare parts shall be identical to the parts used in the equipments.

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#### 14.0 DEVIATIONS

- 14.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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#### 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:**

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

- i) 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

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - CAPACITOR BANK AND ASSOCIATED EQUIPMENT (PC150-TS-0817)</b>	PC150/E/121/SecVI-4.0	0	
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ANNEXURE - I	DOCUMENTATION FOR CAPACITOR BANK & ASSOCIATED EQUIPMENT



	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - CAPACITOR BANK AND ASSOCIATED EQUIPMENT (PC150-TS-0817)</b>	PC150/E/121/SecVI-4.0	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 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 60871	Shunt Capacitor for power system
IS:5553/IEC60289 / IEC60076-6/IEC 726	Series reactors
IEC60186 IEC:593/IS 12672	Voltage Transformers 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

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IS 8084	Interconnecting Bus bars for AC voltage above 1 kV up to and including 36 kV.
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.

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- 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 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 guaranteed. 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, capacity temperature 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.

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- 5.1.17 The bidder shall furnish calculation of voltage drop at rated capacitor unit per phase & losses of the reactor.
- 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.

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- xii) Marshalling box.
- xiii) Rating plate, wiring diagram plate & terminal marking plate.
- xiv) Lifting lugs.
- xv) Earthing terminals.
- 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.

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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.

- 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

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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**

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.

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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.

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



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- Name of consultant
- Enquiry / Order Number with plant / project name
- Code No. and Description

## 11.0 SPARES

### 11.1 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

### 11.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

### 11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

### 11.4 All spare parts shall be identical to the parts used in the equipments.

## 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.

## 13.0 DEVIATIONS

### 13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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### 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:**



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Y - Yes, N - No

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**TECHNICAL SPECIFICATION**

**CATHODIC PROTECTION POWER SUPPLY MODULE (CPPSM)**

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION - CATHODIC PROTECTION POWER SUPPLY MODULE (PC150-TS-0818)</b>	PC150/E/121/SecVI-4.0	0	
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## 1.0 SCOPE

This specification covers the requirements for the design, manufacture and testing of Cathodic Protection Power Supply Module (CPPSM) working on controlled switch mode principle intended to supply power to cathodic protection system

## 2.0 CODES AND STANDARDS

2.1 The system design, performance and materials to be supplied shall conform to the requirements of the latest revision of following standards:

IS: 1248 (Parts-I, 2, 8 & 9)	Direct acting indicating analogue electrical measuring instruments and accessories.
IS: 3700 (Parts-I to 11)	Essential rating and characteristics of semiconductor devices
IS: 3715 (Parts-I to 4)	Letter symbols for semiconductor devices
IS: 4411	Code of designation of semiconductor devices.
IS: 5469 (Parts-I to 4)	Code of practice for the use of semiconductor junction devices.
IS: 6619	Safety code for semiconductor rectifier equipment.
IS:7204 (Parts-I to 4)	Stabilised power supplies DC output.
IS: 12021 (Parts-I to 4)	Control transformers for switchgear and control gear for voltages not exceeding 1000 V AC.
IS: 13703 (Parts-I to 4)	Low voltage fuses for voltages not exceeding 1000 V AC or 1500 V DC.
IS/IEC:60947	Low voltage switchgear and control gear.

2.2 In case of imported equipment, standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian standards.



2.3 The equipment shall also conform to the provisions of Indian Electricity rules and other statutory regulations currently in force in the country.

2.4 In case of any contradiction between various referred standards/ specifications/ and statutory regulations the following order of priority shall govern:

- Statutory regulations.
- This specification.
- Codes and standards.

## 3.0 SITE CONDITION

The CPPSM shall be suitable for installation in non air-conditioned room with restricted ventilation or in outdoor kiosk in locations having generally corrosive, warm, humid and dusty atmosphere. Service conditions shall be as per actual site conditions. If not specifically mentioned therein, a design ambient temperature of 45°C and an altitude not exceeding 1000 m above mean sea level shall be considered.

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#### 4.0 GENERAL REQUIREMENTS

The offered equipment shall be brand new with state of art technology and proven field track record. No prototype equipment shall be offered.



- 4.1 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 15 years from the date of supply.
- 4.2 Vendor shall give a notice of at least one year to the end user of equipment and owner before phasing out the product / spares to enable the end user for placement of order for spares and services.

#### 5.0 TECHNICAL REQUIREMENTS



##### 5.1 Fabrication and General Details

CPPSM shall be housed in sheet steel enclosure. The front, rear walls and doors shall be made by using minimum 2 mm thick sheet steel and side walls shall be made of minimum 1.6 mm thick sheet steel. Wherever required, suitable stiffeners shall be provided. The Unit shall be freestanding type. Hinged doors "Shall be provided at the front and back as required. The unit shall be natural cooled type. Louvered openings with wire mesh for natural ventilation may be provided. Degree of protection for the panel shall be minimum IP-41. The CPPSM panel shall, preferably, not need rear access for operation, maintenance and shall be suitable for mounting flushed to the wall.

- 5.1.2 Suitable hooks shall be provided for lifting the panel. These hooks when removed shall not leave any hole in the panel or imperfection in the paint finish.
- 5.1.3 All instruments shall be panel mounted type and back connected. All fuses shall be provided inside the panel and shall be of link type. 660 V grade PVC insulated BIS approved wires with stranded copper conductor of size minimum 2.5 mm<sup>2</sup> shall be used for power and auxiliary wiring. Control wiring for electronic circuits shall be through flat ribbon cable or through copper wire of minimum 0.5 mm diameter. All wirings shall be ferruled with PVC ferrules at both ends for ease of identification. Clamp type terminals suitable for termination up to 10 mm" conductor shall be provided for all control cable connection. Suitable power terminals shall be provided for power cables. Minimum 20% spare terminals shall be provided. The terminal blocks shall be mounted minimum 300 mm above the gland plate.
- 5.1.4 All live parts shall be properly shrouded. This shall ensure complete safety to personnel intending routine maintenance by opening the panel doors.
- 5.1.5 CPPSM shall be suitable for bottom cable entry unless otherwise specified and shall be supplied complete with crimping type tinned copper lugs and cable glands. Cable glands shall be of rolled aluminium single compression type for indoor installations and double compression type for outdoor installations. The space in the terminal chamber shall be adequate for termination of required number and sizes of cables.
- 5.1.6 The CPPSM shall be field proven. The design, internal component layout and rating of component shall ensure high MTBF and low MTTR. Prototype equipment shall not be acceptable. Layout of panel components shall enable easy access to the components for maintenance.
- 5.1.7 All the control equipment like switches, push buttons, potentiometers etc. shall be located at a convenient height of minimum 300 mm and maximum 1800 mm from the bottom of the panel.

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- 5.1.8 The printed circuit boards (PCBs) shall be of copper clad glass epoxy laminate. PCB tracks shall be tinned and solder masked. The PCB shall be coated with suitable lacquer to make it immune to dust, moisture and fungal growth. Where plug in type of PCBs are used gold plated male-female connectors shall be used for the purpose.
- 5.1.9 If required the panel shall be provided with space heater to prevent moisture condensation. The space heaters shall be located at the bottom of the panel and shall be provided with a manually operated switch and HRC fuse. The space heater shall have porcelain-insulated connectors. Where space heater is not provided, the electronic PCBs/components and other control devices shall be made immune to moisture condensation.
- 5.1.10 Panel shall be provided with integral base frame channel. The integral base frame of panel shall be suitable for directly bolting with the help of foundation bolts and shall also be suitable for tack welding to purchaser's insert plate/flat/channel embedded in the floor. Amply dimensioned oblong holes shall be provided at the bottom of the panel for its bolting to the embedded insert plate/channel.
- 5.1.11 An earth bus bar of minimum (25 x 3) mm<sup>2</sup> copper or equivalent aluminium shall be provided throughout the length of the panel. Provision shall be made for connecting this earth bus at two ends with the plant earth grid by means of (40x5) mm" GI flat. All non-current carrying metallic parts of the panel and mounted equipment shall be connected to the panel earth bus. All doors and movable parts shall be connected to the earth bus by flexible copper cables.
- 5.1.12 All panel mounted equipments (e.g. lamps, push buttons, switches, meters, PCBs, etc.) shall be provided with suitable nameplates. Nameplates shall be engraved out of 3-ply (black-whiteblack) lamicooid sheets or anodised aluminium. Back-engraved perspex sheet nameplates may also be acceptable. Engraving shall be done with groove cutters. Hard paper or self-adhesive plastic tape nameplates shall not be acceptable. Nameplates shall be fastened by screws and not by adhesive. Labels shall be provided for every component on the cards, connecting wires as well as for the terminals in the terminal strip inside the panel.
- 5.1.13 Where specified, the CPPSM shall be housed in an outdoor kiosk. The kiosk shall be made of sheet steel of minimum 3 mm thick and epoxy painted on both internal and external surfaces. Hinged lockable doors shall be provided at the front and back. Acrylic transparent glass window shall be provided on the front door of the kiosk so that the meters, indications and positions of the control switches on the CPPSM can be seen without opening the door of the kiosk. The kiosk shall be suitable for outdoor mounting and shall give proper protection to the CPPSM against rain, other harsh weather conditions. Necessary ventilation arrangement with louvers and wire mesh shall be provided for proper operation of the CPPSM. The cable entry to the kiosk shall be from bottom through cable glands. Suitable canopy shall be provided on the top of the kiosk.
- 5.1.14 **Painting**
- All metal surfaces shall be thoroughly cleaned and degreased to remove mill scale, rust, grease and dirt.
- Fabricated structures shall be pickled and then rinsed to remove any trace of acid. The under surface shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc chromate primer. The undersurface shall be made free from all imperfections before undertaking the finishing coat.

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After preparation of the under surface, the panel shall be spray painted with two coats of final paint or shall be powder coated. Colour shade of final paint shall be approved by the purchaser before final painting is started. The finished panels shall be dried in stowing ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run off paint, etc.

All unpainted steel parts shall be cadmium plated or suitably treated to prevent corrosion. If these parts are moving elements, then they shall be greased.

## 6.0 EQUIPMENT DESCRIPTION

The CPPSM shall be complete with following main sections:

- Input controls.
- Power converter and filters.
- Output protections
- System controls
- Current interrupter
- Control, indication and metering



### 6.1 Input Controls

- 6.1.1 A moulded case circuit breaker with thermal over load and short circuit release (rated for the input power supply short circuit current) shall be provided at the input for power supply control.

### 6.2 Power Converter and Filters

- 6.2.1 The CPPSM shall convert and control the input DC power supply voltage/current into variable DC output voltage/current through switching power semiconductor devices (Thyristor/power transistor/power MOSFET, etc.). The variation in the output voltage/current shall be achieved through control of duty cycle of conduction of the switching power semiconductor devices. The current and voltage ratings of the power semiconductor devices shall be at least two times the maximum device current and min. two times the maximum voltage coming across it respectively. The voltage rating of the power semi-conductor devices shall be co-coordinated with the breakdown voltage of lightning arrestor provided at the output so that the power semiconductor devices are protected from any voltage surge coming from the pipeline. Shunt zeners / MOV shall be provided across the power semiconductor devices for protection. The power semiconductor devices shall have humidity/moisture resistant finish and mounted in sufficiently sized heat sink designed to provide adequate cooling under worst conditions of operation. The power semiconductor devices shall have adequate protection against high dv/dt and di/dt.
- 6.2.2 Where specified, the converter shall electrically isolate the input power to CPPSM from its output so that the grounding of the positive output of the CPPSM through anode ground bed shall not affect the grounding system of the input power supply. Alternatively, a separate DC to DC converter having electrical isolation between input and output power supply shall be provided at the input of the CPPSM.
- 6.2.3 The power semiconductor devices shall be protected by semiconductor fuses or the system shall have instantaneous short circuit-current limit feature to protect the devices against output short circuits. An adjustable output over current limit feature shall be provided.



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- 6.2.4 Filter shall be provided in the input power supply circuit to minimise the AC injected into the DC input power supply system.
- 6.2.5 Adequate filtering shall be provided on the DC output of the converter to limit the ripple content in the output to less than 5% at rated output.
- 6.2.6 The converter system shall be of natural air cooled type.
- 6.2.7 For CPPSMs with multiple output circuits, each output circuit shall have independent output converter and output filters.

### 6.3 **Output Protections**

Two pole moulded case circuit breaker or miniature circuit breaker rated for the DC output current, short circuit current and having thermal over load, short circuit release shall be provided in the output. A lightning arrestor rated for minimum 10KA impulse current discharge capacity and rated voltage & max. spark over voltage rating suitable to protect the CPPSM components against lightning and switching surges shall be provided at the output. For CPPSMs with multiple output circuits, each output circuit shall have independent protections.

### 6.4 **System Controls**

- 6.4.1 The CPPSM shall have two distinct modes of operation (independent for each output circuit) as below:

a) **Constant Voltage - Constant Current Mode (CVCC)**



In this mode the output voltage ( $V_{os}$ ) of CPPSM shall be continuously adjustable from 0.5V DC to the rated output voltage. Current limit feature shall be provided in this mode of operation. The current limit ( $I_{os}$ ) shall be continuously adjustable from zero to rated output current.

For constant voltage mode of operation the output current limit shall be set at maximum and output voltage setting shall be varied. Irrespective of output current demand the chosen value of the output voltage shall be maintained by the control system till the current limit is reached. After that the output current limit shall be maintained and output voltage shall decrease to keep the current constant.

For constant current mode of operation the output voltage shall be set at maximum and output current shall be varied through varying the setting of output current limit. Irrespective of output voltage requirement the control system shall maintain the output current to the set current limit value till the voltage limit is reached. After that the output voltage limit shall be maintained and output current shall decrease to keep the voltage constant.

b) **Auto PSP Mode**

In this mode of operation the output of the CPPSM shall operate in an external closed loop with pipe-to-soil potential (PSP) in feedback loop. The CPPSM control shall adjust the output voltage such that the PSP as measured by reference cell always remains equal to the set potential on the unit. The set potential ( $V_{ps}$ ) shall have high long time stability and minimum temperature drift. The set potential shall be continuously adjustable over the range as required. An adjustable over current limit shall be provided to limit the maximum output current.

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The unit shall be designed to operate with the number of reference cells connected to it (to be provided by others). In case of more than one reference cell being specified, CPPSM shall have feature to automatically select the reference cell having less negative potential than the others and use the same for auto control of the unit (e.g. (-) 0.8 V is less negative than (-) 0.9 V). Adequate hysteresis shall be provided in selecting the less negative potential reference cell, to avoid hunting between the reference cells at change over conditions.

In case of open circuit or short circuit of the reference cell or potential being less negative than a minimum set potential ( $V_{rs}$ ), for the controlling reference cell, the unit shall sense these conditions as reference cell failure and shall automatically switch over to the other healthy reference cell for control. Should fault occur in all the reference cells, the output voltage or current of the CPPSM shall adjust automatically to a preset value ( $V_{as}/I_{as}$ ), which shall be adjustable.

In both CVCC and auto PSP modes of operation the electronic over current limit shall be fast enough to protect the active devices of the unit and fast enough to act before tripping of MCCB/MCB or blowing of fuse.

6.4.2 The unit shall continuously monitor the PSP and necessary annunciation shall be provided in case of PSP either exceeding the specified maximum limit ( $V_{pm}$ ) or remaining lower than the specified minimum limit ( $V_{pn}$ ).

6.4.3 The output voltage regulation for no load to full load variation with input voltage variation from maximum to minimum shall not be more than 2.5 % of rated voltage throughout the range of output voltage and over the specified ambient temperature variation, in CVCC-constant voltage mode of operation. In auto PSP mode the closed loop PSP regulation for no load to full load variation with input voltage variation from maximum to minimum shall be within 20mV throughout the PSP setting range specified.

In CVCC- constant current mode of operation, the current regulation for minimum to maximum output voltage and minimum to maximum variation in input voltage shall not be more than 2.5% throughout the range of output current.

6.4.4 The output of the unit shall be ungrounded and shall allow grounding of positive terminal of the output through the anode ground bed.

6.4.5 For CPPSMs with multiple output circuits, each output circuit shall have independent control system.



## 6.5 Current Interrupter

6.5.1 If required a current interrupter for CPPSM output current interruption shall be provided.

6.5.2 The current interrupter shall have an output contactor with current rating minimum 125% of the output current rating of the CPPSM and a digital timer to operate it.



6.5.3 The timer shall have 'ON' and 'OFF' timings. When the timer is turned on the 'ON' timing shall start and shall close the output contactor till the end of the 'ON' timing. At the end of the 'ON' timing the 'OFF' timing shall start and keep the contactor open till the end of the 'OFF' timing. At the end of the 'OFF' timing the 'ON' timing shall start again. This process of 'ON' and 'OFF' timing shall continue.

6.5.4 The 'ON' and 'OFF' timings of the timer shall be settable by separate 2 digit thumbwheel switches, each settable from 1 to 99 seconds. The timing error of the timer shall be less

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than 5 parts per million. In case of microprocessor based system keypad with display may be provided in place of thumbwheel switches.

- 6.5.5 Whenever the timer is switched on it shall always start with ON 'timing'. A timer-reset push button shall be provided. On pressing this pushbutton during operation of the timer, the timer shall get reset and upon release of the button, the timer shall restart with 'ON' timing.
- 6.5.6 The power required for operation of the timer and contactor shall be derived from the main power supply to the CPPSM.
- 6.5.7 The following controls and indications shall be provided for current interrupter. The controls shall be housed in a lockable cover, so that normally they are not accessible. The indications shall be mounted on the door.
- a) Controls
- Timer power 'ON' / 'OFF'
  - Timer reset
  - Thumb wheel switch for 'ON' timing
  - Thumb wheel switch for 'OFF' timing
- In case of microprocessor based system, keypad with display may be provided in place of thumbwheel switches.
- b) Indications (LED)
- Timer power 'ON'
  - 'ON' timing
  - 'OFF' timing
- 6.5.8 The output contact of the current interrupter contactor shall be wired in the positive DC output of the CPPSM. A link shall be provided for shorting these terminals whenever the current interrupter is not in use.
- 6.5.9 If required the current interrupter shall be an independent unit of portable type. The interrupter unit shall have terminals for input power supply and terminals of the contactor in the timer output. The input power supply and the rating of the timer output contactor shall be as required.
- 6.5.10 Where the current interrupter is not specified with CPPSM or is specified as portable type external to the CPPSM, then the CPPSM shall have provision for connection of input power supply terminals and output contacts of external current interrupter for current interruption test. A link shall be provided for shorting the output terminals provided in CPPSM for current interruption, whenever the current interrupter is not connected.
- 6.5.11 For CPPSMs with multiple output circuits, each output circuit shall have independent current interrupter.
- 6.6 Controls, Indication and Metering
- 6.6.1 Following controls shall be provided on CPPSM front door.
- a) ON/OFF control for input through MCCB.
- b) ON /OFF control for output through MCCB/ MCB.
- c) Auto/CVCC mode selector switch.
- d) Potentiometers for Vos, Vps and los settings.

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e) Selector switch for selecting indication of PSP set and PSP actual for all the reference cells.

6.6.2 Following controls shall be provided inside the module at user accessible common location:

- a) Potentiometer for Vrs, Vpm, Vpn and Vas/las settings.
- b) Controls for current interrupter:
  - Timer power 'ON' / 'OFF'
  - Timer reset
  - Thumb wheel switch for 'ON' timing
  - Thumb wheel switch for 'OFF' timing

6.6.3 CPPSM shall have following indicating lights (lamps or minimum 5 mm dia LEDs):



- a) CPPSM ON/OFF
- b) Unit in auto/CVCC (2 lamps)
- c) Reference cell controlling the closed loop control of the CPPSM (number of lamps same as number of reference cells).
- d) Reference cell faulty (number of lamps same as number of reference cells).
- e) Pipeline over protected.
- f) Pipeline under protected
- g) Indications for current interrupter:
  - Timer power 'ON'
  - 'ON' timing
  - 'OFF' timing

It shall be possible to switch-off all the indication lamps by a single switch. In case of LED indication lights this facility may not be provided.

6.6.4 Following meters having min cl. 1.5 accuracy shall be provided on the CPPSM:

- a) Digital meter for output voltage
- b) Digital meter for output current
- c) Digital voltmeter to measure PSP set (Vps) and PSP actual for all the reference cells. The meter shall have range from (-) 4 V to 0 V and shall have cl. 0.5 accuracy.
- e) Digital meters for measuring Vrs, Vpm, Vpn and Vas/las settings.
- f) Meters for input voltage and current

It shall be possible to switch-off all the digital meters preferably by a single switch.

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6.6.5 If specified, CPPSM shall incorporate provision for remote monitoring of the unit through SCADA system as below:

- a) Potential free contacts for the following:
- All the reference cells failed. (Contact open on alarm condition)
  - Pipeline overprotected. (Contact open on alarm condition)
  - Pipeline under protected. (Contact open on alarm condition)
  - System in auto-mode. (Contact close in auto condition)
  - System in CVCC mode. (Contact close in CVCC mode)
- b) 4 to 20 mA electrically isolated signal for the following:
- PSP (-4V to 0V)
  - CPPSM output voltage
  - CPPSM output current

The transducers shall have electrical isolation between input and output. The isolation insulation shall withstand 2 kV, 50 Hz for minimum 1 minute. The accuracy class of the transducer shall be 0.5. The transducers shall be protected against input and output voltage surges. The transducer shall be suitable for driving upto 600 ohms load impedance located upto 500 m away and wired with 0.5 mm- copper conductor cable. The transducers shall be suitable for minimum 125% continuous over load in the input voltage/current parameter.

6.6.6 For units having multiple outputs, each output circuit shall have independent controls, indication and metering.

## 7.0 TESTS AND ACCEPTANCE



7.1 During fabrication, the equipment shall be subjected to inspection by owner or his authorised representative to assess the progress of the work as well as to ascertain that only quality raw materials are used for the same. He shall be given all assistance to carry out the inspection.

7.2 Final acceptance test shall be carried out at manufacturer's works under his care and expense. Instruments and equipments required for testing shall be arranged by manufacturer. Owner's representative shall be given minimum 2 weeks prior notice for witnessing the tests. Test certificates indicating test results shall be furnished by the manufacturer. Acceptance tests shall include but not be limited to the tests listed below.

### 7.2.1 Visual Inspection

This shall include-

- Completeness of the equipment in line with specification.
- Checking of all settings.
- All labels provided and satisfactory.
- Dimensional checking.

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- Proper mounting of components and neatness of wiring etc.
- Model number.

### 7.2.2 Insulation tests

The voltage specified in the table below shall be applied for one minute to the circuits indicated:

Withstand voltage	Control electronics <60V	Power electronics $U_{n1}$	Auxiliary circuits $U_{n2}$
To earth	700VD.C.	$2xU_{n1} + 1000V$	$2xU_{n2} + 1000V$
To control electronics	-	$2xU_{n1} + 1000V$	$2xU_{n2} + 1000V$
To power electronics	$2xU_{n2} + 1000V$	-	$2xU_{n2} + 1000V$
To auxiliary circuits	$2xU_{n2} + 1000V$	$2xU_{n1} + 1000V$	-

( $U_n$ , and  $U_{n2}$  are nominal voltage rating of power electronics and auxiliary circuits respectively).

D.C. test voltages may be applied instead of A.C. The magnitude of D.C. test voltages to be applied shall be 2 times the above-mentioned A.C. (r.m.s) Values.

Insulation resistance test shall be conducted before and after heat run test.

### 7.2.3 Heat run test

All CPPSMs shall be subjected to a heat run test performed at rated voltage for period not less than 16 hours prior to execution of functional tests.

At least one CPPSM of each rating shall be loaded to its rated output throughout 16 hour test period. All other CPPSMs shall be energized under partial load or zero load current condition throughout the test period.



### 7.2.4 Functional tests

Functional tests as below shall be performed on each CPPSM. If during execution of functional tests, any electronic component of the unit is required to be replaced e.g. due to malfunction or failure of the unit to fulfil the performance requirements of the specification, then the load test shall be repeated at rated current following which functional tests shall be carried out.

#### 7.2.4.1 CVCC mode operation testing

##### a) Constant voltage operation

During the test, current limit shall be set to rated output current. Performance testing shall be carried out for various output voltage settings and load varying from zero to maximum. The verification of operation of the control functions,

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measurement of output voltage, current, input voltage, current, ripple in the output, input, evaluation of output voltage regulation and efficiency of the unit shall be carried out during the testing.

**b) Constant current operation**

During the test, voltage limit shall be set to rated output voltage. Performance testing shall be carried out for various output current limit settings and load resistance varied to achieve output voltage from minimum to maximum. The verification of operation of the control functions, measurement of output voltage, current, input voltage, current, ripple in the output, input, evaluation of output current regulation of the unit shall be carried out during the testing.

**7.2.4.2 Auto PSP mode operation**

Suitable set-up shall be arranged for output loading and reference cell feedback. The closed loop performance and regulation shall be checked with the PSP set voltage varied from 0.85V to 1.2V.

Disconnecting the reference cell feedback connection in the above set up shall simulate the reference cell failed condition. The output voltage/current of the unit shall go to the value set on the potentiometer Vas/las provided inside the CPPSM. The settings on Vas/las shall be varied and the output voltage/current shall be observed.

7.2.4.3 Operation of sensors for pipeline over protection, under protection, reference cell failure and reference cell selection logic in auto PSP mode shall be verified by connecting variable external voltage sources to reference cell inputs of the CPPSM. The number of external voltage sources shall be same as number of reference cell inputs specified for the CPPSM.

7.2.4.4 The unit shall be checked for operation of the current limit by over loading the unit in both CVCC and auto PSP modes of operation. For Units where semiconductor fuses are not provided for protection of the power semiconductor device, the protection of same shall be tested as below:

A switch rated for making and carrying CPPSM output short circuit current shall be connected to the output terminals of the unit. The output voltage and the output current limit settings of the unit shall be set to the maximum rated values. The switch connected in the output shall be shorted quickly.



The unit shall go to current limit mode and shall not damage any active component of the unit.

7.2.4.5 The current interrupter shall be tested for time interval settings and specified operation.

**8.0 PACKING AND DESPATCH**

The equipment shall be properly packed for selected mode of transportation i.e. by ship/rail or trailer. The panels shall be wrapped in polythene sheets before being placed in crates to prevent damage to finish. Crates shall have skid bottom for handling. Special notations such as

'Fragile', 'This side up', 'Centre of gravity', 'Weight' etc., shall be clearly marked on the package together with Tag nos., P.O. Nos. etc.



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The equipment may be stored outdoors for long periods before erection. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature.

## 9.0 DEVIATIONS



- 9.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.



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## TECHNICAL SPECIFICATION

### CATHODIC PROTECTION TRANSFORMER RECTIFIER UNIT

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## 1.0 SCOPE

This specification covers the requirements for the design, manufacture and testing of Cathodic Protection Transformer Rectifier units (CPTR units) working on controlled rectification principle intended to supply power to cathodic protection system for underground pipelines/ structures.

## 2.0 CODES AND STANDARDS

2.1 The system design, performance and materials to be supplied shall conform to the requirements of the latest revision of following standards:

IS: 1248 (Parts-I, 2,8 & 9)	Direct acting indicating analogue electrical measuring instruments and accessories.
IS: 3700 (Parts-I to 11)	Essential rating and characteristics of semiconductor devices
IS: 3715 (Parts-I to 4)	Letter symbols for semiconductor devices
IS: 4411	Code of designation of semiconductor devices.
IS: 5469 (Parts-I to 4)	Code of practice for the use of semiconductor junction devices.
IS: 6619	Safety code for semiconductor rectifier equipment.
IS:7204 (Parts-I to 4)	Stabilized power supplies DC output
IS: 12021 (Parts-I to 4)	Control transformers for switchgear and control gear for voltages not exceeding 1000 V AC.
IS: 13703 (Parts-I to 4)	Low voltage fuses for voltages not exceeding 1000 V AC or 1500 V DC.
IS/IEC:60947	Low voltage switchgear and control gear.

2.2 In case of imported equipment, standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian standards.



2.3 The equipment shall also conform to the provisions of Indian Electricity rules and other statutory regulations currently in force in the country.

2.4 In case of any contradiction between various referred standards/ specifications and statutory regulations the following order of priority shall govern:

- Statutory regulations.
- This specification.
- Codes and standards

## 3.0 SITE CONDITIONS

The CPTR unit shall be suitable for installation in non air-conditioned room with restricted ventilation or in outdoor kiosk, in locations having generally corrosive, warm, humid and dusty atmosphere. Service conditions shall be as actual site conditions. If not specifically mentioned therein, a design ambient temperature of 45°C and an altitude not exceeding 1000 m above mean sea level shall be considered.

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#### 4.0 GENERAL REQUIREMENTS

- 4.1 The offered equipment shall be brand new with state of art technology and proven field track record. No prototype equipment shall be offered.
- 4.2 Vendor shall ensure availability of spare parts and maintenance support services for the offered equipment for at least 15 years from the date of supply.
- 4.3 Vendor shall give a notice of at least one year to the end user of equipment and PDIL before phasing out the product/spares to enable the end user for placement of order for spares and services.



#### 5.0 TECHNICAL REQUIREMENTS

##### 5.1 Fabrication and General Details

- 5.1.1 CPTR unit shall be housed in sheet steel enclosure. The front, rear walls and doors shall be made by using minimum 2 mm thick sheet steel and side walls shall be made of minimum 1.6 mm thick sheet steel. Wherever required, suitable stiffeners shall be provided. The Unit shall be freestanding type. Hinged doors shall be provided at the front and back as required. The unit shall be natural cooled type. Louvered openings with wire mesh for natural ventilation may be provided. Degree of protection for the panel shall be minimum IP-41. The CPTR unit panel shall, preferably, not need rear access for operation, maintenance and shall be suitable for mounting flushed to the wall.
- 5.1.2 Suitable hooks shall be provided for lifting the panel. These hooks when removed shall not leave any hole in the panel or imperfection in the paint finish.
- 5.1.3 All instruments shall be panel mounted type and back connected. All fuses shall be provided inside the panel and shall be of link type. 660 V grade PVC insulated BIS approved wires with stranded copper conductor of size minimum 2.5 mm<sup>2</sup> shall be used for power and auxiliary wiring. Control wiring for electronic circuits shall be through flat ribbon cable or through copper wire of minimum 0.5 mm diameter. All wirings shall be ferruled with PVC ferrules at both ends for ease of identification. Clamp type terminals suitable for termination up to 10 mm conductor shall be provided for all control cable connection. Suitable power terminals shall be provided for power cables. Minimum 20% spare terminals shall be provided. The terminal blocks shall be mounted minimum 300 mm above the gland plate.
- 5.1.4 All live parts shall be properly shrouded. This shall ensure complete safety to personnel intending routine maintenance by opening the panel doors.
- 5.1.5 CPTR unit shall be suitable for bottom cable entry unless otherwise specified and shall be supplied complete with crimping type cable termination lugs and cable glands. Cable glands shall be of rolled aluminium, single compression type for indoor installations and double compression type for outdoor installations. The space in the terminal chamber shall be adequate for termination of required number and sizes of cables.
- 5.1.6 The input power factor of the unit at rated load shall be 0.8 lag or better.
- 5.1.7 The CPTR unit shall be field proven. The design, internal component layout and rating of component shall ensure high MTBF and low MTTR. Prototype equipment shall not be acceptable.

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- 5.1.8 All the control equipment like switches, pushbuttons, potentiometers etc. shall be located at a convenient height of minimum 300 mm and maximum 1800 mm from the bottom of the panel.
- 5.1.9 The printed circuit boards (PCBs) shall be of copper clad glass epoxy laminate. PCB tracks shall be tinned and solder masked. The PCB shall be coated with suitable lacquer to make it immune to dust, moisture and fungal growth. Where plug in type of PCBs are used gold plated male-female connectors shall be used for the purpose.
- 5.1.10 If required the panel shall be provided with space heater to prevent moisture condensation. The space heaters shall be located at the bottom of the panel. and shall be provided with a manually operated switch, HRC fuse and link for phase and neutral respectively. The space heater shall have porcelain connectors. Where space heater is not provided the electronic PCBs/components and other control devices shall be made immune to moisture condensation.
- 5.1.11 Panel shall be provided with integral base frame channel. The integral base frame of panel shall be suitable for directly bolting with the help of foundation bolts and shall also be suitable for tack welding to purchaser's insert plate/flat/channel embedded in the floor. Amply dimensioned oblong holes shall be provided at the bottom of the panel for its bolting to the embedded insert plate/channel.
- 5.1.12 An earth bus bar of minimum (25 x 3) m<sup>2</sup> copper or equivalent aluminium shall be provided throughout the length of the panel. Provision shall be made for connecting this earth bus at two ends with the plant earth grid by means of (40x5) mm- GI flat. All non-current carrying metallic parts of the panel and mounted equipment shall be connected to the panel earth bus. All doors and movable parts shall be connected to the earth bus by flexible copper cables.
- 5.1.13 All panel mounted equipments (e.g. lamps, pushbuttons, switches, meters, PCBs, etc.) shall be provided with suitable nameplates. Nameplates shall be engraved out of 3-ply (black-whiteblack) lamicoide sheets or anodised aluminium. Back-engraved Perspex sheet nameplates may also be acceptable. Engraving shall be done with groove cutters. Hard paper or self-adhesive plastic tape nameplates shall not be acceptable. Nameplates shall be fastened by screws and not by adhesive. Labels shall be provided for every component on the cards, connecting wires as well as for the terminals in the terminal strip inside the panel.
- 5.1.14 Where specified, the CPTR unit shall be housed in an outdoor kiosk. The kiosk shall be made of sheet steel of minimum 3 mm thick and epoxy painted on both internal and external surfaces. Hinged lockable doors shall be provided at the front and back. The kiosk shall be suitable for outdoor mounting and shall give proper protection to the CPTR unit against rain, other harsh weather conditions. Necessary ventilation arrangement with louvers and wire mesh shall be provided for proper operation of the CPTR unit. The cable entry to the kiosk shall be from bottom through cable glands. Suitable canopy shall be provided on the top of the Kiosk.
- 5.1.15 **Painting**
- All metal surfaces shall be thoroughly cleaned and degreased to remove mill scale, rust, grease and dirt.
- Fabricated structures shall be pickled and then rinsed to remove any trace of acid. The under surface shall be prepared by applying a coat of phosphate paint and a coat of yellow

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zinc chromate primer. The under surface shall be made free from all imperfections before undertaking the finishing coat.

After preparation of the under surface, the panel shall be spray painted with two coats of final paint or shall be powder coated. Colour shade of final paint shall be approved by the purchaser before final painting is started. The finished panels shall be dried in stowing ovens in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run off paint, etc. All unpainted steel parts shall be suitably treated to prevent corrosion. If these parts are moving elements, then they shall be greased.

## 6.0 EQUIPMENT DESCRIPTION

The CPTR unit shall be complete with following main sections:

- Transformer and input controls.
- Rectifier and filter
- Output protections
- System controls
- Control, indication and metering

### 6.1 Transformer and Input Controls

6.1.1 The transformer shall be natural cooled dry type with separate primary and secondary windings.



An intermediate earth screen shall be provided between primary and secondary windings. CPTR Units having multiple output circuits shall have separate secondary windings for each output circuit. Transformer shall be vacuum impregnated with epoxy varnish and baked. The safety factor for transformer rating shall be minimum 125%.

6.1.2 Single-phase transformers may be provided up to 50V, 50A DC output rating of the CPTR units. Beyond this rating, 3 phase transformers shall be provided. A moulded case circuit breaker with thermal over load and short circuit release shall be provided at the input of the transformer. Miniature circuit breaker with thermal overload and short circuit release in place of moulded case circuit breaker may be provided, where the miniature circuit breaker rated for the incoming AC supply short circuit current.

### 6.2 Rectifier and Filters

6.2.1 The rectifier shall be made of thyristors and diodes as basic components. The CPTR unit shall be suitable for 415 V AC, 3-ph power supply. Rectifier shall be 3 phase full wave type and controlled type. For CPTR units rated 50V, 50A DC or less, the unit may be suitable for 240V AC, 1 ph power supply and the rectifier shall be full wave type and controlled type. Alternatively, for single phase AC CPTR units, diode rectifier of full wave type in the secondary of the transformer and triac or back to back connected thyristors in the transformer primary AC supply circuit may be provided. The current and voltage ratings of thyristors, diodes shall be at least two times the actual maximum device current and minimum two times the actual maximum voltage coming across the device respectively. The thyristors/ triac/ rectifier elements shall be protected against voltage surges coming from the incoming power supply and from output side from the pipeline. Required shunt zeners / MOV shall be provided across the rectifier elements for protection.

The rectifier elements shall have humidity/moisture resistant finish and mounted in sufficiently sized heat sink designed to provide adequate cooling under worst conditions of operation. The rectifier elements shall have adequate protection against high dv/dt and di/dt. 6.2.2 The thyristors/triacs shall be protected by semiconductor fuses. For units rated 50V, 50A DC or less, if the thyristors or triacs are adequately over rated and system has

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enough inductance so that in case of sudden output short circuit the over current limit feature comes into action before short circuit current rises beyond the rating of the thyristors/triacs, then the semiconductor fuses may not be provided. This feature shall be demonstrated during testing of the unit at works.

- 6.2.3 Adequate filtering shall be provided on the DC output of the rectifier to limit the ripple content in the output to less than 5% at rated output.
- 6.2.4 The rectifier system shall be of natural air cooled type.
- 6.2.5 For CPTR units with multiple output circuits, each output circuit shall have independent rectifier and filter.

### 6.3 Output Protections

Two pole moulded case circuit breaker or miniature circuit breaker (if available) rated for the DC output current, short circuit current and having thermal over load, short circuit release shall be provided in the output. A lightning arrester rated for minimum 10KA impulse current discharge capacity and rated voltage & maximum spark over voltage rating suitable to protect the CPTR unit components against lightning and switching surges shall be provided at the output. For CPTR units with multiple output circuits, each output circuit shall be provided with circuit breaker and lightning arrester.

### 6.4 System Controls

- 6.4.1 The CPTR unit shall have two distinct modes of operation (independent for each output circuit) as below:

#### a) Constant Voltage and Constant Current Mode (CVCC)



In this mode the output voltage of CPTR unit shall be continuously adjustable from 0.5V DC to the rated output voltage. The set output voltage ( $V_{os}$ ) shall remain constant irrespective of output current. Current limit feature shall be provided. The current limit ( $I_{os}$ ) shall be continuously adjustable from zero to rated output current.

For constant voltage mode of operation the output current limit shall be set at maximum and output voltage setting shall be varied. Irrespective of output current demand the chosen value of the output voltage shall be maintained by the control system till the current limit is reached. After that the output current limit shall be maintained and output voltage shall decrease to keep the current constant.

For constant current mode of operation the output voltage shall be set at maximum and output current shall be varied through varying the setting of output current limit. Irrespective of output voltage requirement the control system shall maintain the output current to the set current limit value till the voltage limit is reached. After that the output voltage limit shall be maintained and output current shall decrease to keep the voltage constant.

#### b) Auto PSP Mode

In this mode of operation the output of the CPTR unit shall operate in an external closed loop with pipe to soil potential (PSP), measured by reference cell, in feedback loop. The CPTR unit control shall adjust the output voltage such that the PSP as measured by reference cell always remains equal to the set potential on the unit. The set potential ( $V_{ps}$ ) shall have high long time stability and minimum temperature drift. The set potential shall be continuously adjustable over the range required.

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The unit shall be designed to operate with number of reference cells connected to it (to be provided by others). In case of more than one reference cell being specified, CPTR unit shall have feature to automatically select the reference cell having less negative potential than the others and use the same for auto control of the unit (e.g. (-) 0.8 V is less negative than (-) 0.9 V). Adequate hysteresis shall be provided in selecting the less negative potential reference cell, to avoid hunting between the reference cells at change over conditions.

In case of open circuit or short circuit of reference cell or potential being less negative than a minimum set potential ( $V_{rs}$ ), the unit shall sense these conditions as reference cell failure and shall automatically switch over to the other healthy reference cell for control. Should fault occur in all the reference cells, the output voltage or current of the CPTR unit shall adjust automatically to a preset value ( $V_{as}/I_{as}$ ), which shall be adjustable.

In both CVCC and auto PSP modes of operation a fast acting electronic over current limit protection shall be provided. This protection shall be fast enough to protect the active devices of the unit and fast enough to act before tripping of MCCB/MCB or blowing of fuse.

6.4.2 The unit shall continuously monitor the PSP and necessary annunciation shall be provided in case of PSP either exceeding the specified maximum limit ( $V_{pm}$ ) or remaining lower than the specified minimum limit ( $V_{pn}$ ).

6.4.3 The output voltage regulation for no load to full load variation with input voltage variation from maximum to minimum shall not be more than 2.5 % of rated voltage throughout the range of output voltage and over the specified ambient temperature variation, in CVCC-constant voltage mode of operation. In auto PSP mode the closed loop PSP regulation for no load to full load variation with input voltage variation from maximum to minimum and PSP feedback varying over the specified range shall be within  $Z_f$  mV.

In CVCC- constant current mode 'of operation, the current regulation for minimum to maximum output voltage and minimum to maximum variation in input voltage shall not be more than 2.5% throughout the range of output current.

6.4.4 The DC output of the CPTR unit shall be floating (ungrounded) in the Unit. However the CPTR Unit shall allow grounding of positive output terminal through the anode ground bed.

6.4.5 For CPTR units with multiple output circuits, each output circuit shall have independent control system.

6.5 Current Interrupter



6.5.1 If required, a current interrupter for CPTR Unit output current interruption shall be provided.

6.5.2 The current interrupter shall have an output contactor with current rating minimum 125% of the output current rating of the CPTR unit and a digital timer to operate it.



6.5.3 The timer shall have 'ON' and 'OFF' timings. When the timer is turned on the 'ON' timing shall start and shall close the output contactor till the end of the 'ON' timing. At the end of the 'ON' timing the 'OFF' timing shall start and keep the contactor open till the end of the 'OFF' timing. At the end of the 'OFF' timing the 'ON' timing shall start again and close the output contactor. This process of 'ON' and 'OFF' timing shall continue.

6.5.4 The 'ON' and 'OFF' timings of the timer shall be settable by separate 2 digit thumbwheel switches, each settable from 1 to 99 seconds. The timing error of the timer shall be less



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- than 5 parts per million. In case of microprocessor based system keypad with display may be provided in place of thumbwheel switches.
- 6.5.5 Whenever the timer is switched on it shall always start with ON 'timing'. A timer-reset push button shall be provided. On pressing this pushbutton during operation of the timer, the timer shall get reset and upon release of the button the timer shall restart with 'ON' timing.
- 6.5.6 The power required for operation of the timer and contactor shall be derived from the main power supply to the CPTR unit.
- 6.5.7 The following controls and indications shall be provided for current interrupter. The controls shall be housed in a lockable cover, so that normally they are not accessible. The indications shall be mounted on the door.
- a) Controls
- Timer power 'ON' / 'OFF'
  - Timer reset
  - Thumb wheel switch for 'ON' timing
  - Thumb wheel switch for 'OFF' timing
- In case of microprocessor based system keypad with display may be provided in place of thumbwheel switches.
- b) Indications (LED)
- Timer power 'ON'
  - 'ON' timing
  - 'OFF' timing
- 6.5.8 The output contact of the current interrupter contactor shall be wired in the positive DC output of the CPTR unit. A link shall be provided for shorting these terminals whenever the current interrupter is not in use.
- 6.5.9 If required the current interrupter shall be an independent unit of portable type. The interrupter unit shall have terminals for input power supply and terminals of the output contactor. The input power supply and the rating of the output contactor shall be as required. Terminals shall be provided in the CPTR unit for taking power supply to the current interrupter.
- 6.5.10 Where the current interrupter is not specified with CPTR unit or is specified as portable type external to the CPTR unit, then the CPTR unit shall have provision/ terminals for connection of input power supply and output contacts of external current interrupter, for current interruption test. A link shall be provided for shorting the output terminals provided in CPTR unit whenever the current interrupter is not connected.
- 6.5.11 For CPTR units with multiple output circuits, each output circuit shall have independent current interrupter.
- 6.6 Controls, Indication and Metering
- 6.6.1 Following controls shall be provided on CPTR unit front door.
- a) ON/OFF control for input through MCCB/MCB.
- b) ON /OFF control for output through MCCB/MCB.

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- c) Auto/CVCC mode selector switch.
- d) Potentiometers for Vos, Vps and los settings.
- e) Selector switch for selecting indication of PSP set and PSP actual for all the reference cells.

6.6.2 Following controls shall be provided inside the module at user accessible common location:

- a) Potentiometer for Vrs, Vpm, Vpn and Vas/las settings.
- b) Controls for current interrupter:
  - Timer power 'ON' / 'OFF'
  - Timer reset
  - Thumb wheel switch for 'ON' timing
  - Thumb wheel switch for 'OFF' timing



6.6.3 TR unit shall have following indicating lights (lamps or minimum 5 mm dia LEDs):

- a) CPTR unit ON/OFF
- b) Unit in auto/CVCC (2 lamps)
- c) Reference cell controlling the closed loop control of the CPTR unit (number of lamps same as number of reference cells).
- d) Reference cell faulty (number of lamps same as number of reference cells).
- e) Pipeline over protected.
- f) Pipeline under protected
- g) Indications for current interrupter:
  - Timer power 'ON'
  - 'ON' timing
  - 'OFF' timing

It shall be possible to switch-off all the indication lamps by a single switch. In case of LED indication lights this facility may not be provided.

6.6.4 Following meters having min cl.1.5 accuracy shall be provided on the CPTR unit:

- a) Digital meter for output voltage
- b) Digital meter for output current
- c) Digital voltmeter to measure PSP set (Vps) and PSP actual for all the reference cells. The meter shall have range from -4 V to 0 V and shall have cl.0.5 accuracy.
- d) Digital meters for measuring Vrs, Vpm, Vpn and Vas/las settings.

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- e) Meters for input voltage and current

It shall be possible to switch-off all the digital meters preferably by a single switch.

6.6.5 If required, CPTR unit shall incorporate provision for remote monitoring of the unit through SCADA system as below:

- a) Potential free contacts for the following:

- All the reference cells failed. (Contact open on alarm condition)
- Pipeline overprotected. (Contact open on alarm condition)
- Pipeline under protected. (Contact open on alarm condition)
- System in auto-mode. (Contact close in auto condition)
- System in CVCC mode. (Contact close in CVCC mode)

- b) 4 to 20 mA electrically isolated signal for the following:

- PSP (-4V to 0V)
- CPTR unit output voltage
- CPTR unit output current

The transducers shall have electrical isolation between input and output. The isolation insulation shall withstand 2kV, 50Hz for minimum 1 minute. The accuracy class of the transducer shall be 0.5. The transducers shall be protected against input and output voltage surges. The transducer shall be suitable for driving up to 600 ohms load impedance located up to 500 m away and wired with 0.5 mm<sup>2</sup> copper conductor cable.

6.6.6 For units having multiple outputs, each output circuit shall have independent controls, indication and metering.

## 7.0 TESTS AND ACCEPTANCE



7.1 During manufacture, the equipment shall be subjected to inspection by owner or his authorised representative to assess the progress of the work as well as to ascertain that only quality raw materials are used for the same. He shall be given all assistance to carry out the inspection.

7.2 Final acceptance test shall be carried out at manufacturer's works under his care and expense. Instruments and equipments required for testing shall be arranged by manufacturer. Owner's representative shall be given minimum 2 weeks prior notice for witnessing the tests. Test certificates indicating test results shall be furnished by the manufacturer. Acceptance tests shall include but not be limited to the tests listed below.

### 7.2.1 Visual Inspection

This shall include-

- Completeness of the equipment in line with specification.
- Checking of all settings.
- All labels provided.

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- Dimensional checking.
- Proper mounting of components and neatness of wiring etc.
- Model number.

### 7.2.2 Insulation tests

The voltage specified in the table below shall be applied for one minute to the circuits indicated:

Withstand voltage	Control electronics <60V	Power electronics $U_{n1}$	Auxiliary circuits $U_{n2}$
To earth	700VD.C.	$2xU_{n1} + 1000V$	$2xU_{n2} + 1000V$
To control electronics	-	$2xU_{n1} + 1000V$	$2xU_{n2} + 1000V$
To power electronics	$2xU_{n2} + 1000V$	-	$2xU_{n2} + 1000V$
To auxiliary circuits	$2xU_{n2} + 1000V$	$2xU_{n1} + 1000V$	-

( $U_{n1}$ , and  $U_{n2}$  are nominal voltage rating of power electronics and auxiliary circuits respectively).

D.C. test voltages may be applied instead of A.C. The magnitude of D.C. test voltages to be applied shall be 2 times the above-mentioned A.C. (r.m.s) Values.

Insulation resistance test shall be conducted before and after heat run test.

### 7.2.3 Heat run test

All CPTR units shall be subjected to a heat run test performed at rated voltage for period not less than 16 hours prior to execution of functional tests.

At least one CPTR unit of each rating shall be loaded to its rated output through out 16 hour test period. All other CPTR units shall be energized under partial load or zero load current condition throughout the test period.



### 7.2.4 Functional tests

Functional tests as below shall be performed on each CPTR unit. If during execution of functional tests, any electronic component of the unit is required to be replaced e.g. due to malfunction or failure of the unit to fulfil the performance requirements of the specification, then the load test shall be repeated at rated current following which functional tests shall be carried out.

#### 7.2.4.1 CVCC mode operation testing

##### a. Constant voltage operation

During the test, current limit shall be set to rated output current. Performance testing shall be carried out for various output voltage settings and load varying from zero to maximum. The verification of operation of the control functions, measurement of output voltage, current, input AC voltage, current, power factor, ripple in the output, evaluation of output voltage regulation and efficiency of the unit shall be carried out during the testing.

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#### b. **Constant current operation**

During the test, voltage limit shall be set to rated output voltage. Performance testing shall be carried out for various output current limit settings and load resistance varied to achieve output voltage from minimum to maximum. The verification of operation of the control functions, measurement of output voltage, current, input AC voltage, current, power factor, ripple in the output, evaluation of output current regulation of the unit shall be carried out during the testing.

#### 7.2.4.2 **Auto PSP mode operation**

Suitable set up shall be arranged for output loading and reference cell feedback. The closed loop performance and regulation shall be checked with the PSP set voltage varied from 0.85V to 1.2V.

Disconnecting the reference cell feedback connection in the above set up shall simulate the reference cell failed condition. The output voltage/current of the unit shall go to the value set on the potentiometer Vas/las provided inside the CPTR UNIT. The settings on Vas/las shall be varied and the output voltage/current shall be observed.

7.2.4.3 Operation of sensors for pipeline over protection, under protection, reference cell failure and reference cell selection logic in auto PSP mode shall be verified by connecting variable external voltage sources to reference cell inputs of the CPTR unit. The number of external voltage sources shall be same as number of reference cell inputs specified for the CPTR unit.

7.2.4.4 The unit shall be checked for operation of the current limit by over loading the unit in both CVCC and auto PSP modes of operation. For Units where semiconductor fuses are not provided for protection of the thyristors/triacs, the protection of same shall be tested as below:

A switch rated for making and carrying CPTR unit output short circuit current shall be connected to the output terminals of the unit. The output voltage and the output current limit settings of the unit shall be set to the maximum rated values. The switch connected in the output shall be shorted quickly.

The unit shall go to current limit mode and shall not damage any active component of the unit.

7.2.4.5 The current interrupter shall be tested for time interval settings and specified operation.



### 8.0 **PACKING AND DESPATCH**

The equipment shall be properly packed for selected mode of transportation i.e. by ship/rail or trailer. The panels shall be wrapped in polythene sheets before being placed in crates to prevent damage to finish. Crates shall have skid bottom for handling. Special notations such as 'Fragile', 'This side up', 'Centre of gravity', 'Weight' etc., shall be clearly marked on the package together with Tag nos., P.O. Nos. etc.



The equipment may be stored outdoors for long periods before erection. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature.

### 9.0 **DEVIATIONS**

9.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.



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**TECHNICAL SPECIFICATION**  
**IMPRESSED CURRENT CATHODIC PROTECTION SYSTEM**  
**FOR PIPELINES**

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## 1.0 SCOPE

- 1.1 This specification defines the requirements of system design, engineering, installation, testing and commissioning of an Impressed Current Cathodic Protection System for underground pipelines / structures including supplementing of corrosion survey, close interval potential logging survey, investigations for interaction/interference problems and mitigation of the same.
- 1.2 This specification provides the basic parameters to develop a suitable impressed current cathodic protection system for the pipelines/structures requiring protection. LSTK contractor shall include, site survey to collect required information, design, supply, installation, commissioning of impressed current cathodic protection system. All data required in this context shall be taken into consideration to develop an acceptable design and for proper engineering of the system.
- 1.3 In addition to this specification, other requirement, if any, for complete cathodic protection shall be considered by LSTK contractor.
- 1.4 Compliance with these specifications, and/or approval of any documents submitted by contractor shall in no case relieve the contractor of his contractual obligations.

## 2.0 CODES AND STANDARDS

- 2.1 The system design, performance and materials to be supplied shall conform to the requirements of the latest revision of following standards as a minimum:
- i) NACE Standard RP-0169 : Standard Recommended Practice Control of External Corrosion on Underground or Submerged Metallic Piping Systems
  - ii) NACE Publication I0A190 : Measurement technique related to criteria for CP of Underground or Submerged Steel Piping System (as defined in NACE Standard RPO169-83)
  - iii) NACE Standard RP-0177 : Standard Recommended Practice Mitigation of Alternating Current and Lightning Effects on Metallic Structures and Corrosion Control Systems
  - iv) NACE Standard RP-0286 : Standard Recommended Practice The Electrical isolation of Cathodically Protected Pipelines.
  - v) NACE Publication No. 54276 : Cathodic Protection Monitoring for Buried Pipelines.





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- vi) NACE Standard RP-0572 : Standard Recommended Practice Design, Installation, Operation and of Impressed Current Deep Ground beds.
- vii) DNV RP-B403 : Recommended Practice Monitoring of Cathodic Protection Systems
- viii) DNV RP-B401 : Recommended Practice Cathodic Protection Design
- ix) IS 8062 : Recommended Practice ICCP for Underground Piping
- x) BS 7361 Part I : Code of Practice for Cathodic Protection for land and marine application.
- xi) VDE 0150 : Protection against Corrosion due to Stray Current from DC Installations.
- xii) IS: 1554 Part I : PVC insulated (heavy duty) cables.
- 2.2 In case of imported equipments standards of the country of origin shall be applicable if these standards are equivalent or stringent than the applicable Indian standards.
- 2.3 The equipment shall also conform to the provisions of Indian Electricity rules and other statutory regulations currently in force in the country.
- 2.4. In case of any contradiction between various referred standards/specifications and statutory regulations the following order of priority shall govern:
- Statutory regulations
  - This specification
  - Codes and standards

### 3.0 SYSTEM IMPLEMENTATION

All work to be performed and supplies to be effected as a part of contract shall require specific review by Owner or his authorised representative. Major activities requiring review shall include but not be limited to the following:

- i) Corrosion survey data interpretation report and plot plans for land acquisition.
- ii) Conceptual system design.
- iii) Basic engineering package.
- iv) Detailed engineering package.
- v) Field testing and commissioning procedures.
- vi) Procedures for interference testing and mitigation
- vii) Close interval potential logging survey procedure
- viii) As built documents.

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#### 4.0 CORROSION SURVEY

##### 4.1 General

4.1.1 The details of corrosion survey including soil resistivity data along ROW and other data required for C.P. design if available with the owner shall be included. However, verification of its veracity and adequacy shall be the entire responsibility of the contractor. In addition, contractor shall have to generate/collect additional data as per clause 4.4 below required for completeness of the job.

Contractor shall carry out soil resistivity survey at anode ground bed locations for design of ground bed. Contractor shall also carry out corrosion survey along the ROW of the pipeline.

4.1.2 To carry out soil resistivity measurement Wenner's 4-pin method or an equivalent method approved by Owner shall be used. Survey instruments shall have maximum AC and DC ground current rejection feature.

Care shall be taken to ensure that the resistivity observations are not influenced by the presence of foreign pipelines/structures, and earth currents in the vicinity of EHV/HV lines and installations using earth return in their power system etc.

##### 4.2 Soil Resistivity Survey at Impressed Current Anode Ground Bed Plot

4.2.1 Each selected anode bed plot shall be sub-divided into sub-plots. Sizes of sub-plots shall depend upon the expected depth for soil resistivity investigations. Each of these sub-plots shall be investigated for resistivity data individually. Sufficient observations shall be taken at each of these sub-plots as required and desired by Owner/Owner's representative to obtain sufficient information about sub-soil stratification and, wherever possible, to establish the depth of water table. The number of subplots at each ground bed plot shall be decided at site in consultation with Owner / Owner's representative.

4.2.2 Number, location, demarcation and size of sub-plots and number of sets of resistivity observations required for each sub-plot shall be individually decided for each ground bed plot location.

4.2.3 One or more ground bed plots may be required to be selected and surveyed at each CP station to form a suitable ground bed.



##### 4.3 Topographic Surveys

Cathodic protection stations consisting of anode ground bed, CP station, etc. As applicable, along with all associated cabling up to pipeline and any other related equipment and accessories for CP station shall be demarcated on the ground. Ground plots so demarcated shall be surveyed for all other topographical and cadastral features and topo-sheets shall be developed by the CONTRACTOR, which shall be suitable for use in land acquisition etc.

##### 4.4 Additional Data to be Collected

The following data shall be collected to generate design data for evaluation of interaction/interference possibilities due to presence of other services in ROW or in its vicinity. OWNER shall provide assistance for liaison work to the extent possible.

- i) Route and types of foreign service/pipeline in and around or crossing the right of way (including those existing and those which are likely to come up during contract execution).

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- ii) Diameter, wall thickness, pressure, soil cover, and coating scheme used, type of cathodic protection system provided, if any, year of laying/commissioning in case of foreign pipelines.
- iii) Details of the existing cathodic protection systems protecting the services i.e. type of protection, location, type, rating of anode beds, test station locations and their connection schemes. Present output current and voltage readings of the CP power supply units.
- iv) Remedial measures existing on foreign pipelines/services to prevent interaction.
- v) Graphical representation of existing structure / pipe-to-solid potential records.
- vi) Possibility of integration/isolation of CP systems, which may involve negotiations with owners of other services.
- vii) Existing and proposed DC/AC power sources and systems using earth return path such as HVDC substations/ earthing stations, fabrication yards with electric welding etc. in the vicinity of the entire pipeline route.
- viii) Crossing and parallel running of electrified and non-electrified traction (alongwith information regarding, operating voltage, AC/DC type etc.) as well as abandoned tracks near ROW having electrical continuity with the tracks in use.
- ix) Crossing or parallel running of any existing or proposed EHV/HV AC/DC overhead power lines along with details of voltage, AC/DC type etc.
- x) Voltage rating, phases, sheathing details of underground power cables along ROW or in its vicinity.
- xi) Any other relevant information that may be needed in designing and implementing proper cathodic protection scheme for the proposed pipeline. Graphical representation of existing structure/ pipe-to-soil potential records.

Contractor shall conduct necessary potential gradient surveys for any existing anode ground beds that may interfere with the CP system of the pipelines covered under this project.

#### 4.5 Report



On completion of all field work, a report incorporating all the results generated from surveys and details of additional data collected shall be prepared. The report shall also contain detailed interpretation of survey results and resistivity data, probable interference prone areas, selected locations for anode ground beds, etc., to form a design basis for the scheme of cathodic protection. This report shall also include various drawings prepared in connection with the above work. Soil resistivity values shall be plotted on semilog graph sheets.

### 5.0 CATHODIC PROTECTION DESIGN PARAMETERS

A distinctly independent impressed current cathodic protection system shall be provided to protect the external surfaces of the complete pipeline/structure installation as specified.

Unless otherwise stated, the following parameters shall be used for design of permanent cathodic protection system:

#### 5.1 Protection Current Density Range

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i) Pipelines having coal tar coating with two/three layers of reinforcement.

Pipeline surrounding	Minimum Protection Current Density* (□ A/m <sup>2</sup> )
Soil resistivity 10 ohm m to 100 ohm.m	300
Soil resistivity less than 10 ohm.m	2000
Soil resistivity more than 100 ohm.m	200
Sea Water	5000

ii) Pipe lines having fusion bounded epoxy coating:

Pipeline surrounding	Minimum Protection Current Density* (□ A/m <sup>2</sup> )
Soil resistivity 10 ohm m to 100 ohm.m	125
Soil resistivity less than 10 ohm.m	500
Soil resistivity more than 100 ohm.m	90

iii) Pipe lines having polyethylene coating

Pipeline surrounding	Minimum Protection Current Density* (□ A/m <sup>2</sup> )
Soil resistivity 10 ohm m to 100 ohm.m	50
Soil resistivity less than 10 ohm.m	125
Soil resistivity more than 100 ohm.m	35

\* Actual current density to be adopted shall be decided based upon soil and other environmental conditions, current drainage survey data, proximity of foreign pipe lines/structures and other interference areas affecting the installation. Where considered necessary for satisfactory protection of pipeline the current density shall be suitably increased by contractor. Also refer to clause 7.1 iv) below.

At HDD (horizontal direction drilling) crossing, the pipe protection current density applicable for marshy area shall be considered.

5.2 The pipe protection Current Density indicated in the clause 5.1 above shall be applicable where the temperature of the fluid transported by the pipeline/ the surface temperature of the buried portion of the pipeline does not exceed 30<sup>0</sup> C. Where this temperature exceeds 30<sup>0</sup>C, the protection Current Density shall be increased suitably in consultation with the Owner/PMC.



5.3 Safety factor for current density : 1.3

5.4 Anode utilisation factor : 0.85 for centre connected anode.

(For high silicon cast iron anode) 0.6 for end connected anode.

5.5 Anode surface current density : 10 Amp./Sq.m. (max.)

For high silicon cast iron anode

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For continuous operation

- |     |                                   |   |                 |
|-----|-----------------------------------|---|-----------------|
| 5.6 | Anode consumption rate            | : | 0.2 Kg./Amp.yr. |
| 5.7 | Pipeline natural potential        | : | (-) 0.45 V      |
| 5.8 | Design life of CP System          | : | 30 years        |
| 5.9 | Anode ground bed loop resistance: |   | 1 ohm (max.).   |

including anode to ground resistance,  
anode and cathode cable resistances.

(The output voltage rating of the CPTR unit /CPPSM shall in minimum be adequate to drive the specified end of life cathodic protection current with safety factor, considering the total anode ground bed loop resistance as the sum of the resistance specified in this clause and pipe to earth resistance).

- 5.10 For mixed metal oxide coated titanium anodes the anode utilisation factor, anode surface current density and anode consumption rate etc. shall be as per the guaranteed values published by the manufacturer and supported by test certificates/ field proven ness.

## 6.0 CATHODIC PROTECTION DESIGN CRITERIA



Cathodic protection system shall be designed to meet the following criteria :

- i) The pipe to soil potential measurements shall be between (-) 0.9V (OFF) and (-) 1.18V (OFF) with respect to a copper/copper sulphate reference electrode.
- ii) In rare circumstances, a minimum polarisation shift of (-) 100 millivolts may be accepted as an adequate level of cathodic protection for the pipeline with the approval of Owner.
- iii) A positive potential swing of 100 millivolts or more shall be considered sufficient to indicate the presence of an interaction/interference situation requiring investigation and incorporation of mitigation measures by the CONTRACTOR.

## 7.0 SYSTEM DETAILS

The system shall include the following major equipment/sub-systems unless otherwise specified in project specifications:

- CP stations
- CPTR units/cathodic protection power supply modules (CPPSM).
- Anode ground beds and anodes
- Anode junction box
- Cathode junction box
- Test stations
- Permanent reference cells
- Electrical resistance probes

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- Polarisation cell and surge diverter
- Polarisation coupons
- Computerized Test Stations
- CP system at cased crossing
- Cables

All equipment shall be new and procured from approved reputed manufacturers. Equipment offered shall be field proven. Equipment requiring specialised maintenance or operation shall be avoided as far as possible. Prototype equipment shall not be accepted.

All equipment/materials shall conform to the relevant specifications included in the tender document.

All equipment including CPTR unit, CPPSM, test stations, anode lead junction boxes etc. shall be located in safe non-hazardous areas.



Where it is essential to install the equipment in hazardous area, such equipment shall be flame proof type and shall meet the requirement of IS: 2148, 5572 or equivalent international standard and shall be suitable for gas group, temperature class T3 (200°C). Indigenous equipment shall be certified by CMRI or any other recognised testing body and shall be approved by the concerned statutory authority. All flameproof equipment shall carry the BIS license marking as per the requirement of statutory authorities.

All Imported equipment for hazardous area may be tested and certified by an independent certifying agency of country of equipment origin and shall be approved by the concerned statutory authority in India.

## 7.1 Cathodic Protection Stations

The number and exact locations of CP stations shall be worked out based on the corrosion survey data collected. In addition, the following guidelines shall be followed for selecting the locations:

- i) Number of CP stations and their selected locations shall ensure that these remain valid and are adequate for the full design life of the system after considering all foreseeable factors.
- ii) As far as possible, the availability of nearby low resistivity areas for location of associated ground beds must be ensured while selecting the locations of CP stations.
- iii) As far as possible, locations of intermediate CP stations shall coincide with the locations of SV stations.
- iv) The locations of CP stations and anode ground bed current ratings shall be suitably selected. The same shall be verified for adequacy by the contractor. The requisite current drainage tests/survey shall be conducted by the contractor to establish the adequacy of CP current requirement indicated in clause 5.0 above and adequacy of number, ratings of CP stations for permanent CP system selected. The minimum end of life pipe protection current requirement shall be considered as the current requirement indicated in the clause 5.0 above or 3 times the current density value measured by the current drainage survey for polyethylene coated pipeline and 4 times the current density value measured by the current drainage survey for fusion bonded epoxy, coal tar enamel with reinforcement coated pipeline, whichever is maximum.

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## 7.2 CP Transformer Rectifier Unit / CPPSM

The supply, installation, testing and commissioning of cathodic protection power supply module (CPPSM) / indoor type Cathodic Protection Transformer Rectifier Unit (CPTR unit)/ outdoor type CPTR unit installed in kiosk along with kiosk shall be included in contractor's scope. The CP TR units shall be provided at CP stations where reliable AC power supply is available. CPPSM shall be provided at other CP stations where reliable DC power supply instead of reliable AC power supply is available. The CPTR unit / CPPSM shall be installed in nonhazardous (safe) area.



For more details refer: 4001-TS-0823 & 4001-TS-0824

## 7.3 Anode Ground Beds

- i) Each CP station shall have an independent anode ground bed, which may be of shallow or deep well construction depending upon the data collected by the contractor. Deep well ground beds may also be used in the congested locations where availability of suitable land for spread out ground beds is restricted.
- ii) Ground bed shall be located electrically remote from the pipeline and foreign pipeline/ other buried metallic structures. Nearest part of the anode bed shall at least be 100 meters away from the pipeline and foreign pipeline/ other buried metallic structures. The anodes installed in the ground shall be located in perennially moist strata, wherever possible. Horizontal ground beds shall be at right angles to the pipeline, as far as possible.

The location of ground bed shall be checked and ensured for remoteness from the pipeline and other buried foreign pipelines/structures, building foundations, switchyards, electrical earthing systems, etc.

- iii) Unless otherwise agreed, anodes shall be of high silicon cast iron type or mixed metal oxide coated titanium anodes.
- iv) Sheet steel anode canisters of adequate size shall be provided for each anode. Anode canisters shall be filled with petroleum coke breeze. In case of deep well ground beds non-canistered anodes with petroleum coke breeze in the well surrounding the anodes shall be provided.
- v) Each shallow anode-bed shall contain anodes with canisters positioned horizontally or vertically in the soil with suitable backfill. The depth of anodes (depth of top of anode in case of vertically laid anodes) shall not be less than 2 meter from grade level
- vi) Layout of anode installation in anode bed shall be detailed out in drawings showing anode installation details, anode grouping, anode wiring, anode cable routing, etc. The deep well anode ground bed details shall include the details of anodes, deep well casing, anode positioning, anode cable supporting, deep well gas venting, active, passive portions of the ground bed, etc.
- vii) Anodes shall be supplied complete with tail cables, which shall be long enough for termination on their associated anode lead junction boxes without intermediate joints. Exact lengths and termination details shall be indicated in construction drawings.
- viii) Potential gradient around the anode bed shall be within safety requirements with regard to interference on foreign structures and its effective boundary shall be defined.

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- ix) In case of two parallel pipelines running in the same ROW, the anode ground beds of the respective pipelines shall be located on the respective sides of the pipelines.

#### 7.4 Anode Junction Box

Depending on the size and configuration of anode ground beds, one or more anode junction boxes shall be provided at each ground bed. All cable tails from individual anodes shall be terminated onto the respective anode junction boxes, which shall be further connected to the main anode junction box (where applicable). The main anode junction box shall be connected to the cable coming from CP power source. Each outgoing circuit in main junction box (where applicable) and each anode circuit in junction shall have provision for measurement and control of individual circuit/anode current.

#### 7.5 Cathode Junction Box

Where output of the CP power supply unit is connected to multiple pipelines a cathode junction box shall be provided near the pipelines at the location of connection of the negative drainage cable to the pipelines.

The negative of the CP power source shall be connected to the incoming circuit of the cathode junction box. The junction box shall have separate out going circuit one for each pipeline to collect the negative drainage currents from each of the parallel pipelines.



The incoming circuit shall have a current measurement facility. Each out going circuits shall have provision for measurement and control of current.

#### 7.6 Test Stations



7.6.1 Test stations shall be provided along the pipeline ROW for monitoring the performance of the cathodic protection system at the following locations. Test stations shall be provided at additional locations, if required, so that distance between any two adjacent test stations does not exceed 1000 meters in inhabited areas and 2000 meters in uninhabited areas like forest/deserts:

- i) At all insulating joints.
- ii) At both sides of metallised road crossings.
- iii) At vulnerable locations with drastic changes in soil resistivity .
- iv) At locations of surge diverters, pipeline grounding through polarisation cells, zinc and magnesium anodes.
- v) At EHV/HV AC/DC overhead line crossings and selected locations where EHV/HV overhead line is in the vicinity of the pipeline.
- vi) At railway line crossings and at selected locations along lines running parallel to the pipeline.
- vii) At both sides of major river crossings.
- viii) At EHV/HV cable crossings or along routes where EHV/HV cables are running in parallel.
- ix) In the vicinity of DC networks or grounding systems and HVDC grounding systems where interference problems are suspected.
- x) At crossings of other pipelines/structures.



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- xi) At the locations of reference cell, electrical resistance probe and polarization coupon installation.
  - xii) At the location of computerised test stations.
  - xiii) At both sides of cased crossings .
  - xiv) Locations where interference is expected.
  - xv) At locations of sectionalising valve (SV) stations.
  - xvi) At any other locations considered necessary by Owner/Owner's representative
- 7.6.2 Test stations for bonding shall be provided with shunt and resistor as a means to monitor and control current flow between the pipeline and foreign pipelines or structures that may exist in common ROW.
- 7.6.3 Test stations with current measuring facility shall be provided at each CP station drainage point (to measure pipeline current on anyone side of pipeline from drainage point at intermediate CP station and towards protected side of the pipeline at starting, end point CP stations), at interference prone areas, on both sides of major river crossings, near marshy areas and minimum one for every 10 km max. along the pipeline.
- 7.6.4 Test stations shall be installed with the face of the test station facing the pipeline. The nameplate of test stations shall carry the following minimum information:
- Chainage in km.
  - Test station connection scheme
  - Distance from pipeline in meter.
  - Direction of product flow.
- 7.6.5 Number of terminals and different schemes of wiring shall be as per the test station connection scheme. Minimum twenty percent spare terminals shall be provided in each test station.
- 7.6.6 Minimum two cables from the pipeline shall be provided at any test station.
- 7.6.7 The location of all the test stations shall be marked with their connection schemes and other relevant information on alignment sheets. A detailed test-station schedule shall be prepared.
- 7.7 Permanent Reference Cells**
- 7.7.1 High purity copper/copper sulphate reference cells with proven high reliability shall be provided for stable pipe to soil potential measurement at CP stations, polarization coupons and computerized test station locations along ROW.
- 7.7.2 Silver/Silver Chloride reference cells in place of copper/copper sulphate cells shall be provided at marshy area locations, where water table is high and chloride concentration is more than 300 ppm. The test station connection scheme shall clearly indicate the type of the reference electrode (Cu CUS04/Ag AgCl) at these locations.
- 7.7.3 The life of the reference cells shall be minimum 20 years under the installed conditions.

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7.7.4 The cable from reference cells shall be provided up to CP power source at CP stations and up to test stations at the locations of polarization coupons, computerised test stations. The cable up to CP power source shall be routed through test stations near pipeline.

#### 7.8 **Electrical Resistance Probe**

7.8.1 The electrical resistance probes (E/R probes) utilising the electrical resistance technique shall be provided along the pipeline at marshy areas and at vulnerable locations to monitor the external corrosion activity on the pipeline. The lead-wires of the probe shall be connected to pipeline through test station and terminated inside test station enabling periodic resistance measurement of the probe using a portable probe measuring instrument.

7.8.2 The material of the E/R probe element shall be of the same alloy as of the pipeline material. The probes shall be provided preferably at the bottom portion of pipeline.

7.8.3 Sufficient number of E/R probes, the locations of their installation and the number of portable E/R probe reading instruments shall be provided.

#### 7.9 **Polarisation Cell and Surge Diverter**

##### 7.9.1 **Polarisation Cell**

- i) Where extra high voltage (66 KV and above) transmission line runs in parallel or crosses the pipeline, the pipeline shall be grounded through polarisation cell with zinc galvanic anodes of min. 20 kg net each. Grounding shall be done at regular intervals of maximum 1 km where transmission lines run parallel within 25 metres of the pipeline to control any surges in the pipeline potential that may appear in case of transmission line faults.
- ii) Locations along pipeline where continuous induced over-voltage due to EHV/HV line etc. is expected or observed during commissioning, the pipeline shall be earthed through polarisation cell to the earth system of the EHV/HV tower causing the voltage induction or to a separate earthing system of zinc anodes through polarisation cell.
- iii) Polarisation cell shall be installed inside test station of suitable size.

##### 7.9.2 **Surge Diverter**



Explosion proof spark gap surge diverter shall be provided across each insulating joint to protect it from high voltage surges. surge diverters shall be provided for classified areas.

7.9.3 The total system including cables, cable termination, anodes/surge diverters, polarisation cell shall be suitable for the anticipated fault current at the location of installation.

7.9.4 The surge diverter and polarisation cell system shall be suitable for the design life of permanent CP system. The grounding system shall have minimum resistance to earth to restrict the pipeline voltage as per NACE/VDE criteria but shall not exceed 5 ohms.

7.9.5 The anodes shall be pre packed with special backfill adequately so that the performance of the anode is not affected by the carbonates, bicarbonates, nitrates, etc, present in the soil. In any case, the thickness of back fill shall not be less than 50mm on all the sides of the anode.

7.10 Motor operated valves where located on the cathodically protected portion of the pipeline shall be grounded by a zinc anode of 20 kg net. Magnesium anodes grounding, if any, provided during temporary CP system shall be disconnected. The MOV power supply

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cable armour shall be insulated (by cutting and taping with insulation tape) at MOV end to avoid armour carrying CP current.

7.11 The above ground cathodically unprotected pipeline at terminals, intermediate SV stations, pigging stations, etc. shall be earthed with GI earth electrodes. The resistance to earth of grounding shall be limited to 5 ohms max.

7.12 **Polarisation Coupons**

The steel coupons of pipeline material shall be provided along the pipeline to monitor the adequacy of the CP system to polarize/protect coating holidays. Coupon shall be installed at CP station drainage points, predicted cathodic protection mid points along the pipeline, at locations where the pipeline is bonded to foreign pipeline/structures, interference prone areas, marshy areas and at other locations such that minimum one coupon is installed maximum every 10 km approximately. Coupons shall be installed at bottom 113rd portion of the pipeline and 250 mm away from the pipe surface.

The coupons shall be constructed from the pipeline material and shall have uncoated surface of 100 mm x 100 mm exposed to soil. Two cables one for connection to pipeline for protection and other for potential measurement shall be provided for each coupon. The protection cable shall be connected through a magnetic reed switch inside the test station to enable measurement of coupon 'OFF' potential.

A permanent reference electrode shall be installed adjacent to the coupon in a manner so as to measure the representative potential of the coupon.

Magnets for operation of reed switch shall be provided .

7.13 **Computerized Test Stations**

Computerized test stations shall be provided along the ROW of the pipeline for automatically monitoring and recording the pipe to soil potential, pipe current, etc. of the pipeline, casing pipeline and foreign pipelines, etc, as required. The computer within the test station shall measure and record these parameters regularly at programmed intervals. The computers shall have required number of input ports for measurement of potentials and current as applicable at the location of its installation. Computers shall have real time clock and record the time of data measurement. Each computer shall an identification number incorporated in its software, which shall be clearly indicated along with the data display/print out.



The computers shall be programmed to collect and store all the field parameters at regular intervals.

Data-retrieval computer of portable type suitable for use in field for programming the field computers and retrieving the data stored by the field computers.

7.14 **CP at Cased Crossing**

7.14.1 At cased crossings where casing is coated, the casing shall be protected by sacrificial anode installations provided at both ends of casing. The anode installation shall be sized based on the permanent C.P. design parameters and design life of permanent CP system. At cased crossings where casing is uncoated or painted, additional protection for casing pipes may not be provided.

7.14.2 The carrier pipe inside the painted or coated casing shall be protected by zinc ribbon anodes weld connected to the outer surface of bottom of carrier pipe extending up to hour hand positions of 4 and 8 O'clock. The anodes shall be placed at close intervals as per

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design calculations with minimum one number of anode installed between every two supports provided between carrier and casing. The anodes shall be sized based on the permanent CP design parameters for marshy area and design life of permanent CP system.

7.14.3 Where casing is uncoated or unpainted additional protection for carrier pipe may not be provided.

#### 7.15 Reference Cell Access Points

Reference cell access points shall be provided near insulating joint locations and at SV stations, where the ground is paved, for measurement of pipe to soil potentials. A perforated PVC pipe filled with native soil and buried at the location shall be provided for the purpose. The length of the PVC pipe shall be adequate to reach the native soil below the paving.

#### 7.16 Cables

7.16.1 Cables shall be with annealed high conductivity stranded copper conductor, PVC insulated, 650/1100 V grade, armoured, PVC sheathed conforming to IS 1554 part-I, except for the cables for anode tail, reference cells and pipeline for potential measurements. The size of the copper conductor shall be minimum 35 sq.mm. for anode and cathode cables, 6 sq.mm. for current measurement, 10 sq.mm. for anode tail cables and polarization coupon protection cables. The size of cable for bonding, polarisation cell, grounding anodes and surge diverter connections shall be suitable for the maximum fault current subject to minimum 25 sq mm.

7.16.2 The anode tail cables shall be PE insulated, 650V grade, unarmoured, PVC sheathed and length shall be sufficient for termination on anode lead junction box without any joint in between.

7.16.3 The cables for reference cells, coupon and pipeline potential measurements shall be of 4 sq.mm copper conductor, PVC insulated, Aluminium backed by mylar/polyster tape shielded, PVC sheathed, armoured, PVC over all sheathed type.

1.16.4 The CPTR unit incomer cable shall be minimum 4 sq.mm. Copper conductor, 650/1100 V grade, PVC insulated, armoured, PVC sheathed. The cable shall be of 3 core type for single phase CPTR units and of 4 core type for 3 phase CPTR units.



7.16.5 The cables for connecting various transducers from CPTR unit/CPPSM to telemetry interface junction box shall be twisted pair with individual pair shielded and overall shielded with aluminium backed by mylar/polyster tape, PVC sheathed, armoured, PVC over all sheathed type.

### 8.0 INSTALLATION

#### 8.1 Cable Laying

i) Cables shall be laid in accordance with layout drawings to be prepared by the contractor. No straight through joint shall be permitted. Cable route shall be carefully measured and cables cut to required length. Minimum half metre cable slack shall be provided near anodes, anode junction box, pipeline and test stations to account for any settling.

ii) All cables inside station/plant area shall be laid at a depth of 0.75 metre. Cables outside station/plant area shall be laid at a depth of minimum 1.5 metres. Cables shall be laid in sand under brick cover and back filled with normal soil. For cables

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laid outside the station/plant area, polyethylene warning mats shall be placed at a depth of 0.9 metre from the finished grade, to mark the route. iii) In case of above ground cables, all unarmoured CP cables shall be laid in GI conduits of sufficiently large size, up to accessible height for protecting against the mechanical damage.

- iii) All underground unarmoured cables including anode tail cables shall run through PE sleeves. Distant measurement cables and permanent reference cell cables routed along the pipeline shall be carried at the top of the carrier pipe by securely strapping it at intervals with adhesive tape or equivalent as required.
- iv) PVC pipes of proper size shall be provided for all underground cables for road crossings.
- v) Cables shall be neatly arranged in trenches in such a manner that crisscrossing is avoided and final take-off to equipment is facilitated.
- vi) The cables for reference cells and pipeline potential measurement shall be routed in a separate trench other than the trench provided for the rest of the CP system cables, AC cables for CPTR Units etc.
- vii) The armour of the cables from CP station to test station (potential measurement, reference cell & drainage cables etc.), CP station to ground bed (anode cable) and test station to pipeline shall be earthed only at CP station end and test station end respectively of the cables. The cable armour shall be insulated (by taping with insulation tape) to avoid armour carrying CP current.

## 8.2 Permanent Reference Cells

The permanent reference cells shall be installed in natural soil conditions as per the recommendations of the cell manufacturer. Installations in highly acidic/alkaline soil and soil contaminated by hydrocarbons shall be avoided.

## 8.3 Cable to Pipe Connections

Connections of all cables other than cathode drainage cables to the pipeline or to charged pipelines shall be made by pin brazing. The resistance of the cable to pipe at the pin brazing connection point shall not exceed 0.1 ohm.

The cathode drainage cable shall be connected to a bolt welded to a metal plate, which is weld connected to the pipeline. The material of the plate shall be same as that of the material of the pipeline.



Pipe coating shall be repaired after connection of cable to pipeline. At cathode drainage point the cable joint including the bolt, metal plate and the exposed portion of the pipeline shall be covered by the coating repair material against ingress of water/moisture. The coating repair material shall be compatible with the original coating and shall prevent ingress of water along the cable surface and at the interface of coating repair with the original pipe coating.

## 8.4 Ground Bed Fencing

Chain link fencing shall be provided around the location of each ground bed/anode lead junction box.

## 9.0 FIELD TESTING AND COMMISSIONING



### 9.1 System testing at site

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Field tests as per the reviewed field testing and commissioning procedures prepared by the Contractor shall be carried out on the equipment/systems before these are put into service. Acceptance of the complete installation shall be contingent upon inspection and test results. Field testing shall include but not be limited to the following:

- i) Contractor shall carry out pre-commissioning operations after completion of installation of the system including all pre-commissioning checks, setting of all equipment, control and protective devices. All site tests, reliability and performance tests shall be carried out by Contractor.
- ii) Before the electrical facilities are put into operation, necessary tests shall be carried out to establish that all equipment and devices have been correctly installed, connected and are in good working condition as required for the intended operation. Owner/Owners representative may witness all tests. At least one week's intimation notice shall be given before commencing the tests.
- iii) All tools, equipment and instruments required for testing shall be provided by Contractor.
- iv) Generally, the following minimum tests must be carried out and results shall be recorded:
  - Visual Inspection : Comparison with drawings, specifications, detailed physical inspection and, if necessary, by taking apart the component parts.
  - Testing : Simulation tests of equipment to determine
    - a) Cables
      - Cable No.
      - Voltage grade.
      - Conductor cross section
      - Continuity check
      - Voltage test.
      - Insulation resistance values between each core & earth, between cores (between core and earth for single core cable).

All cables shall be tested by 500 V megger.
    - b) E/R Probe
      - Location/Identification number
      - Checking of wiring as per schematics
      - Resistance reading of probe
      - Installed on top/bottom!side of the pipeline
    - c) Reference Cell
      - Location

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- Type of cell
- Potential reading
- Installed on top/bottom level of pipeline
- d) Insulating joint
  - Location
  - Pipe to soil potential of both protected and non-protected sides of the insulating joint before and after energisation of CP system.
- e) Surge diverter
  - Location/identification number.
  - Rating
  - Type
  - Check for healthiness.
- f) Polarisation Cell
  - Location/Identification number
  - Rating
  - Check for wiring
  - Check standby current drain after CP system energisation. (Current drain with respect to voltage across the cell shall be recorded).
  - Details of grounding provided for the polarisation cell.
- g) Anode Ground Bed
  - Location/Station
  - Check for actual layout and compliance with drawings.
  - Resistance of each individual anode.
  - Current dissipation by each individual anode.
  - Total resistance of complete anode bed.
  - Mutual interference.
- h) Computerised test station
  - Location/Identification number
  - Checking of wiring as per schematics
  - Checking programmed interval for collection of the field data by the computer
  - Type of reference cell

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- i) Polarisation Coupons
- Location
  - Exposed area/size of coupon.
  - Coupon to soil 'ON' and 'OFF' potentials.
  - Type of reference cell.
  - Magnetic reed switch rating.
  - Operation of magnetic reed switch with magnet.

## 9.2 CP Commissioning Procedure



A model commissioning procedure for a three stations CP system of a pipeline is given below for general guidance. Contractor shall develop detailed commissioning procedure as per this guideline.

- i) On completion of installation of anode beds and other systems as envisaged in this specification, they shall be individually checked, tested and compared against the agreed specifications and procedure.
- ii) Electrical continuity of the entire pipeline shall be verified in conformity with design.
- iii) Input resistance of the pipeline at all the drainage points shall be checked and recorded.
- iv) All current measuring test stations shall be calibrated and recorded using portable battery, variable resistances, voltmeters, ammeters, etc. as required.
- v) Temporary protection facilities provided (if any) which do not form part of permanent CP shall be disconnected from the system & removed unless agreed otherwise.
- vi) Anodes provided for grounding at the MOVs on cathodically protected portion of the pipeline shall be disconnected. Sacrificial anode where provided for the protection of the casing pipe at cased crossings shall be disconnected.
- vii) The pipeline shall be allowed to depolarize for at least 72 hours after switching 'OFF' the protection (if any) of all other pipelines in the common ROW.
- viii) Before the pipelines are put on charge by switching 'ON' any of the CP stations, natural pipeline to soil, casing pipe to soil and coupon to soil potential values at all the test stations of the system (coupon to soil potential at the locations of the coupon installations) shall be measured with respect to Copper/Copper Sulphate half cell.
- ix) CP station no.1 shall be energised without put potential adjusted to achieve a maximum pipe to soil potential (PSP) as specified, at the test station nearest to the drainage point. Observations on either spread of protected portion of pipeline and coupons under this CP station shall be taken for PSP values at each of the installed test stations (coupon to soil potential at the locations of the coupon installations). The pipeline current values across the cross section of the pipeline shall also be determined at all the intended test stations influenced by this station.
- x) CP station no.1 shall now be switched 'OFF', CP station no. 3 shall be switched 'ON' and measurement procedure as detailed in clause ix) above shall be repeated.



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- xi) Similarly CP station no. 1 and 3 shall now be switched 'OFF', CP station no.2 shall be switched 'ON' and measurement procedure as detailed in clause ix) above shall be repeated.
- xii) All the CP stations of the system shall be switched 'OFF' and the pipelines shall be allowed to depolarize. All the three CP stations in the system shall then be simultaneously switched 'ON' and PSP values at the drainage points of pipeline shall be brought to a value of maximum PSP as specified and a complete set of observations shall be taken.
- Another complete set of pipe to soil and coupon to soil observations shall be taken after lines have stayed on charge for 48 hours. If there are appreciable differences in these observations as compared to those of earlier set, a third set of observations shall be taken after 72 hours. Maximum drainage point protective potentials shall not be allowed to go beyond the maximum PSP values as specified, in any case.
- Coupon to soil 'OFF' potential shall be measured at all locations of coupon installations by operation of magnetic reed switch in the test station. The PSP of the coupons shall be within the PSP range specified in clause 6 of this document. The output of all CP stations shall then be so adjusted that the sites of occurrence of least negative protective potentials are not less negative than (-) 0.95V (OFF) and sites of occurrence of the most negative protective potential are not more negative than (-) 1.18V (OFF). A full set of pipe to soil, coupon to soil observations shall again be taken 72 hours after the adjustment of potentials and the protection system shall be left in this state of operation.
- xiii) Care shall be exercised to ensure that power supply remains uninterrupted during the period of commissioning. In case of an interruption, the test in progress shall be repeated after allowing time for polarisation. More sets of observations shall be taken in any of the steps specified above, if advised by the Owner/Owner's representative.
- xiv) The zinc anodes for grounding of MOVs at the locations of MOVs on cathodically protected portion of the pipeline shall be reconnected to the MOVs.
- xv) At cased crossings where casing is protected, sacrificial anodes provided for the casing shall be connected to the casing pipe. The casing to soil potential and anode output current shall be measured and recorded. Where casing pipe protection is inadequate or the output current of the anode is more than the designed current, then additional anodes shall be provided as required.
- xvi) PSP values at each of the test stations of the existing pipelines shall be measured, plotted, where existing pipelines run in parallel to the new pipeline, mutual interference situations between the pipelines shall be identified and necessary mitigation measures shall be provided. Interference situations shall also be identified and mitigated by comparing different sets of readings taken at same test stations at different intervals of time under identical conditions where positive potential swing is 100 mV or more.
- xvii) Current readings at all the current measuring test stations shall be measured and recorded.
- xviii) Where computerized test stations are provided the computer shall be initialized /started to collect and store the field data of potentials, current readings, etc as programmed.

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- xix) After one month of starting the computers to collect the field data, the data stored by the computers at all the computerized test stations shall be retrieved/down loaded using the field data-retrieving computer. The data shall be analysed with the help of a station main computer.
- xx) At the locations of the Electrical resistance probe installations the resistance readings of the probes shall be measured using probe reader.
- xxi) Final records of testing and commissioning including graphical representation of final pipe to soil potential readings shall be compiled with interpretation in consultation with Owner/Owner's representative and submitted.
- xxii) If any deficiencies are found in the system, the same shall be rectified by the contractor, at no extra cost or time schedule impact, to the complete satisfaction of Owner/Owner's representative. Such deficiencies shall include mitigation of stray current electrolysis and interference problems that may be found existing in the course of testing and commissioning. A set of PSP observations shall also be taken during the peak of the first dry season after commissioning the system into regular operation. Any deficiency found in the protection of the pipeline shall be rectified by the contractor at his own cost.
- xxiii) If it is found during commissioning that the sites of occurrence of least negative or most negative protective potentials are less negative than (-) 0.95V (OFF) or more negative than (-) 1.18V (OFF) respectively even after 72 hours of operation, then the drainage point potentials shall be adjusted depending upon anode ground bed currents in consultation with Owner/Owner's representative. In any case, the protective 'OFF' potential values of pipeline and polarization coupons shall not exceed the PSP value range specified in cl. 6 of this document, at any location on the pipeline.
- xxiv) The reference cell shall be calibrated minimum once in 24 hours during the commissioning.
- xxv) The current dissipated by individual anodes shall be measured from the anode lead junction box and corrected for equal dissipation to the extent possible keeping the total ground bed current same.

## 10.0 INTERFERENCE MITIGATION

- 10.1 Investigations shall be made for stray current electrolysis of the pipeline, mutual interference between the pipeline and foreign pipelines/structures, interference on foreign pipelines/structures due to the CP of the pipeline and ground bed, interference on metallic structures which lie in between pipeline and ground bed or near to ground bed, AC induction on pipeline due to overhead EHV/HV lines, interference due to high voltage DC lines, HVDC earthing system, electric traction, etc.
- 10.2 Measurements including pipe/structure to soil potentials and pipe/structure currents etc. on the pipeline/structure being CP protected and on foreign pipelines/structures, and ground potential gradient etc. shall be made to investigate the current discharge and pickup locations. In case of fluctuating stray currents, investigations shall be made continuously over a period of time and if required simultaneously at different locations to find out the stray current source(s). Recorders shall preferably be used for long time measurements.
- 10.3 Wherever foreign pipelines which may or may not be protected by an independent CP system run in parallel to the protected pipeline, either in the same trench or very near to

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the protected pipeline and are not bonded to it, investigations shall be performed for current discharge points on both the pipelines.

10.4 Mitigative measures shall be provided depending upon the type of stray current electrolysis/interference. These shall include installation of bond with variable resistor, diodes, installation of galvanic anodes for auxiliary drainage of current, adjustment/relocation (if possible) of offending interference source, provision of electrical shield etc. depending on the type of interference.

10.5 Bonding with foreign pipelines/structures as a mitigation measure shall be provided where the owners of the foreign pipelines/structures have no objection. Otherwise alternative mitigation measures shall be provided. Wherever bonding is provided for mitigation, the bonding resistor shall be adjusted for optimum value for minimum/no interference. Galvanic anodes installed as a mitigation measure shall be adequately sized for the life specified for permanent CP system.

10.6 Where transmission lines cross the pipeline or run in parallel with in or more than 25m from the pipeline, A.C. Voltage measurements shall also be made on the pipeline to find out continuous induction of voltage. In case of the induced voltage being beyond the safe limits, the pipeline shall be grounded to the nearest transmission tower earth system through polarisation cell or to a separate earthing system of zinc anodes of minimum 20 kg net each through polarisation cell.



**11.0 CLOSE INTERVAL POTENTIAL SURVEY**

Where specified, contractor shall carry out a close interval 'ON'/'OFF' potential survey over the entire length of pipeline by computerised potential logging method and identify the under protected/over protected area, any major coating damage on the pipeline, after the backfilling has been consolidated sufficiently and CP system has stabilized. Contractor shall provide required mitigation measures and rectify the under/over protected zones, identify if any, the major pipeline coating defects, required to be repaired. During the survey the reference cell shall be calibrated minimum once in 24 hours. Detailed procedures for running this survey shall be submitted for review.



Additional tests for detailed identification of coating defects shall be conducted by the contractor.

**12.0 DEVIATIONS**

12.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.



 <p>पी डी आई एल <b>PDIL</b></p>	<p><b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b>  <b>TALCHER FERTILIZERS LIMITED</b>  <b>TECHNICAL SPECIFICATION - UPS SYSTEM (PC150-TS-0821)</b></p>	PC150/E/121/SecVI-4.0	0	
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## TECHNICAL SPECIFICATION UNINTERRUPTED POWER SUPPLY

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## 1.0 SCOPE

- 1.1 The specification covers the design, manufacture, testing at works and despatch in well packed condition of Uninterrupted Power Supply System required to supply AC power for non linear loads (i.e. instrumentation loads).
- 1.2 The scope shall include the following:
- i) Full wave controlled rectifier
  - ii) Inverter
  - iii) Static switches
  - iv) Storage battery
  - v) Static voltage stabilizer for bypass supply
  - vi) Manual bypass switches
  - vii) Isolation / output transformer to achieve desired output voltage
  - viii) UPS Distribution Boards
  - ix) Interconnecting cabling between various units of UPS
  - x) All other items required, but not specified for safe and reliable operation of UPS system.

## 2.0 STANDARDS TO BE FOLLOWED



- 2.1 The equipment shall conform to the latest issue of the following and relevant Indian Standard specifications Equipment complying with equivalent IEC standards shall also be acceptable.
- IS-13314 - Solid state inverters run from storage batteries
  - IS-11260 - Stabilized power supplies AC output
  - IEC-146 - Solid state inverters
- 2.2 The equipment shall also conform to the provision of Indian Electricity Rules, Indian Supply Act and any other statutory regulations in force from time to time.

## 3.0 AMBIENT CONDITIONS & ELECTRICAL SYSTEM CHARACTERISTICS



These shall be as specified in the enclosed Design Philosophy - Electrical.

## 4.0 DESIGN AND OPERATIONAL REQUIREMENTS

- 4.1 The UPS unit and its associated equipments 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 UPS system shall be based on latest generation of IGBT based, pulse width modulated (PWM) design with proven performance. The basic scheme required for UPS system shall be as indicated in Block diagram in this specification.
- 4.3 The UPS shall have Redundant Scheme with Bypass. Under normal operating conditions, both inverter units should run in parallel sharing 50% load in synchronism with by-pass power and supply uninterrupted A.C. power to load. On failure of one of these inverters, the faulty inverter should get automatically disconnected from the load and healthy inverter should supply 100% load in synchronism with by pass supply. In the event of second inverter also developing a fault, a no-break load transfer to standby power supply should take place through static switch.



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- 4.4 Output frequency of the inverters must remain synchronised to one another which in turn shall be synchronised to the standby power supply frequency provided the latter does not vary by more than +3% to -5%. It should be possible to change the setting of frequency range of synchronism between above limits by frequency selector switch. Outside these limits inverter should desynchronise with the bypass and run at its own frequency. When running at its own frequency, frequency variation shall be maintained less than  $\pm 1.0\%$ . Resynchronisation with bypass power supply must take place automatically with some time delay when frequency comes back to +3% to -5% range. Change-over from inverter to bypass or bypass to inverter shall also be possible in desynchronised mode of operation. Change-over time in both synchronised and desynchronised mode operation shall be indicated.
- 4.5 The UPS unit shall be suitable for 0.7 lagging to unity power factor. The overall power factor may be taken as 0.8 lagging.
- 4.6 The maximum waveform distortion of the output voltage shall not exceed 5% r.m.s. for linear loads and 10% r.m.s for non-linear loads. The UPS unit shall be suitable for operation for non-linear loads having crest factor of 3.
- 4.7 The inverter steady state output voltage and frequency (free running) variation shall not exceed  $\pm 1\%$  for specified input power supply condition and no-load to full load condition.
- 4.8 Voltage dip / rise on sudden application / throw of 100% load or on changeover from inverter to bypass or vice versa shall not exceed 15% and shall be recovered within 100 m. sec. to rated voltage.
- 4.9 UPS shall be designed for overload of 125% for 10 min. and 150% for 10 sec. after which drooping characteristic shall come into operation.
- 4.10 On failure of the main supply, inverter unit shall continue to supply rated load from the battery bank for two hours duration.
- 4.11 Charger shall simultaneously supply entire power necessary for inverter and to keep the battery of required capacity in fully charged condition. Provision for automatic charging in both float and boost shall be made.
- 4.12 Battery shall be Nickel-Cadmium or Lead Acid Plate tubular positive plate or VRLA type. The battery capacity shall be decided considering load power factor as 0.8, derating factor for ageing 0.8 and derating for minimum ambient temperature as applicable.
- 4.13 The ventilation fans, if provided shall be fully redundant and connected to the output from the inverter and an audio-visual alarm shall be provided on its failure. It shall be possible to operate inverter for about half an hour even after the failure of the fan without temperature rise inside the inverter cubicle exceeding the safe operating temperature limits.
- 4.14 In case of inverter failure due to any reason or overload, affected unit shall be isolated and changeover to other inverter or to bypass shall take place automatically.
- 4.15 Noise level at a distance of 1m from UPS panels shall not exceed 60 dB.
- 4.16 UPS system shall be provided with necessary control, protection, metering, indication, alarm & annunciation for reliable and safe operation of the system. The suggestive list is indicated in Annexure-II.
- 4.17 All semi-conducting devices shall be protected by fast acting semi-conducting fuses. These fuses shall be co-ordinated with load side HRC fuses.

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- 4.18 The battery may be taken out of service for maintenance during which period it shall be possible for the inverter to continue operation taking power from the rectifier. The input filter of the inverter shall be suitably designed to take care of this operational requirement.
- 4.19 It shall be possible to vary the output voltage steplessly within  $\pm 5\%$  of the specified output voltage. This adjustment shall be possible to be made when UPS is in operation.
- 4.20 UPS system shall be suitable for both floating output and earthing of one leg in case of single phase system / star-point in case of three phase system.
- 4.21 The UPS system shall have very high system of reliability having minimum MTBF of 50,000 hrs. Vendor shall furnish the value of MTBF, MTTR & availability factor.
- 5.0 CONSTRUCTIONAL DETAILS**
- 5.1 The equipment shall preferably be supplied in enclosed, dust & vermin proof, floor mounted, sheet steel enclosure. In case, it is necessary to provide opening for ventilation, this should be closed by fine mesh. Minimum degree of protection for enclosure shall be IP-43 as per IS/IEC-60947.
- 5.2 Enclosure shall be fabricated with cold rolled sheet annealed steel of minimum thickness 2.0 mm.
- 5.3 The door hinges shall be concealed type. The doors and the removable covers shall be provided with non-deteriorating neoprene gaskets without any discontinuities. Gaskets shall be held in position in groove in shaped sheet steel work or these shall be of U type.
- 5.4 All external hardware shall be cadmium plated steel. Hardware for fixing the removable parts shall be provided with retaining devices.
- 5.5 Panels shall be liberally designed. All components shall be so mounted that they are easily accessible for inspection and maintenance.
- 5.6 UPS unit shall preferably have separate panels for each rectifier inverter units, bypass supply, distribution boards etc. Various panels of UPS except distribution boards shall be mounted side-by-side & bolted together to form compact assembly.
- 5.7 Distribution boards shall be of fixed type single front execution in fully compartmentalised design and divided into distinct panels each comprising of bus-bar chambers, individual feeder modules and vertical cable alley.
- 5.8 Mounting height of components requiring operation and observations shall not be lower than 300 mm and higher than 1800 mm.
- 5.9 All the live parts which are accessible after opening the front cover / back cover shall be properly insulated or provided with insulating barrier to prevent accidental contact. Bus bars of distribution boards shall be PVC sleeved.
- 5.10 Nameplate consisting of black Perspex with white engraving shall be provided for each panel and for each equipment mounted on the front of the panel. Suitable label identification for each component mounted inside the panel shall also be provided.
- 5.11 All the wirings shall be properly laid and ferruled at both ends. PVC channels may be used for wiring. For control wiring, minimum 1.5 sq. mm copper conductor shall be used.
- 5.12 The power connections shall be made by PVC insulated flexible copper cables or taped copper / aluminium strip.





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- 5.13 All power & control cables shall enter from the bottom.
- 5.14 Removable bolted aluminium gland plate, heavy duty compression type rolled aluminium cable glands, crimping type aluminium cable lugs for Al. cables and copper cable lugs for Cu. cables, pressure clamp / bolted type terminals etc. shall be provided for each incoming and outgoing cable.
- 5.15 Terminal blocks shall be grouped according to circuit functions and suitably numbered. 20% extra terminals shall be provided in the terminal block.
- 5.16 A suitably sized earth bus shall be provided at the bottom of panel with provision for earth connection at both ends to purchaser's earth grid.
- 5.17 All panels shall be of same height so as to form a bank which shall give good aesthetic appearance.

## 6.0 COMPONENT DETAILS

- 6.1 All components shall conform to relevant IS / IEC standards and shall be of reputed make. Makes of all components shall be subject to owner's / consultant's approval.
- 6.2 **Thyristors, diodes and transistors**  
The thyristors, diodes and transistors shall have adequate safety margins to withstand specified operating conditions. A factor of safety of minimum 4 shall be taken against voltage surges.
- 6.3 **PCBs**  
All electronic control & monitoring printed circuit cards shall preferably be modular plug in type. Monitoring points shall be provided in each of the PCB, PCBs shall be firmly clamped in position so that vibration or long usage does not result in loose contacts. Failure of each PCB shall be indicated by visual alarm and indication. The visual fault diagnostic shall preferably indicate fault into various sections of the card.
- 6.4 **Transformers and Chokes**  
All transformers and chokes shall be of dry type and air cooled. This shall be class 'H' insulated, vacuum impregnated. Class B insulated cast resin transformers and chokes shall be also acceptable.
- 6.5 **Electrolytic Capacitors**  
These shall be polarised aluminium type I, suitable for long life and category I, as per IS-4317 or equivalent IEC. The capacitor shall preferably be self healing type. These shall be so located in inverter panels that the operating temperature does not exceed 65°C maximum.
- 6.6 **Instruments**  
Ammeters & voltmeters shall be moving coil type of class 1.5 accuracy as per IS-1248. These shall be flush mounting type of minimum size of 96 mm x 96 mm and shall have taut band scale of 240°. Frequency meter shall be of reed type having range of 45 Hz to 55 Hz.
- 6.7 **Static Switches**  
Static switches shall be naturally commutated type with parallel inverse connected thyristors. These shall be rated for continuous duty for 100% load. Short time rated static switches are not acceptable.
- 6.8 **Voltage Stabilizer**  
Voltage stabilizer shall be static type and shall satisfy the following requirements:
- i) Maximum output voltage variation under steady state condition shall be  $\pm 3\%$ .
  - ii) Maximum harmonic distortion shall be less than 5%.

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iii) The output voltage shall be restored within  $\pm 2\%$  of nominal value in less than 2 secs.

#### 6.9 **Battery**

Battery along with accessories shall conform to Engineering Standard ES-0814.

#### 6.10 **Indication Lamps**

All indication lamps shall be of LED type suitable for the specified control voltage, having minimum illumination of 40 milli candela. The colour of the LEDs shall be as follows:

ON	:	Red
OFF	:	Green
FAULT	:	Yellow

#### 6.11 **Moulded Case Circuit Breakers**

For isolating devices of various equipment, moulded case circuit breakers shall be used. These shall be provided with overload and short circuit protective devices and shall conform to IS 2516.

### 7.0 **PAINTING**

7.1 The enclosure after suitable pre-treatment shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.

7.2 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.

7.3 Unless otherwise specified, the finishing shade shall be light grey shade no.631 as per IS: 5.

7.4 Electrostatic powder paint shall be preferred.

### 8.0 **TESTS AND INSPECTION**

8.1 The UPS units shall be subjected to type & routine tests as per relevant standards.

8.2 All the relevant 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.

8.3 These inspections, shall, however, not absolve the vendor from his responsibility for making good any defects 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 description written boldly.

- Name of client
- Name of consultant
- Enquiry / order number with plant / project name
- Equipment Code no. & Description

### 10.0 **SPARES**

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- 10.1 Spares for operation and maintenance  
Item wise unit prices of spare parts shall be quoted.
- 10.2 Commissioning Spares  
Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.
- 10.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.
- 10.4 All spare parts shall be identical to the parts used in the equipments.
- 11.0 PACKING**
- 11.1 The board shall be properly packed before despatch to avoid damage during transport, storage and handling.
- 11.2 The packing box shall contain a copy of the installation, operation and maintenance manual.
- 11.3 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.
- 12.0 DEVIATIONS**
- 12.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

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**ANNEXURE - I**



**DOCUMENTATION FOR UNINTERRUPTED POWER SUPPLY**

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.	Block Diagram	N	Y	Y
4.	General Arrangement drawings and foundation plan	N	Y	Y
5.	Calculation for battery sizing	N	N	N
6.	Feeder Details for Distribution Boards	N	Y	Y
7.	Descriptive literature and catalogues	N	N	Y
8.	Bill of materials	N	Y	Y
9.	Schematic & Wiring Diagram	N	Y	Y
10.	Installation, operation & maintenance manual	N	N	Y
11.	Spare parts list with identification	N	N	Y
12.	Test Certificates	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

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## ANNEXURE – II

### METERING INDICATIONS AND ALARM SCHEDULE

#### A. METERING



1. Incoming Voltmeter with selector switches for each incomer
2. Ammeter with selector switches for each incomer
3. Ammeter & Voltmeter at each inverter output and bypass output.
4. Frequency meter & power factor meter at one common point of output
5. Ammeter & Voltmeter at incoming of each UPS distribution boards
6. Ammeter at each rectifier output
7. Battery charge / discharge meter

#### B. LED INDICATION

1. A.C. Mains 'ON'
2. Rectifier output 'ON'
3. Load on inverter
4. Load on bypass
5. Inverter synchronised to mains
6. Battery on float
7. Battery on boost
8. Fault (one lamp for all types of fault)



#### C. AUDIO-VISUAL ALARM (with Accept, Reset & Test facilities)

1. Mains failure
2. Rectifier failure
3. Inverter output over voltage
4. Inverter output under voltage
5. Inverter fuse failure
6. Rectifier fuse failure
7. Fan failure
8. Inverter temperature high
9. Static switch failure
10. Bypass input failure
11. Inverter desynchronised

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## TECHNICAL SPECIFICATION

### SOFT STARTER

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## 1.0 SCOPE

- 1.1 This specification covers the general requirements for design, manufacture, assembly, inspection and testing at the vendor's works of high voltage indoor soft starters above 1100V grade.

## 2.0 STANDARDS TO BE FOLLOWED



- 2.1 The equipment shall conform to the latest issue of relevant Indian/IEC Standard specifications. Equipment complying with equivalent IEC standards shall also be acceptable.

## 3.0 GENERAL TECHNICAL REQUIREMENTS

### 3.1 Design features

- (1) The thyristorised starter shall be used for starting of large induction motors.
- (2) The soft starter shall give an excellent voltage control during soft starts, smooth steeples acceleration.
- (3) The soft starter shall be used during starting for smooth and stepless acceleration only. Once motor gains its full speed bypass vacuum contactor shall be operated to bypass thyristors. The thyristor shall be short time rated (2 min.).
- (4) The soft starter drive shall consist of the following.
  - Isolation vacuum contactor.
  - Bypass vacuum contactor.
  - Thyristor unit.
  - Motor protective devices.
  - Indicating / Metering / Control circuits and accessories.
  - Cooling / ventilation equipments / accessories.
- (5) Soft starter shall have following minimum in built protection and alarm, but not limited to,
  - Electronic over load.
  - Line fault.
  - Under voltage.
  - Over voltage.
  - Stall.
  - Phase reversal.
  - Open gate for thyristor.
  - Over temperature for thyristor.
  - Over load for thyristor.
- (6) Soft starter panel shall be provided with following indicating, metering and control devices.
  - Motor starting / protection devices.
  - Selector switch – Auto / Manual.
  - Start / Stop push buttons for manual operation.
    - Input voltmeter and ammeter.



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- Meters to indicate power in MW.
  - Current and potential transformers.
  - Auxiliary relays.
  - Audio-visual alarms / fault indicators.
  - Alarm acknowledge / reset / test push buttons.
  - Provision for wiring external sequential / process interlock / signals for starting / running / tripping.
  - Terminals for remote control / indication.
  - Space heater and ventilating fans / cooler, if required.
- (7) Starting Current shall be limited to Maximum 250% of Full Load Current.
- (8) The arc proof panels shall Type Tested approved in compliance with IEC 62271-200 in accordance with classification IAC-A-FLR minimum time duration of 1 sec.

### 3.2 Performance requirement

Soft starter panel shall be designed for operation at design temperature of 46°C. Vendor shall provide the necessary arrangement within the panel for satisfactory operation of soft starter.

### 3.3 Construction

- (1) Soft starter panel shall be industrial type (Non-hazardous), totally enclosed, dust and vermin proof, floor mounted, free standing cubicle type of construction confirming to the degree of protection as specified in data sheet.
- (2) Enclosure and partitioning of the cubicles are of high quality zinc coated steel sheets (frame and front door 2.5mm). Access to the cabinet front will be prevented by a locked, pressure resistant door. Door can be opened up to 170°.
- (3) Each cubicle of the switchboard is divided in various compartments both for Medium Voltage power equipment (busbars, fused contactor, soft starter instrument transformers) and for Low Voltage control and auxiliaries (instrument compartment, wiring ducts for interconnections) which are segregated by metal partitions.
- (4) The panel cubicle shall comprise rigidly welded structural frame enclosed completely by sheet steel of minimum 14 SWG (cold rolled) thickness, smooth finished, leveled and free from flaws. All doors and removable covers shall be provided with neoprene gasket all around to make the cubical dust and vermin proof.
- (5) The panel shall be provided with bottom sheet steel plates of minimum 2mm thick. Panel shall be fitted with removable gland plates of sufficient thickness at the bottom of the panel for fixing cable glands for power and control cable termination. Sufficient space shall be provided for termination of power cable sizes, as specified in data sheet.
- (6) Louvers shall be provided at front, rear, top and bottom of the panel to dissipate heat developed inside.
- (7) Degree of protection shall not be less than IP 4X.
- (8) Panel shall be fitted with a label and serial number on the front and rear. In addition, panel shall be fitted with a label indicating panel designation and rating. All devices shall be provided with separate labels to indicate the function and also device numbers as marked in wiring diagrams.
- (9) Main equipment of the panel shall be accessible for maintenance from the front and rear. All insulating material shall be flame resistant, non-hygroscopic and antitracking.

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(10) All hardware's used inside the panel shall be zinc passivated or cadmium plated.

#### 4.0 EQUIPMENT SPECIFICATIONS

##### 4.1 HT Fuses

- (1) High voltage fuses shall be of HRC link type for the 3.3 KV voltage and shall comply with the requirements of relevant standards.
- (2) The fuse link shall have a striker pin for indication and also for trip mechanism.
- (3) It is vendor's responsibility to precisely co-ordinate these fuses with contactors and upstream protective devices in the same system and shall be adequately rated for short circuit capacity.
- (4) The type of fuse chosen by vendor shall subject to approval by the purchaser. Vendor to furnish fuse prearcing time shall be furnished by along with the offer.
- (5) Thyristor units shall be protected by fast acting semiconductor fuses



##### 4.2 Vacuum contactors

- (1) Vacuum contactors of adequate rating for the compressor motor starting at 3.3 kV Voltage to match the bypass & isolation application and shall conform to relevant India / IEC standards.
- (2) Vacuum contactor shall be provided with properly designed and co-ordinated HRC fuses as mentioned in clause no. 3.1 above.
- (3) AC or DC operating coil for the contactor shall be informed to vendor at later stage. This operating coil shall be rated to operate satisfactorily between 80% and 110 % of the rated voltage. The contactor shall not drop out, if the voltage drops to 70% of rated voltage shall make arrangements to derive the auxiliary power, using necessary control transformer, for operating the contactor.
- (4) The vacuum contactors shall have exclusively for Purchaser's use minimum 1 NO & 1 NC auxiliary potential free contacts, rated for 10 amps, 240V AC and 0.5 Amp (inductive breaking) 220V DC or as specified and shall be wired upto the terminal blocks.

##### 4.3 Instrument transformers

- (1) The current transformers and Voltage transformers shall conform to the requirements stipulated in relevant standards. It shall vendor's responsibility to ensure adequate size of CT & VT
- (2) The CTs & VTs shall be of cast resin type (insulation class "E" or better) and shall be able to withstand the thermal and mechanical stress resulting from the maximum short circuit and momentary current ratings of the switchgear.
- (3) CTs shall have polarity mrks on each transformer and at the associated terminal block Facility shall be provided for short-circuit and earthing the CT secondary at the terminal blocks.
- (4) VTs shall be protected on the primary side by limiting fused and by MCBs on secondary side with 9kA interrupting ratings.
- (5) The MCBs shall have min 1 NO + NC auxiliary potential free contacts, for annunciation and interlocks.
- (6) CTs shall withstand specified system fault current for 1 sec.

##### 4.4 Measuring and recording instruments

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION – SOFT STARTER (PC150-TS-0822)</b>	PC150/E/121/SecVI-4.0	0	
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- (1) Microprocessor based measuring and recording instruments shall be provided. The unit shall have RS-485 port at the output for serial communication.
- (2) These instruments shall be standalone type, shall be configurable and shall be compatible with higher level computer.
- (3) The instrument shall be rectangular in shape and not greater than 150mm (W) x 150mm (H). The accuracy class shall be as per IS or international standards.

#### 4.5 Protection and control

The functions of protection and control of the Soft Starter shall be performed by a dedicated digital microprocessor control module. The control module shall include fiber optic control and communication.



#### 4.6 Control wiring and terminals

- (1) Feeders for Control (DC) / Auxiliary supply shall be provided at one point of the panel and voltage level shall be as specified in data sheet. Terminals to receive AC/DC control and auxiliary power shall be provided in cubicle and the terminals shall adequately rated (min. 20A).
- (2) Adequate rated 2 pole MCBs shall be provided for each of the AC/DC control circuits.
- (3) Internal wiring shall be done with 650V grade PVC insulated, stranded copper conductor of minimum size 2.5mm<sup>2</sup> size.
- (4) Separate colour coding shall be used for AC / DC control and power circuits and earth wire.
- (5) All incoming and outgoing and control wire connection shall be wired to adequately rated (min.20A), elmex type terminal blocks about 20% spare terminals shall be provided in cubicle. All terminals shall be easily accessible.
- (6) All wire shall be bunched together and routed through wire ways inside cubicle.
- (7) Separate schematics, wiring diagrams and termination schedule for external and internal cable/wire connections shall be furnished by the vendor. External connections shall include Purchaser's remote equipment, which will be furnished by Purchaser to the successful vendor.
- (8) Low watt consumption LED type indicating lamps shall be provided.
- (9) All wires, terminals and all other devices shall be provided with appropriate ferrules to correspond with wiring diagrams, for circuit identifications Termination lugs to be provided wherever necessary.

#### 5.0 EARTHING

- (1) An earth bus having cross section as specified in data sheet A shall be provided and extended through the length of the panel. All electrical equipment shall be connected to this earth bus.
- (2) Suitable clamp type terminals with hardware at each end of the panel shall be provided to suit the size of the OWNER's earthing conductor of size 75 x 10 mm GI
- (3) Hinged doors shall be earthed through flexible copper brand of adequate size paint at earthing points shall be removed for proper contact star washers for door earthing are not acceptable.
- (4) Bolted joints, splices, taps. etc to the earth bus shall be with at least two bolts

#### 6.0 NAME PLATES AND RATING PLATES

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES</b> <b>TALCHER FERTILIZERS LIMITED</b> <b>TECHNICAL SPECIFICATION – SOFT STARTER (PC150-TS-0822)</b>	PC150/E/121/SecVI-4.0	0	
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### 6.1 Name plate

- (1) Nameplate with engraved letters shall be provided for both front and rear side of panel function of every instrument, relay fuse etc shall be indicated by labels fixed near each device.
- (2) Non-corrosive name plates shall be manufactured in anodized aluminium sheet and the letters shall be engraved on black lettering on white background. The name plates/labels shall be held in position by self-tapping screws.
- (3) All devices mounted inside the cubicle and instruments etc., shall be identified by marking the device numbers inside cubicle as per the wiring drawing.

### 6.2 Rating plates

- (1) The panel shall have a rating plate fixed to the non-removable part of the enclosure.
- (2) All electrical equipment like VTs, CTs, etc and all other electrical devices shall be provided with rating plate made of stainless steel which can be easily seen.
- (3) The rating plates shall give all the relevant information as specified in relevant standards.
- (4) Danger boards, caution boards, operating instruction plates, shall be fixed to panel as per the standard engineering practice and regulations.

## 7.0 ACCESSORIES

### 7.1 Heater

Soft starter panel shall be equipped with space heaters to prevent moisture condensation within the enclosure and shall be suitable for continuous operation on 240V, 1 phase, 50 Hz AC supply. The space heaters shall be controlled through thermostats. Supply for motor space heater shall be brought to separate terminals in respective cubicle.

### 7.2 Cooling

Soft starter panel shall be provided with necessary ventilation / cooling equipment's for smooth operation of soft starter at given design temperature.

### 7.3 Plug Point

A 240V, 1 phase, 50Hz AC plug point shall be provided in the interior of each cubicle with an on-off switch.



## 8.0 PAINTING

- (1) The enclosure after suitable pre-treatment shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.
- (2) 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.
- (3) Unless otherwise specified, the finishing shade shall be light grey shade no.631 as per IS: 5.
- (4) Electrostatic powder paint shall be preferred.

## 9.0 TESTS AND INSPECTION

9.1 The Soft Starters shall be subjected to type & routine tests as per relevant standards.

9.2 All the relevant 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.

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9.3 These inspections, shall, however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.

## 10.0 Documentation

10.1 Following Minimum Drawings & Document shall be submitted :

- single line diagram with front view of the switchboards complete with overall dimensions (as built)
- circuit diagrams per typical units
- foundation drawings complete with fixing system and floor openings (as built)
- installation and maintenance manual of the switchboards and main equipment
- test certificates of the switchboard

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
- Equipment Code no. & Description

## 11.0 SPARES

11.1 Spares for operation and maintenance

Item wise unit prices of spare parts shall be quoted.

11.2 Commissioning Spares

Commissioning spares, as required, shall be supplied with the main equipment. Item wise list of recommended commissioning spares shall be furnished for approval.

11.3 Any other spare parts not specified, but required, shall also be quoted along with the offer.

11.4 All spare parts shall be identical to the parts used in the equipments.

## 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.

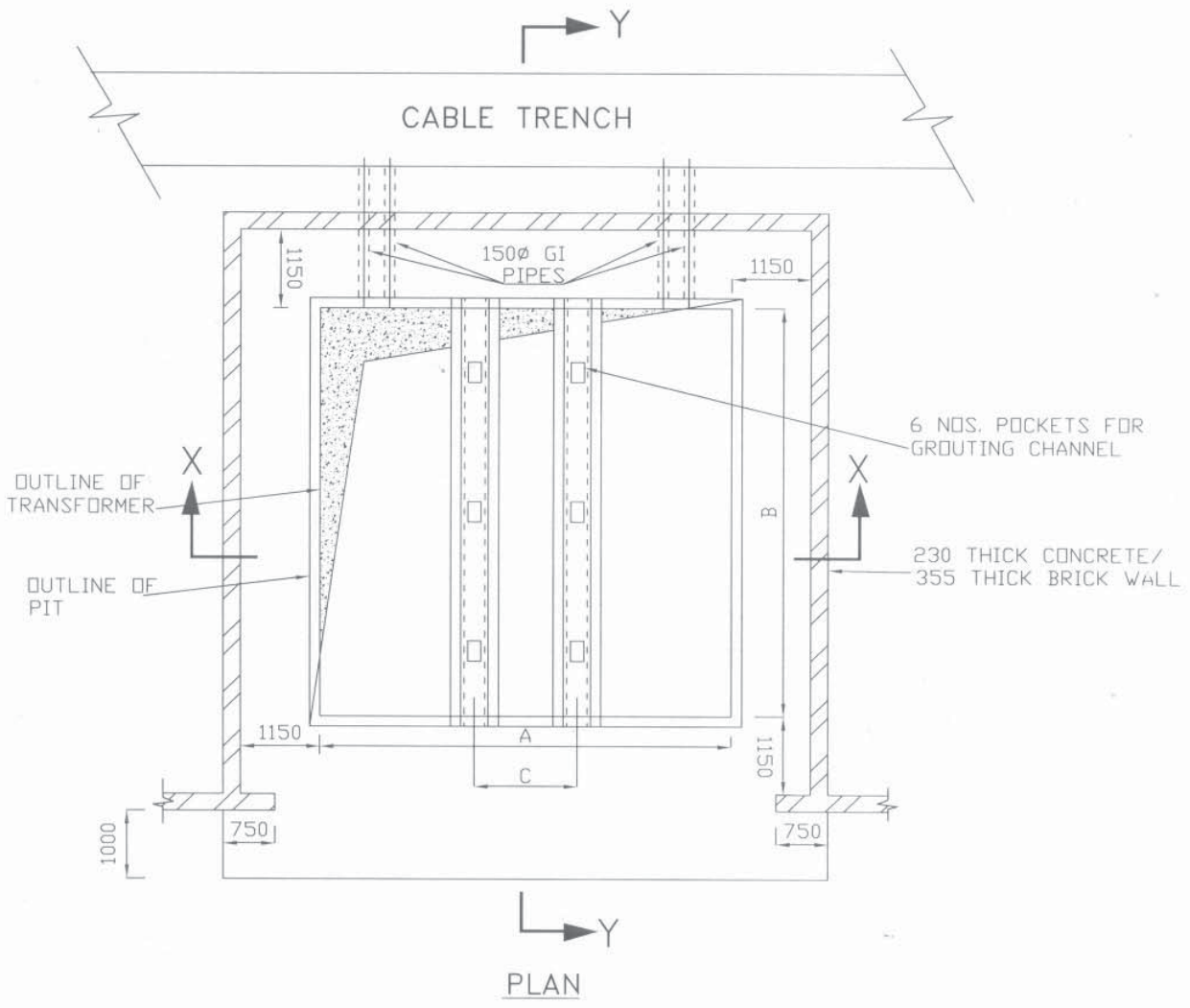
## 13.0 DEVIATIONS

13.1 Deviations, if any, from this standard shall be clearly indicated in the offer with reasoning.

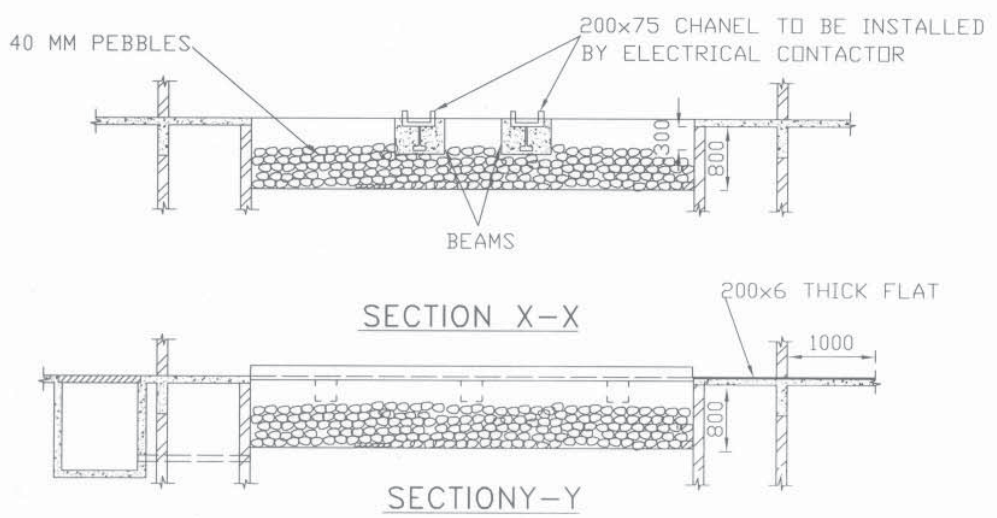


# FOUNDATION DETAIL OF 11/.433 KV TRANSFORMER

PC150 PDS: E113	0
DOCUMENT NO.	REV
SHEET 1 OF 1	

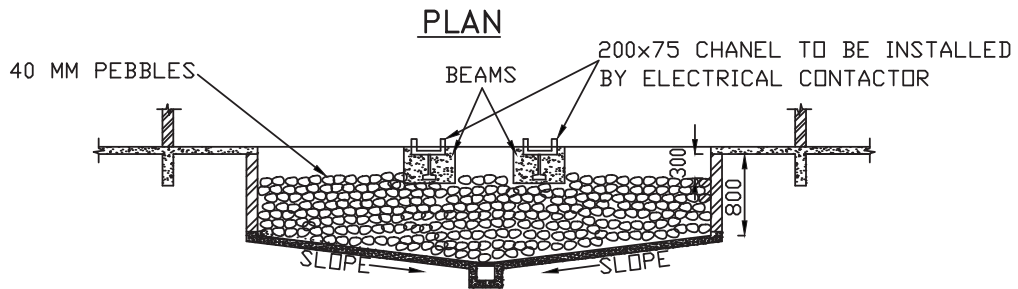
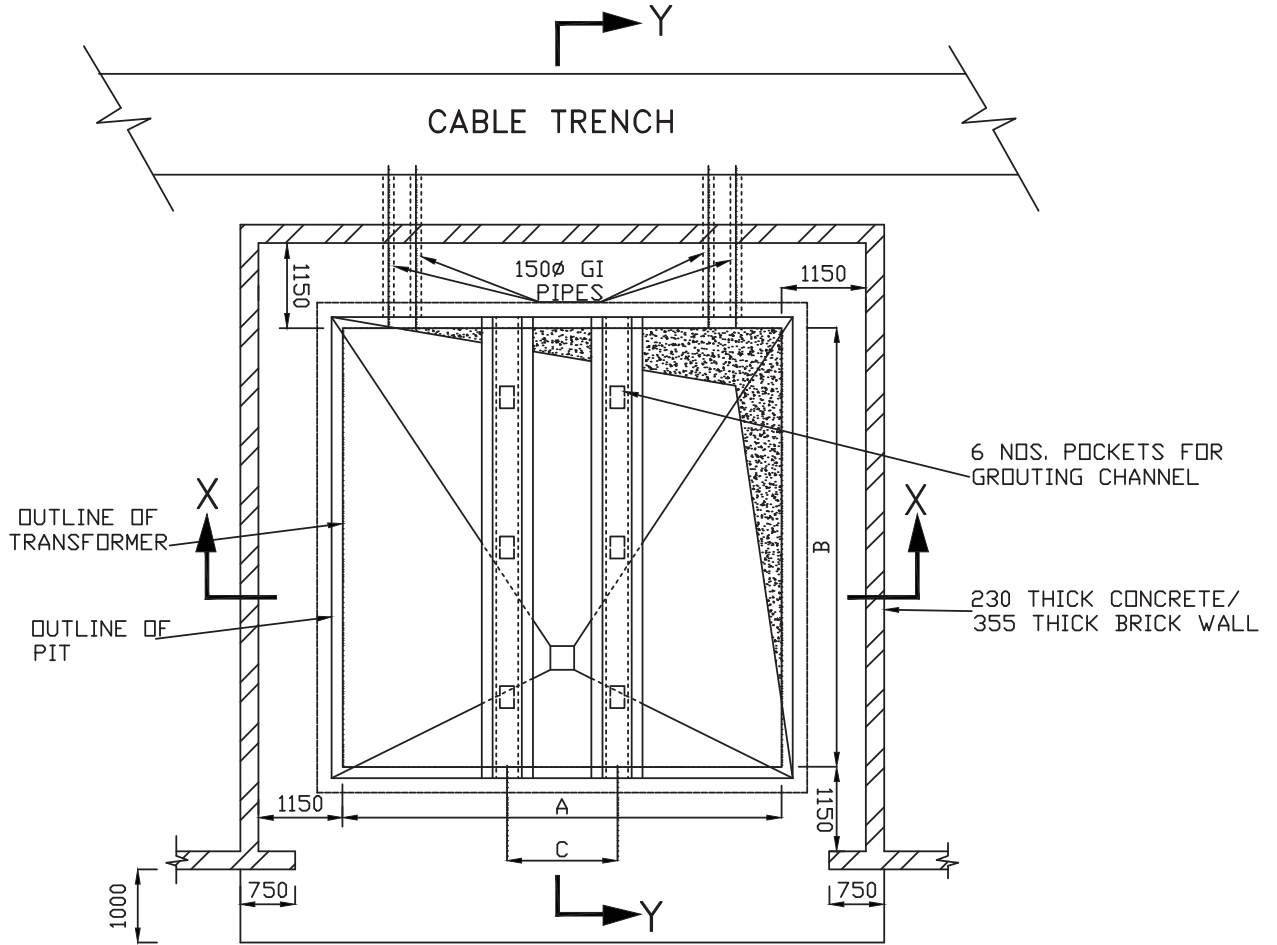


TYPICAL DETAIL OF 11/.433KV T/F

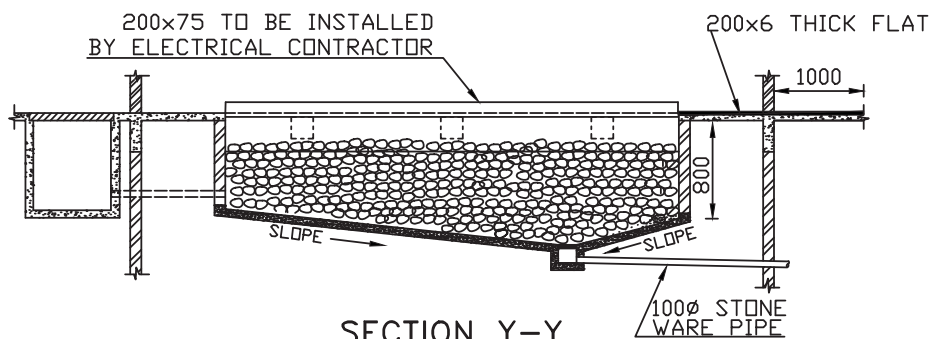


NOTE :

TRANSFORMERS RATED ABOVE 10MVA SHALL BE MOUNTED ON 200MM x 8MM THICK PLATES.



SECTION X-X



SECTION Y-Y

NOTE :

TRANSFORMERS RATED ABOVE 10MVA SHALL BE MOUNTED ON 200MM x 8MM THICK PLATES.



TYPICAL DETAILS OF  
TRANSFORMER ROOM DOOR

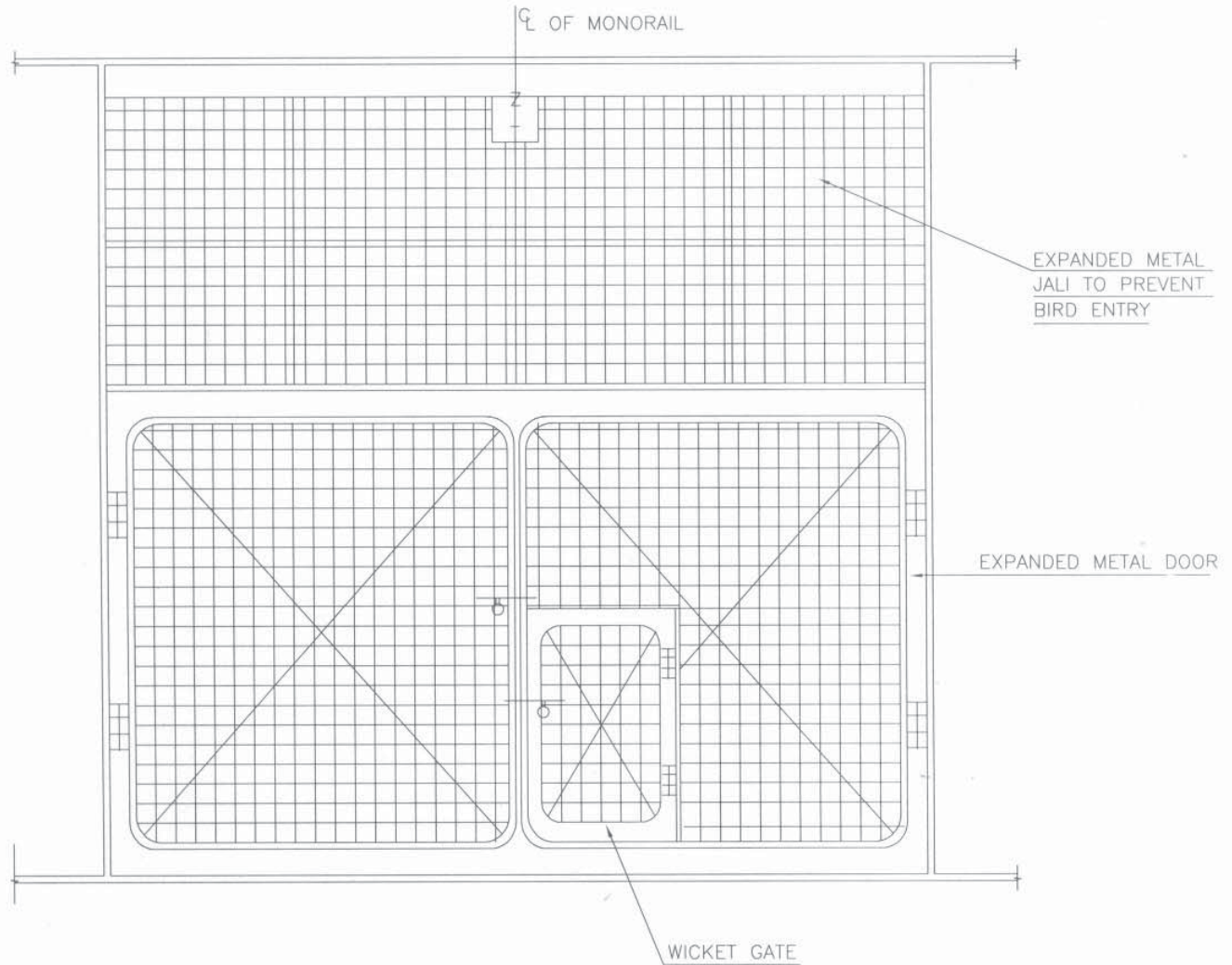
PC150- E 115

0

DOCUMENT NO.

REV

SHEET 1 OF 1



NOTE :-

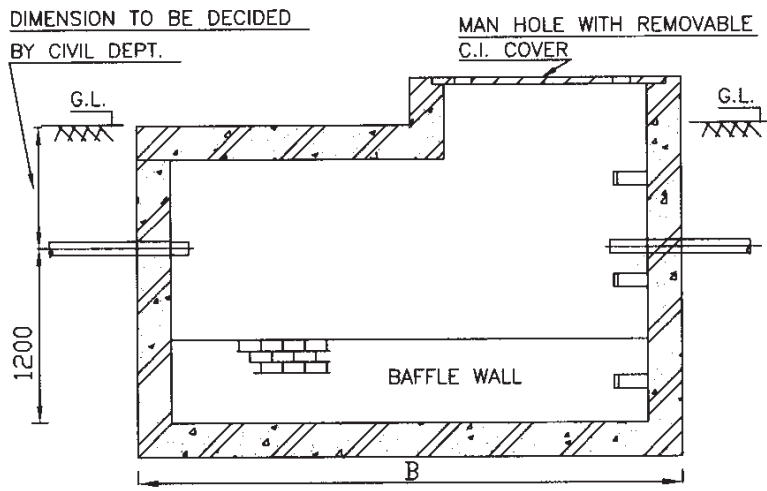
1. THIS STANDARD IS INDICATIVE ONLY, THE EXACT DIMENSIONS SHALL BE DECIDED AS PER TRANSFORMER SIZE & SUB-STATION LAYOUT.
2. TRANSFORMER GATE HEIGHT SHALL BE 250MM MORE THAN THE TRANSFORMER HEIGHT AND SHALL BE OPENABLE OUTSIDE.



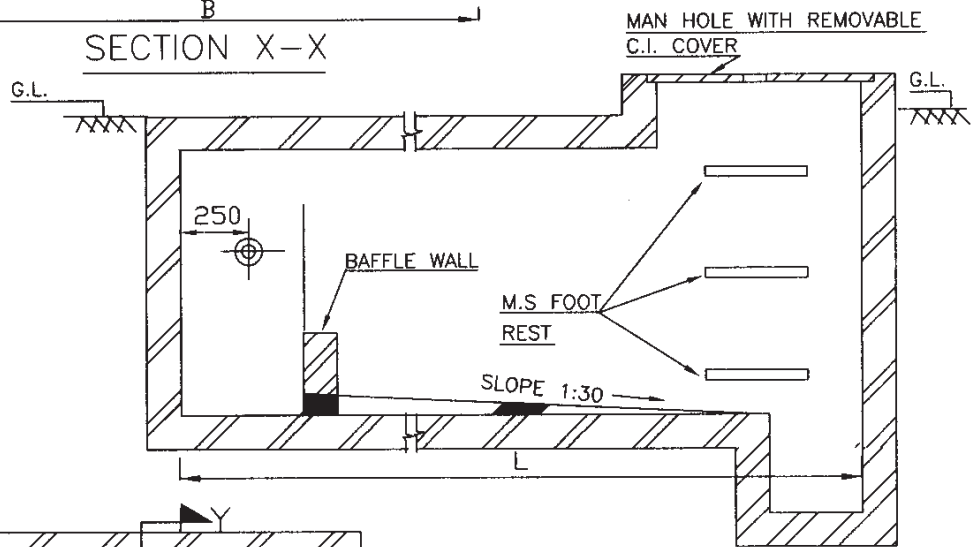


# SUMP PIT FOR TRANSFORMER OIL

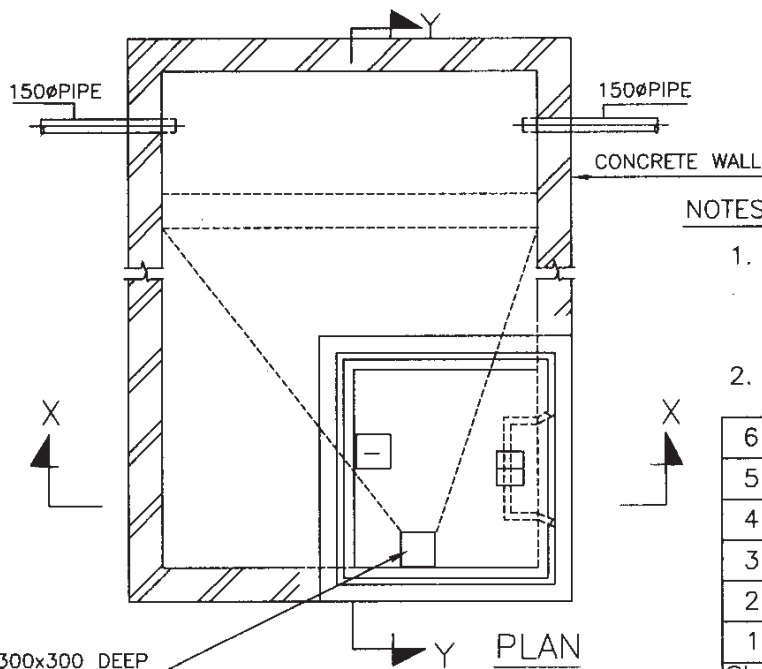
PC150 PDS: E116	1
DOCUMENT NO.	REV
SHEET 1 OF 1	



SECTION X-X



SECTION Y-Y



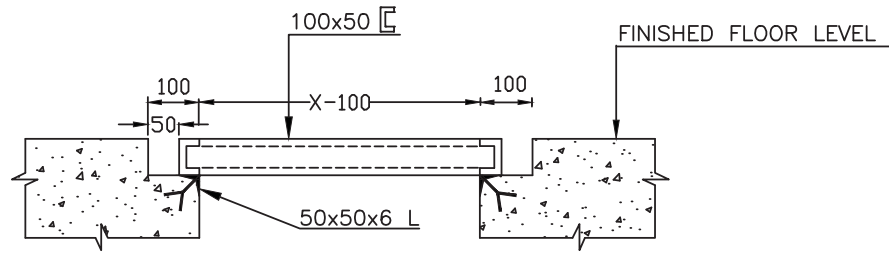
300x300x300 DEEP  
SUNCTION PIT

PLAN

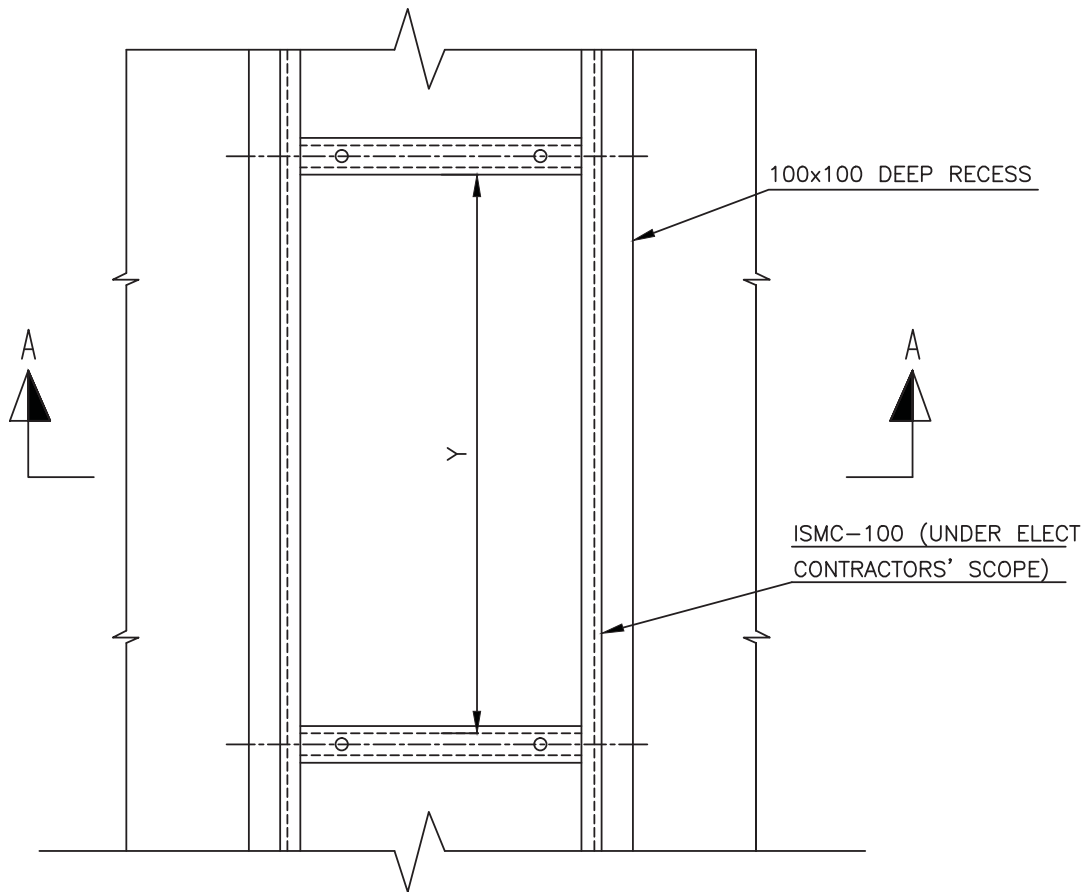
NOTES:-

- DIMENSION 'L' AND 'B' SHALL BE DECIDED BASED ON OIL VOLUME OF HIGHEST RATED TRANSFORMER.
- 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



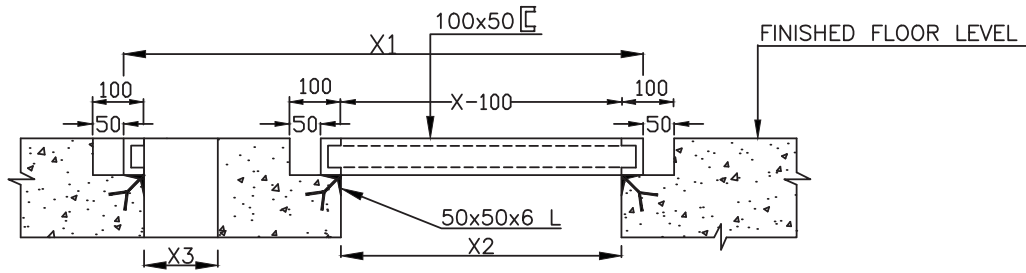
PLAN

X- DEPTH OF PANEL

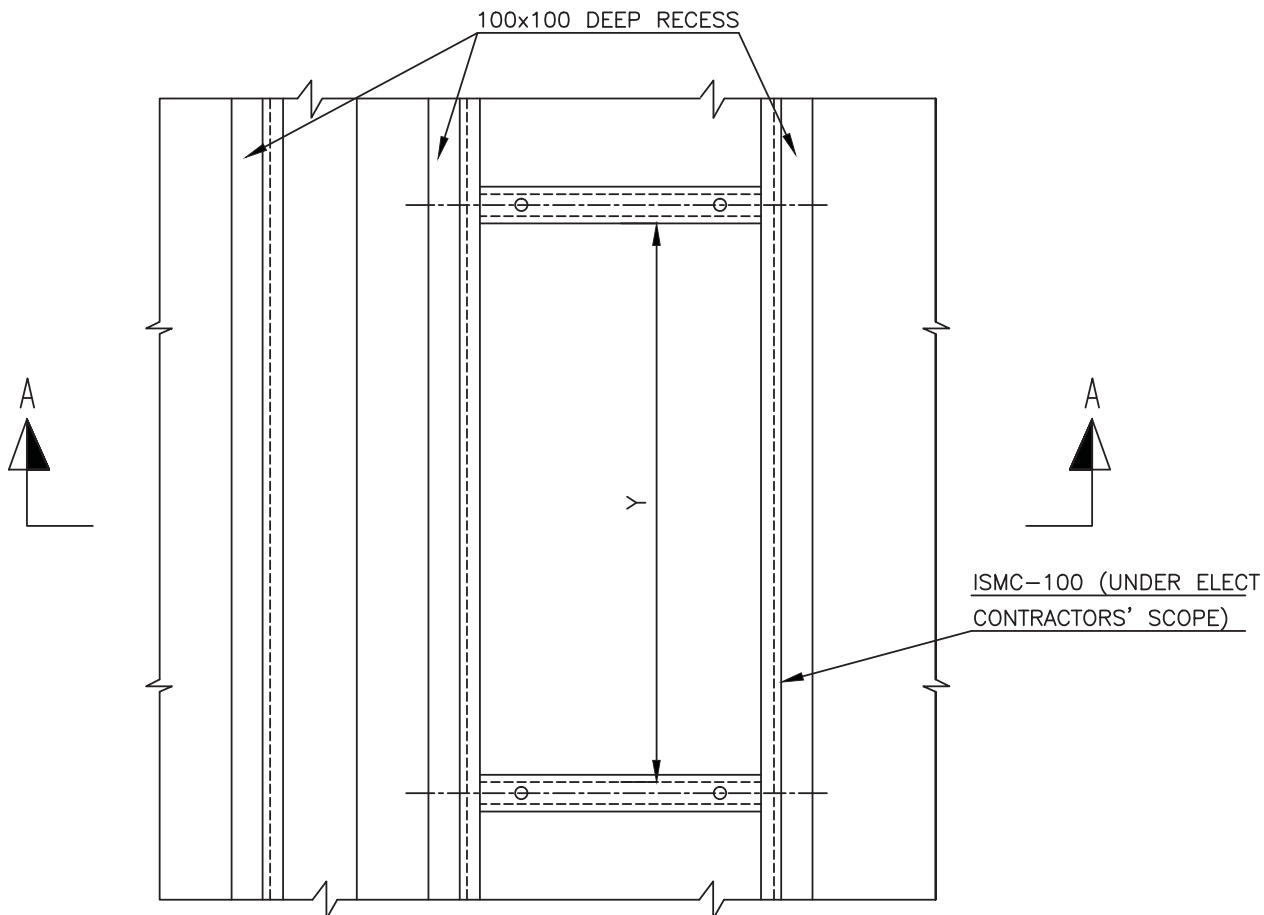
Y- LENGTH OF TWO PANELS

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

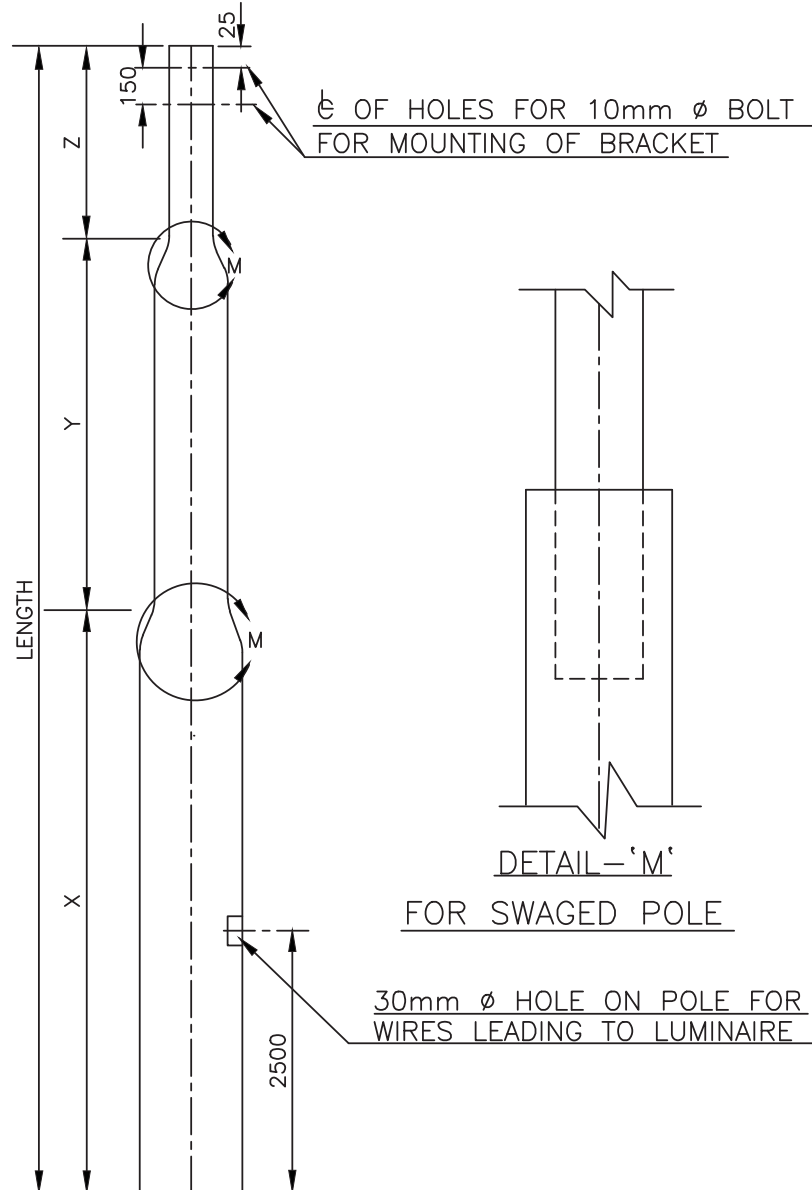


X1 = DEPTH OF PANEL  
X2 = FOOR OPENING  
X3 = FOOR OPENING  
Y = LENGTH OF PANEL

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.

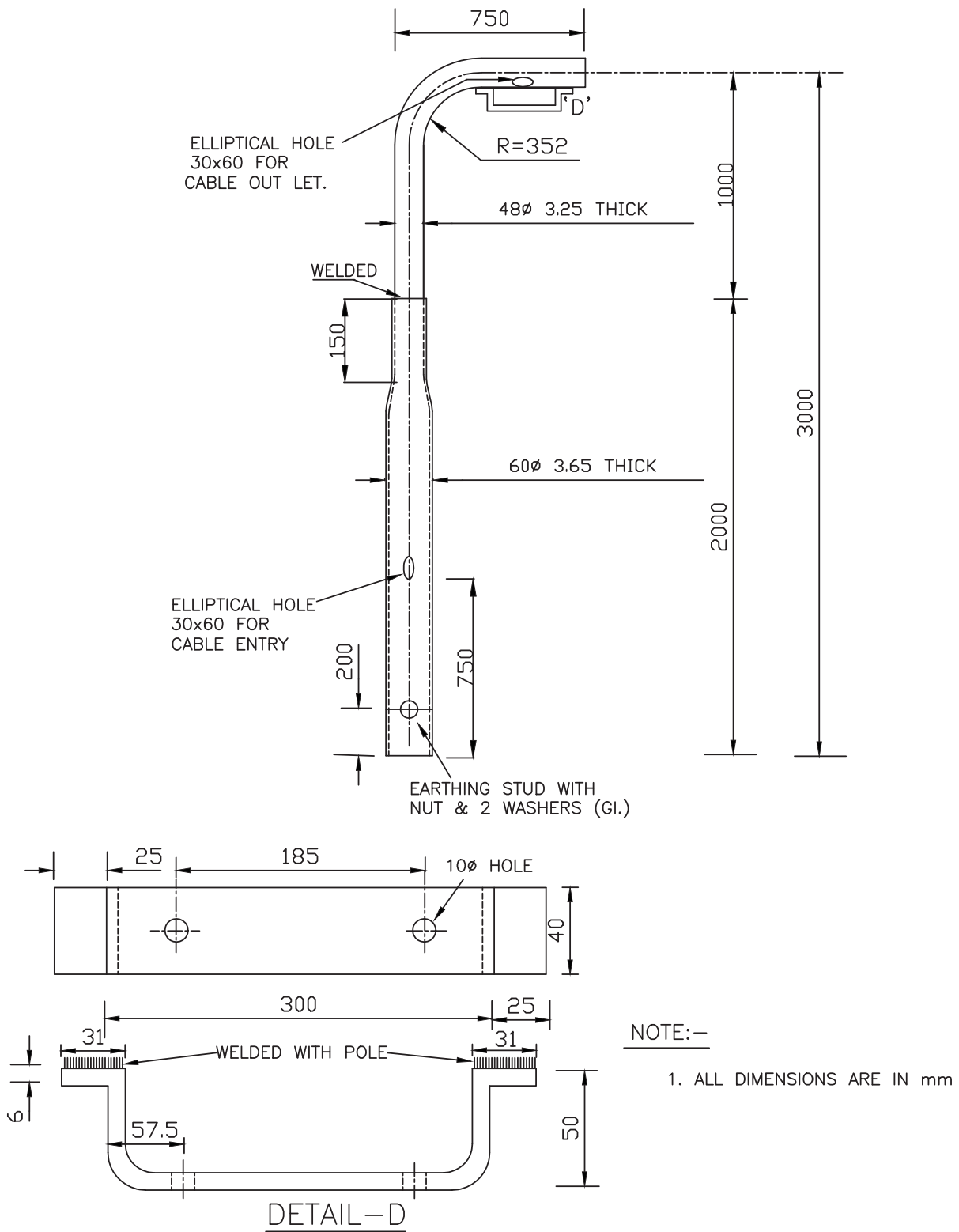


POLE DESIGNATION	LENGTH(M) $X+Y+Z=L$	PLANTING DEPTH(M)	DIAxTHICKNESS BOTTOM(mm)	DIA MIDDLE(mm)	DIA TOP(mm)	WEIGHT OF POLE (Kg)
410 TP3/SP3	$X+Y+Z=7$	1.25	114.3x4		78.1	87/85
410 TP12/SP12	$X+Y+Z=8$	1.5	114.3x4		78.1	101/97
410 TP13/SP13	$X+Y+Z=8$	1.5	139.7x4		88.9	125/119
410 TP27/SP27	$X+Y+Z=9$	1.5	114.3x4		76.1	113/108
410 TP30/SP30	$X+Y+Z=9$	1.5	139.7x4		88.9	140/133
410 TP33/SP33	$X+Y+Z=9$	1.5	165.1x4		114.3	170/184

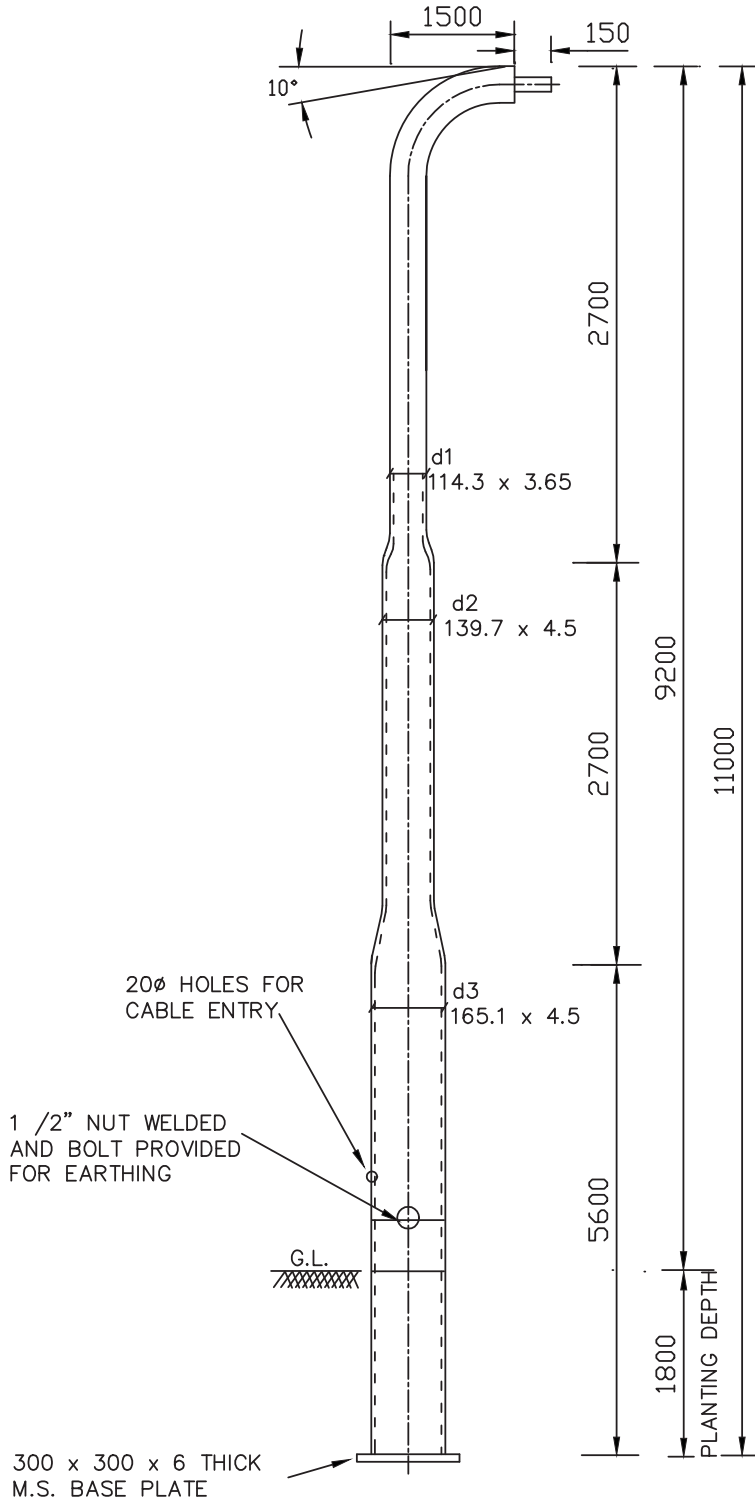
NOTE:-

1. TP REFER TO STEPPED POLE.
2. SP REFER TO SWAGED POLE.
3. POLE DESIGNATION IS AS PER IS: 1239

SWAGED POLE TYPE 'B'

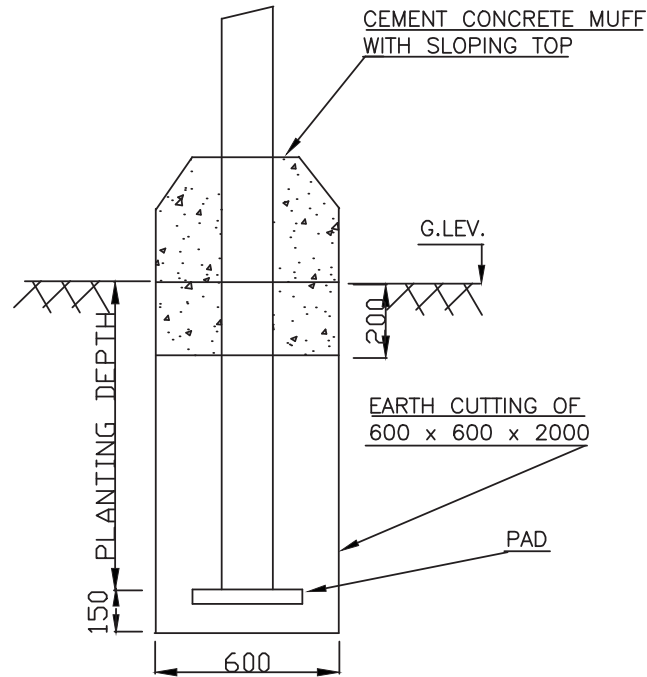


SWAGED POLE TYPE 'C'  
(FOR PLANT GROUND MOUNTING)



NOTES: -

1. NIPPLE OF DIA. 45 (NIPPLE TO BE PREPd. BY DIRECT REDUCTION OF DIA OF TOP PIPE WITHOUT USE OF ANY WASHER)
2. POLE MATERIAL MS AS PER IS 1239 ABOVE GROUND PORTION TO BE PAINTED 2 COATS OF RED OXIDE PRIMER, UNDER GROUND PORTION PAINTED BITUMINUS PAINT.
3. FOR FLOOD LIGHTING POLE THE TOP PORTION NOT TO BE TILTED BUT A 300 x 300 x 6mm THICK M.S. PLATE WELDED AT THE TOP SHALL BE PROVIDED TO MOUNT FLOOD LIGHT.
4. ALL DIMENSIONS ARE IN mm



1. FOR PAD USE:-

- a) 400x400x70 CONCRETE BLOCK FOR POLES.
- b) BASE PLATE AS SHOWN IN PDS:E 205 FOR STEEL TUBULAR POLES SHALL BE USED AS PAD
- c) RCC / WOOD POLES DO NOT NEED ANY PAD.

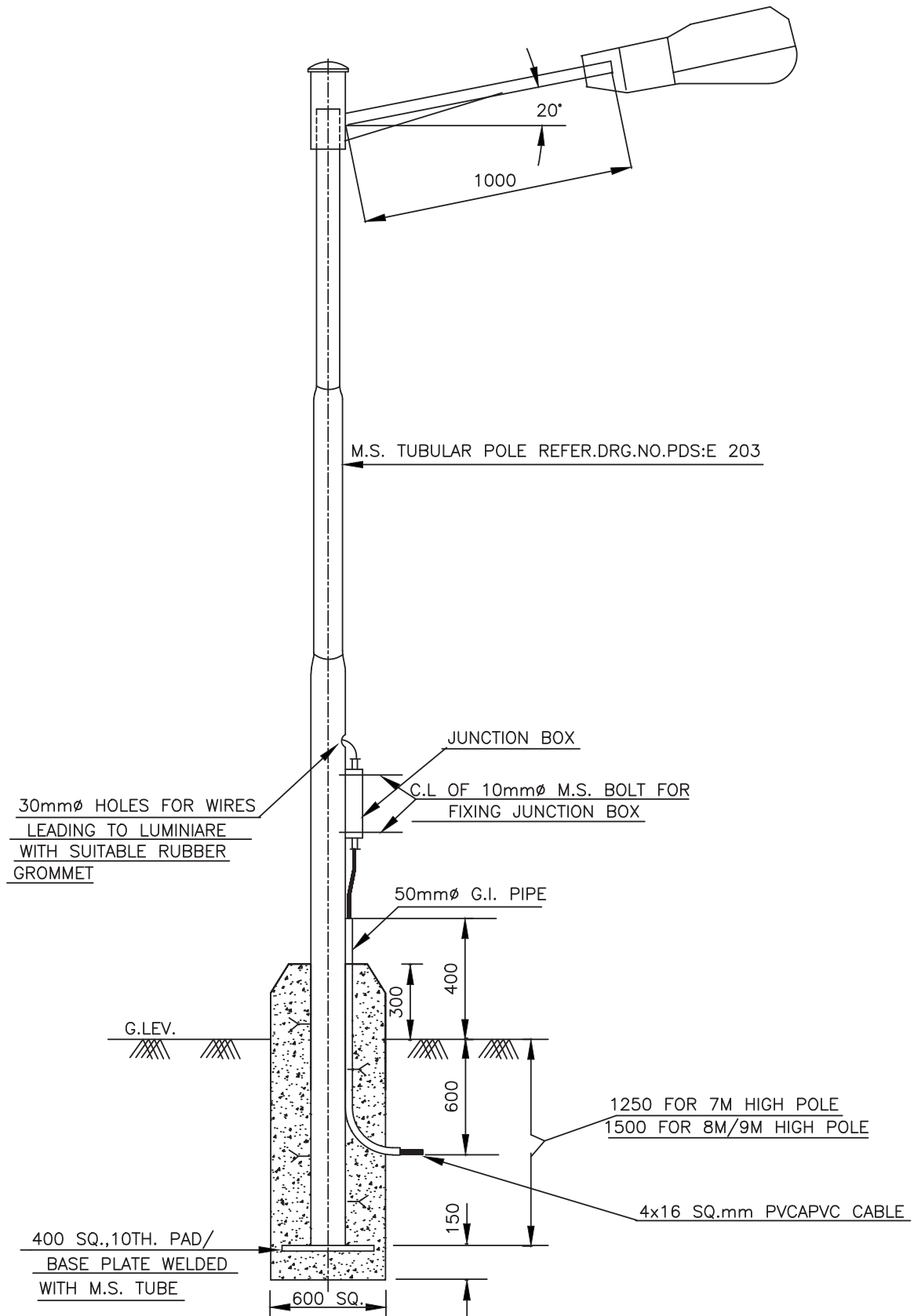
2. MUFF IS MUST FOR STEEL TUBULAR POLES AND OPTIONAL FOR OTHERS POLES, MUFF SHALL BE PROVIDED AFTER UNDER GROUND CABLING FOR STREET LIGHTING IS COMPLETED.

3. MUFF HEIGHT FROM GROUND LEVEL SHALL BE 300mm FOR ORDINARY POLES AND 457mm FOR STREET LIGHTING POLES HAVING J.B.LOCATED ON THE MUFF

4. FOR MOUNTING OF JBS' ON THE MUFF REFER PDS:E 209

5. FOR PLANTING DEPTH REFER RELEVANT ISS.

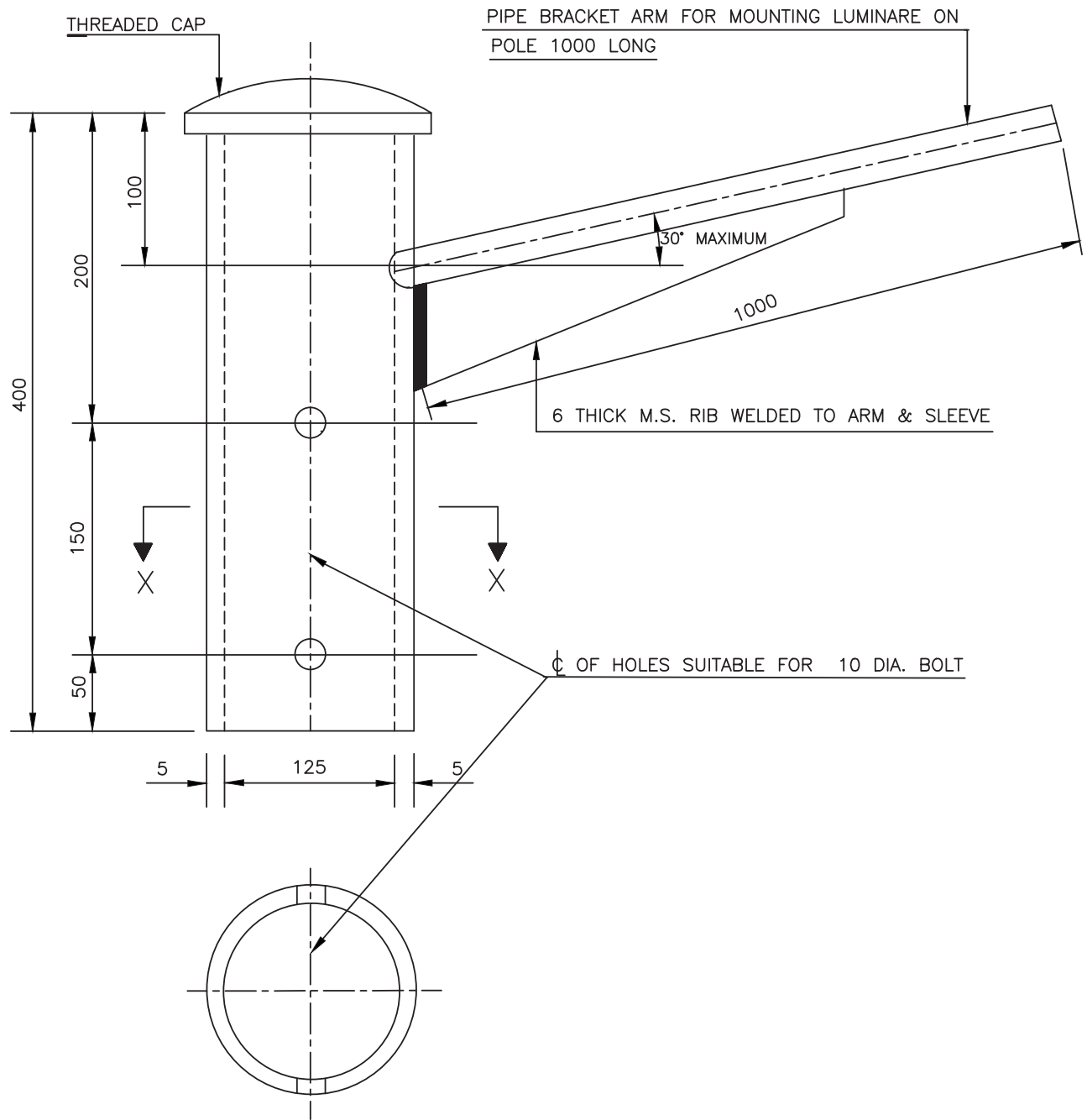
6. ALL DIMENSIONS ARE IN mm



NOTE :-

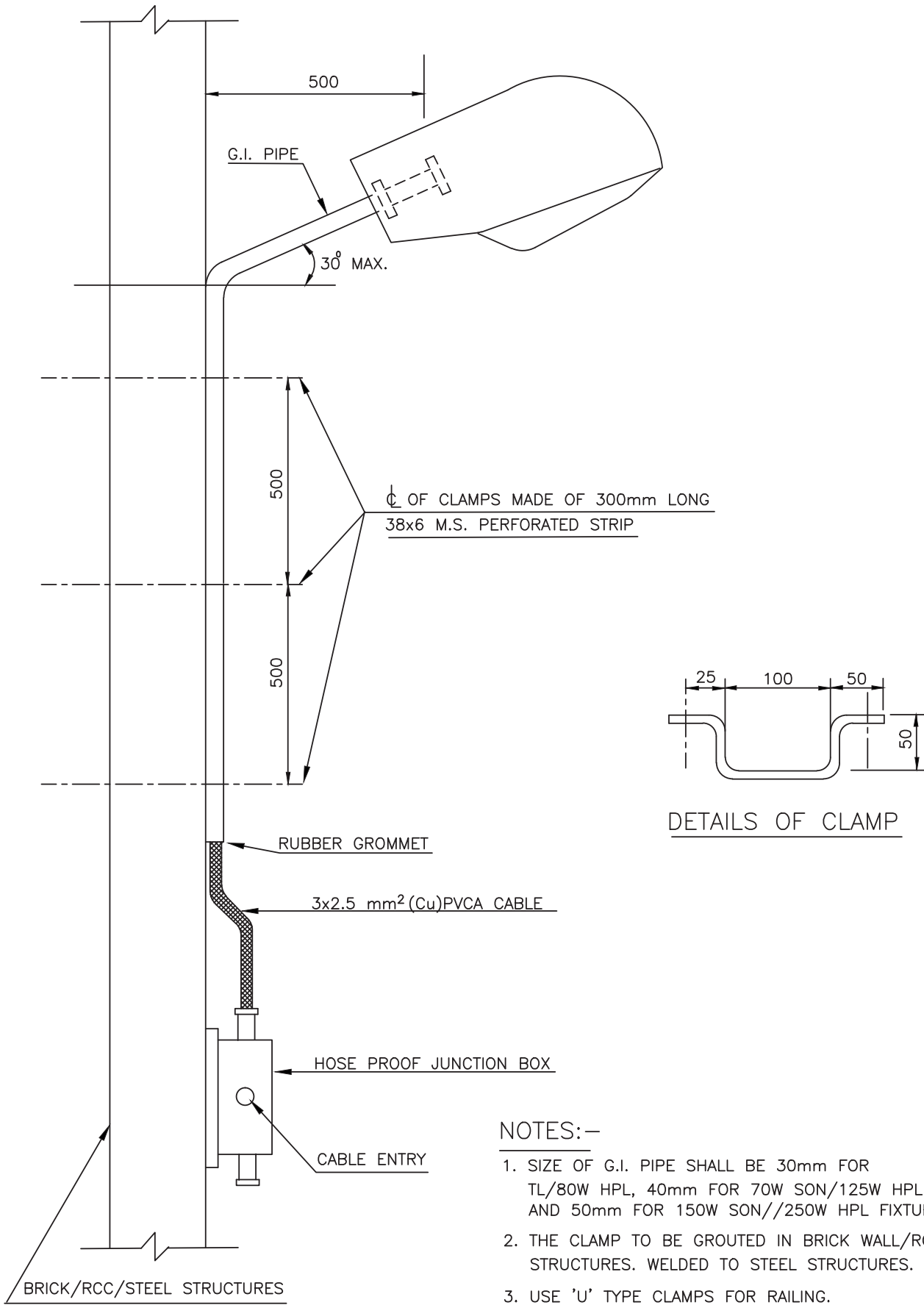
ALL DIMENSIONS ARE IN mm.





NOTES:-

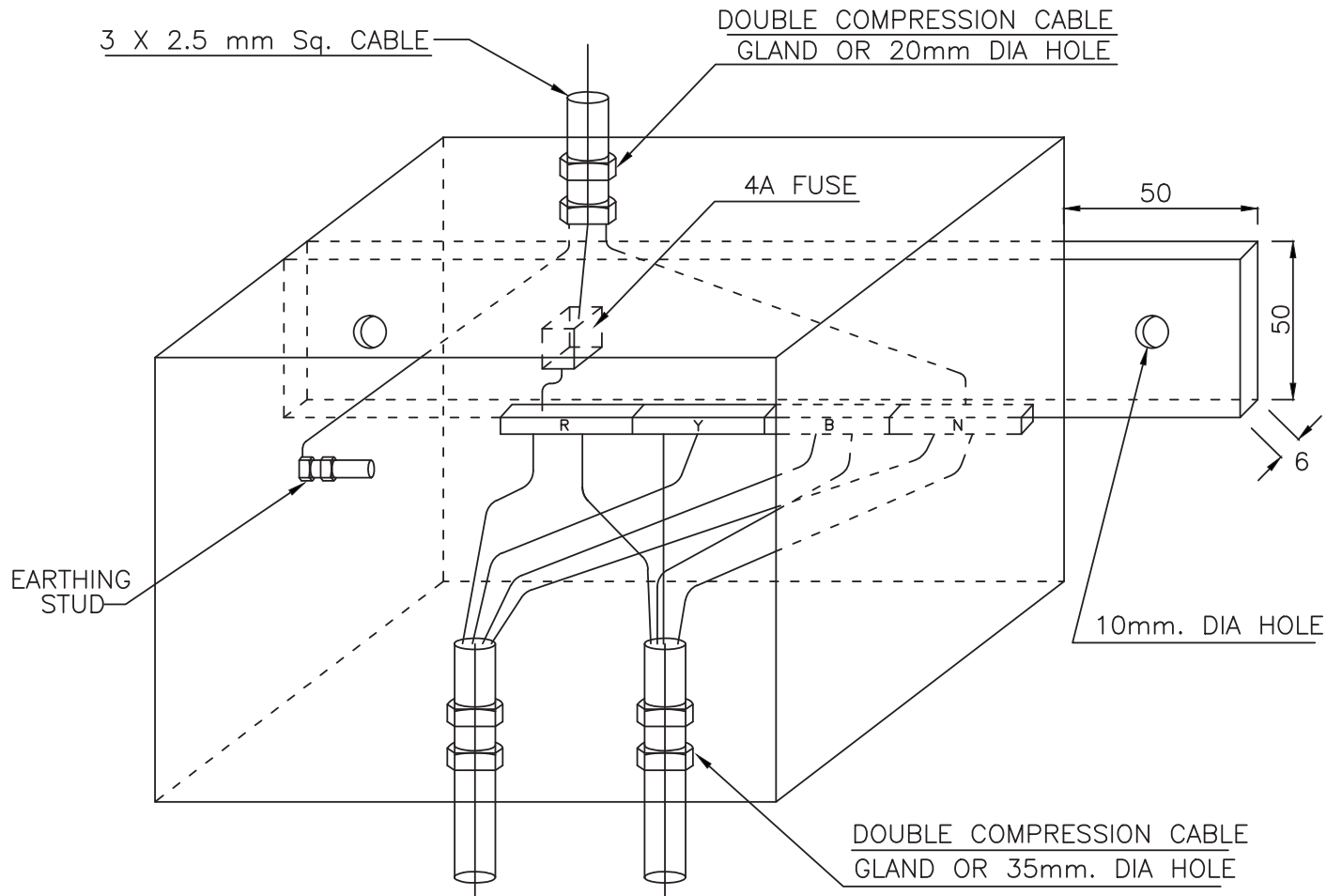
1. SIZE OF PIPE SHALL BE 30mm FOR TL/80W HPL FIXTURES, 40mm FOR 70W SON/125W HPL FIXTURES AND 50mm FOR 150W SON/250W HPL FIXTURES.
2. ALL DIMENSIONS ARE IN mm.



DETAILS OF CLAMP

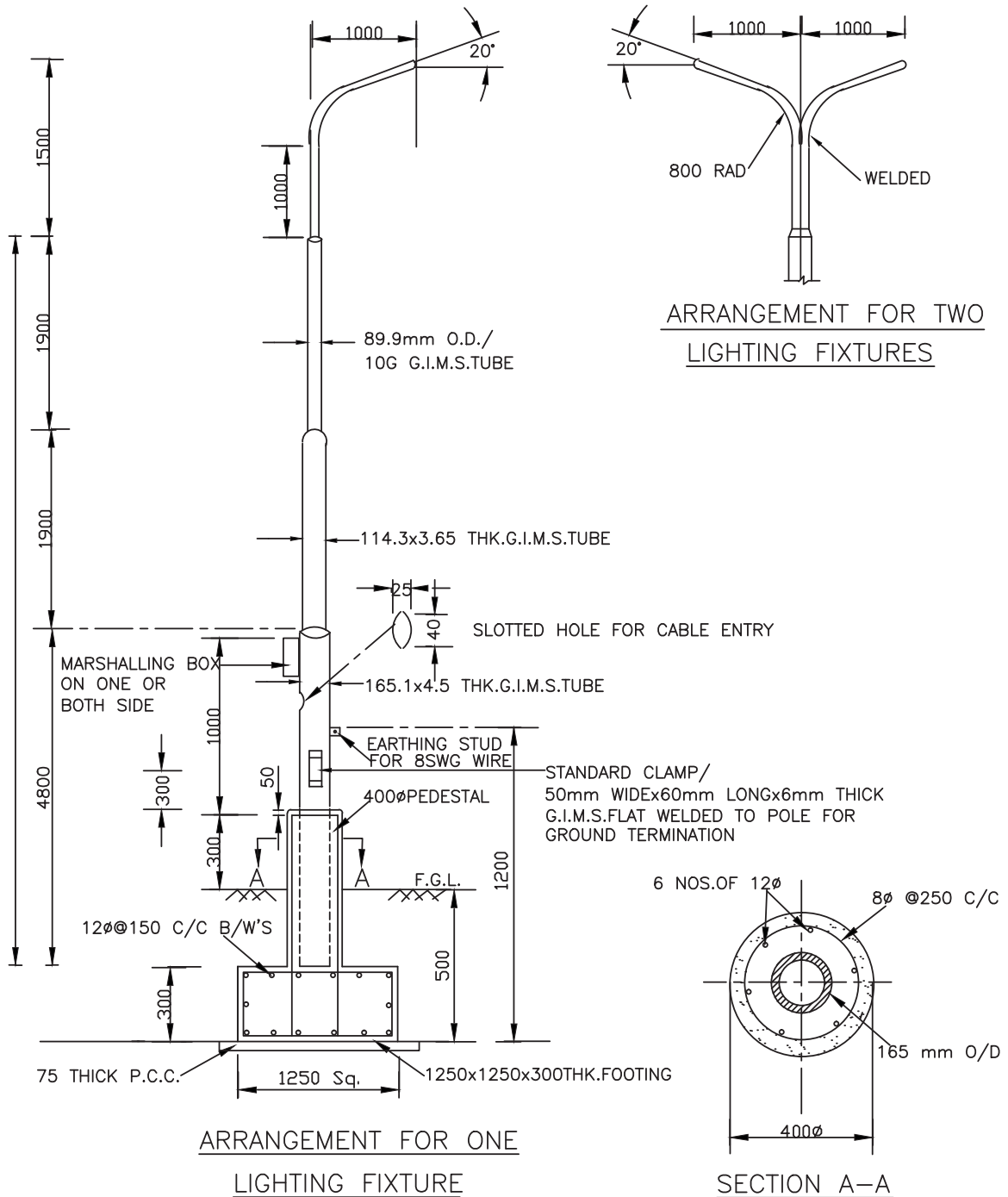
NOTES:-

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.

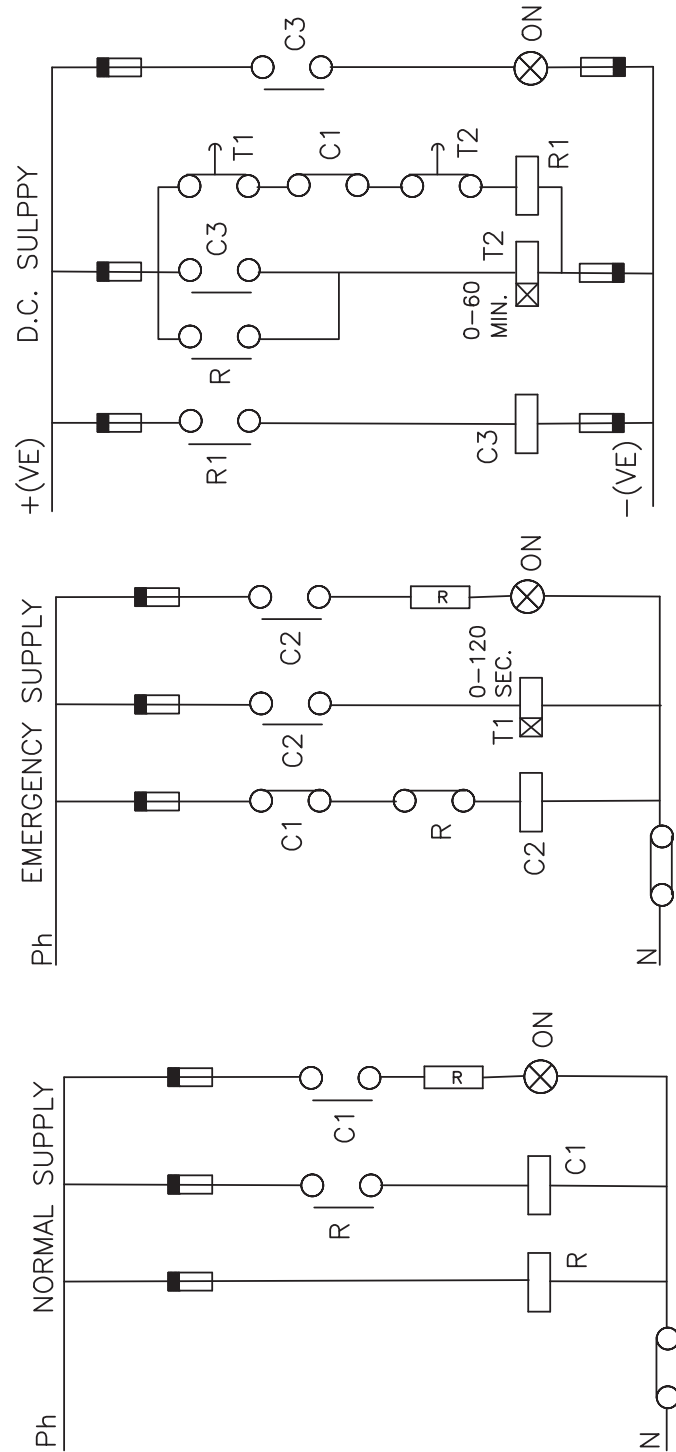


## COMPONENT RATING FOR DOL STARTER

SL. NO.	MOTOR RATING IN KW	FULL LOAD CURRENT IN AMPS.	STARTING CURRENT IN AMPS.	MOTOR DUTY SWITCH RATING IN AMPS.	FUSE RATING IN AMPS.	CONTACTOR RATING IN AMPS.	THERMAL O/L RANGE IN AMPS.		C.T. RATIO	POWER CABLE SIZE sq. mm (PVCAPVC)
							L&T	SIEMENS		
1.	0.18	0.59	4.2	16	2	16	0.4–0.65	0.5–0.8	2/1	3x2.5(CU)
2.	0.25	0.88	6.3	16	4	16	0.6–1.0	0.8–1.2	2/1	3x2.5(CU)
3.	0.37	1.05	7.56	16	4	16	0.9–1.5	0.8–1.25	2/1	3x2.5(CU)
4.	0.55	1.50	10.8	16	6	16	1.4–2.3	1.0–1.6	2/1	3x2.5(CU)
5.	0.75	1.80	12.96	16	6	16	1.4–2.3	1.25–2.0	2/1	3x2.5(CU)
6.	1.10	2.50	18.0	16	10	16	2.3–3.0	2.0–3.2	5/1	3x2.5(CU)
7.	1.50	3.4	24.4	16	16	16	3.0–5.0	2.5–4.0	5/1	3x2.5(CU)
8.	2.20	4.60	33.1	16	16	16	4.5–7.5	3.2–5.0	5/1	3x2.5(CU)
9.	3.00	7.0	50.4	32	20	16	4.5–7.5	5.0–8.0	10/1	3x2.5(CU)
10.	3.70	7.3	52.5	32	20	16	6.0–10.0	5.0–8.0	10/1	3x2.5(CU)
11.	5.50	10.5	75.6	32	32	16	9.0–15.0	8.0–12.5	15/1	3x4(CU)
12.	7.50	14.0	100.8	63	32	16	9.0–15.0	10.0–16.0	20/1	3x6(CU)
13.	9.30	17.5	126.0	63	32	32	14.0–23.0	12.5–20.0	20/1	3x10(AL)
14.	11.0	20.6	148.3	63	63	32	14.0–23.0	16.0–25.0	25/1	3x10(AL)
15.	15.0	28.0	201.6	63	63	32	20.0–33.0	20.0–32.0	35/1	3x16(AL)
16.	18.5	33.0	237.6	100	80	40	30.0–50.0	25.0–36.0	40/1	3x25(AL)
17.	22.0	40.0	288.0	125	80	45	30.0–50.0	32.0–50.0	50/1	3x25(AL)
18.	30.0	52.0	374.4	125	100	70	45.0–75.0	40.0–57.0	60/1	3x35(AL)
19.	37.0	63.5	457.2	125	125	70	45.0–75.0	57.0–70.0	75/1	3x50(AL)
20.	45.0	76.0	557.2	200	160	110	66.0–110.0	70.0–95.0	100/1	3x70(AL)
21.	55.0	96.0	691.7	250	200	110	66.0–110.0	85.0–105.0	125/1	3x95(AL)
22.	67.5	119.0	858.0	250	200	200	90.0–150.0	85.0–135.0	125/1	3x150(AL)
23.	75.0	140.0	1008.0	A.C.B.	A.C.B.	A.C.B.	MICROPROCESSOR RELAY		150/1	3x185(AL)
24.	90.0	156.0	1123.2	A.C.B.	A.C.B.	A.C.B.	MICROPROCESSOR RELAY		175/1	3x240(AL)
25.	110.0	192.0	1382.4	A.C.B.	A.C.B.	A.C.B.	MICROPROCESSOR RELAY		225/1	3x300(AL)
26.	125.0	217.0	1627.5	A.C.B.	A.C.B.	A.C.B.	MICROPROCESSOR RELAY		250/1	3x400(AL)
27.	132.0	234.0	1684.8	A.C.B.	A.C.B.	A.C.B.	MICROPROCESSOR RELAY		250/1	3x400(AL)
28.	160.0	279.0	2008.8	A.C.B.	A.C.B.	A.C.B.	MICROPROCESSOR RELAY		300/1	2–3x185(AL)
29.	180.0	304.0	2188.8	A.C.B.	A.C.B.	A.C.B.	MICROPROCESSOR RELAY		350/1	2–3x240(AL)

NOTE:–

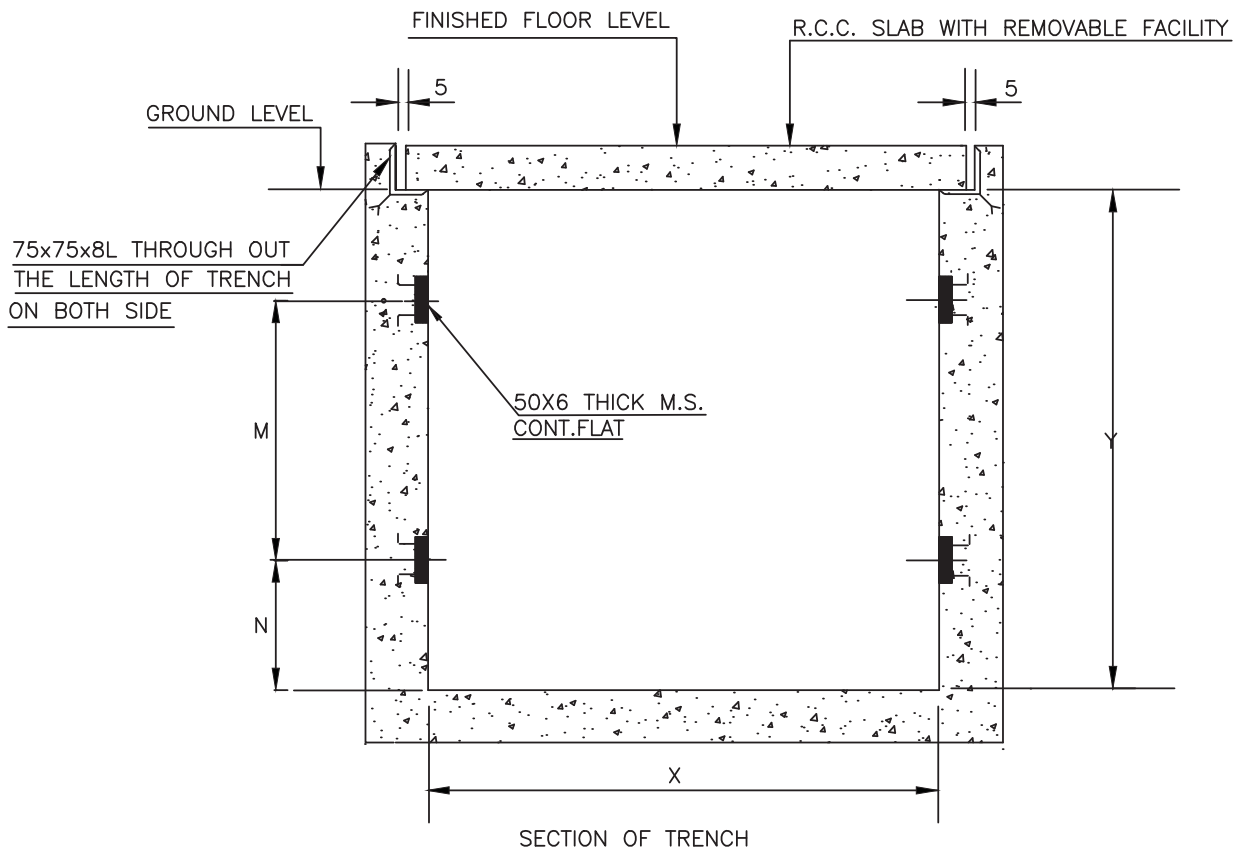
1. THE ABOVE DATA IS APPLICABLE FOR 415V, 4 POLE MOTORS.
2. AMMETERS SHALL HAVE UNIFORM SCALE UPTO C.T. PRIMARY CURRENT AND COMPRESSED END SCALE UPTO SIX TIMES THE C.T. PRIMERY CURRENT.
3. POWER CABLE SIZE SHALL BE SUBJECT TO VOLTAGE DROP CHECK.



NOTE:-

CONTACTORS C1,C2 AND C3 CONTROLS THE LIGHTING FEEDERS FOR NORMAL,EMERGENCY AND D.C. SUPPLY RESPECTIVELY.

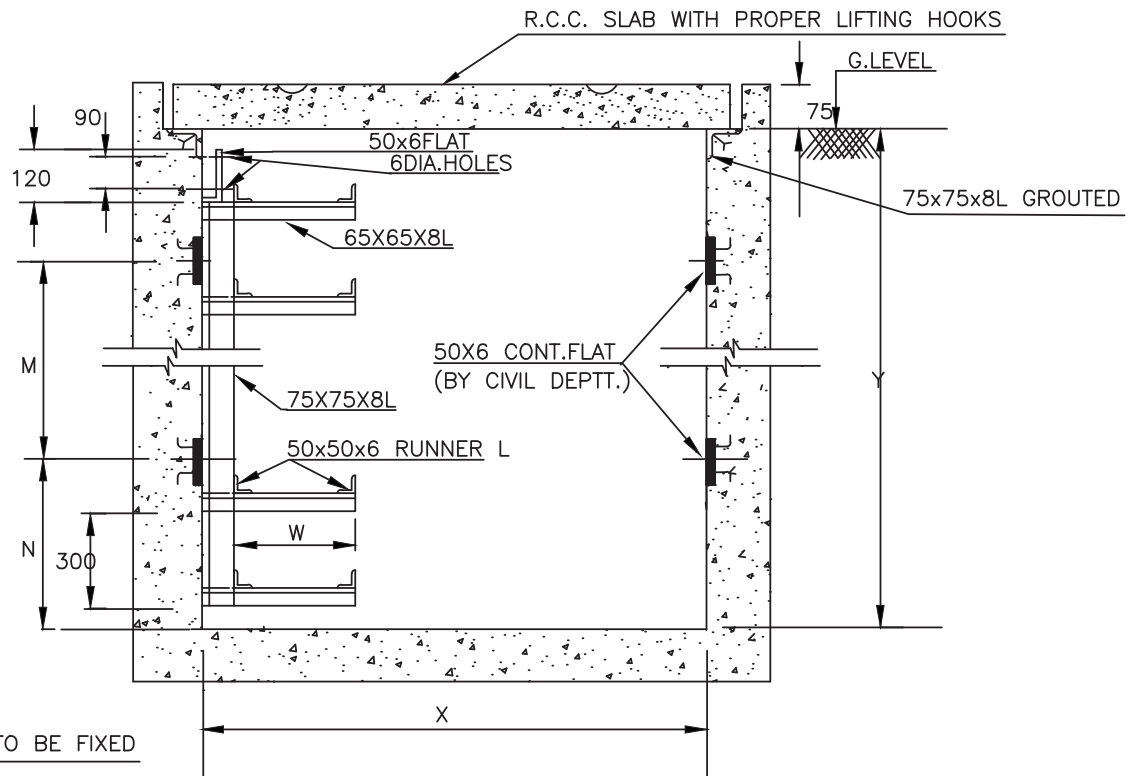
## DETAILS OF CONCRETE CABLE TRENCH



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:—

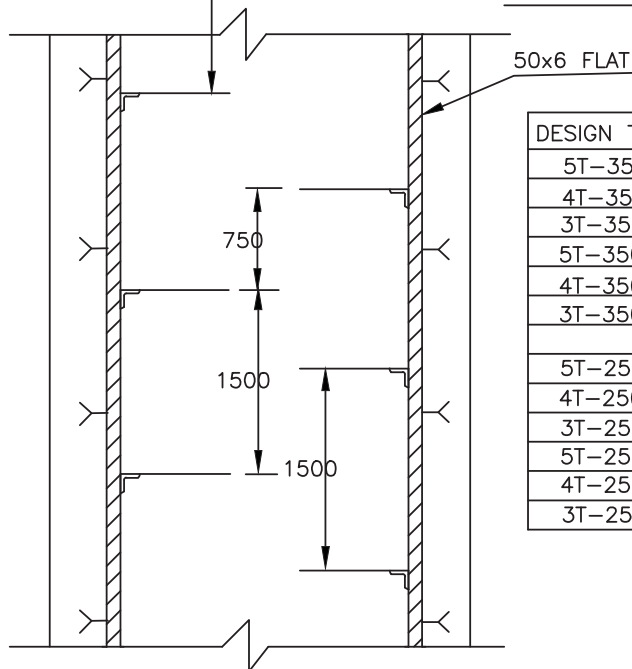
1. THE TOP OF TRENCH SHALL MATCH THE FLOOR LEVEL IN PLANT AREA.
2. IN INDOORS INSTEAD OF RCC SLAB, 20mm. THICK AL. EXTRUDED PLANK OR 10mm. THICK M.S. CHEQUERED PLATE SHALL BE USED AS PER PDS:E 507.
3. PROPER SLOPE TO BE GIVEN IN THE TRENCH FOR NATURAL DRAINAGE.
4. SS—SINGLE SIDE CABLE SUPPORTS.
5. DS—DOUBLE SIDE CABLE SUPPORTS.
6. ALL DIMENSIONS ARE IN mm.



CABLE SUPPORTS TO BE FIXED

© 1500 INTERVAL

SECTION OF TRENCH

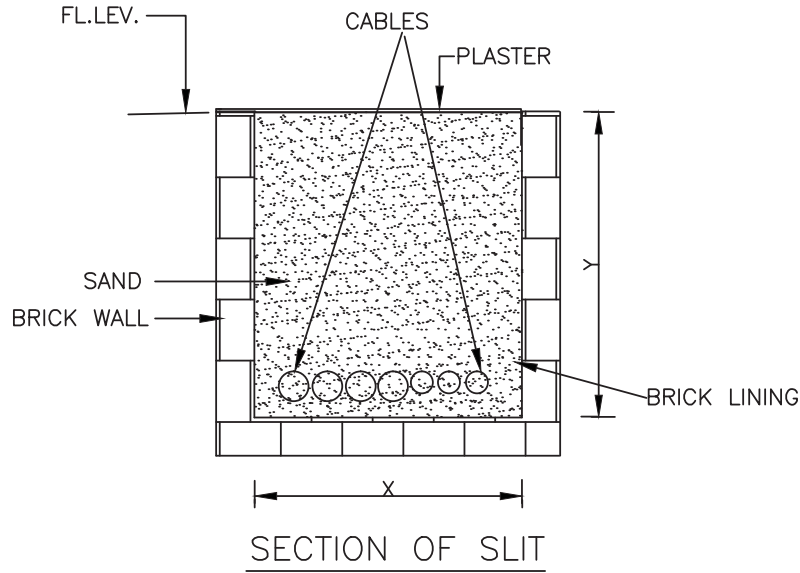


TYPICAL PLAN OF TRENCH

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.

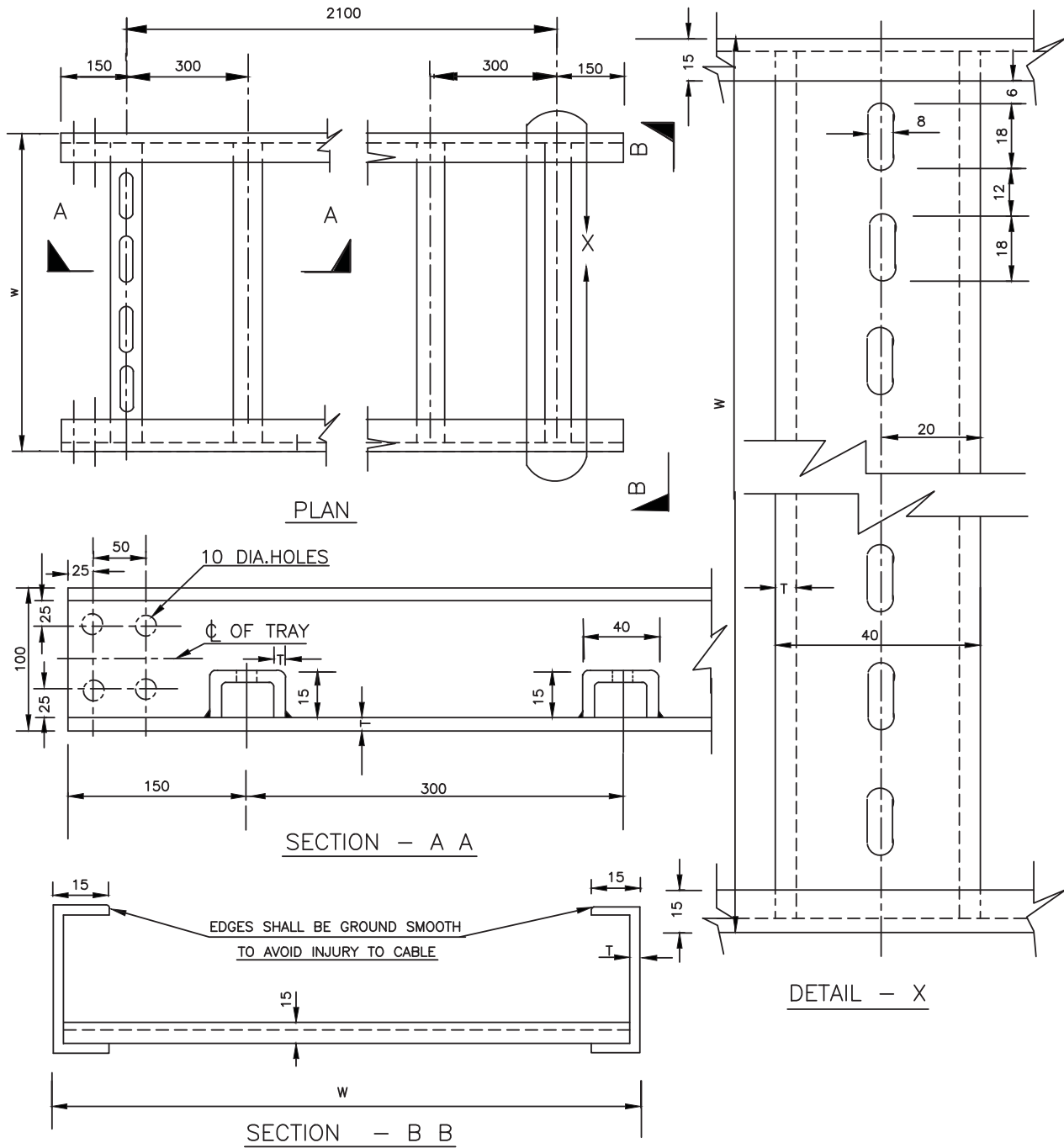




DESIGN TYPE	X	Y
S 300	300	300
S 200	200	200

NOTE:-

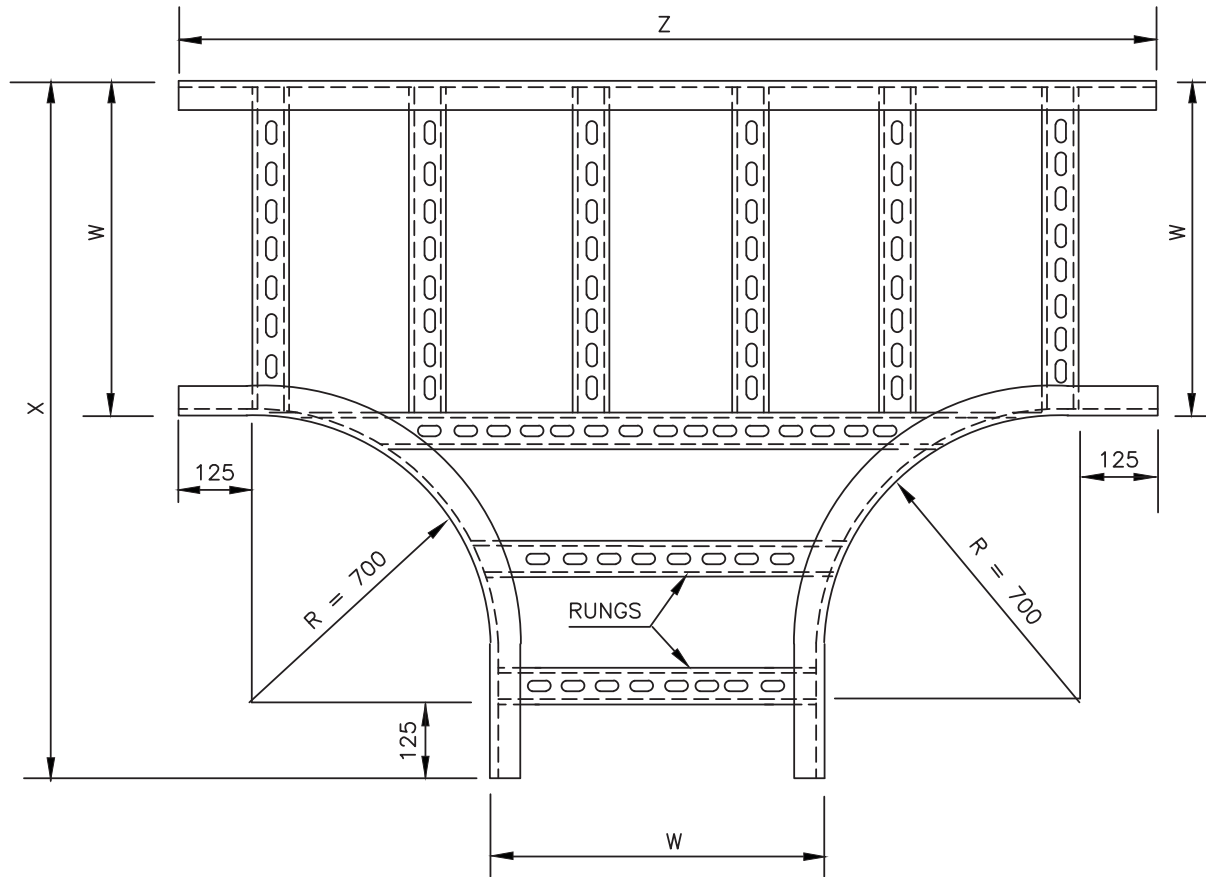
1. CABLE SLITS SHALL BE FILLED WITH SAND AND PROPERLY PLASTERED WITH LEAN CONCRETE AFTER LAYING OF CABLES.
2. WHEREVER CABLES ARE COMING OUT OF THE SLIT, SUITABLE MECH.PROTECTION TO BE PROVIDED.



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.

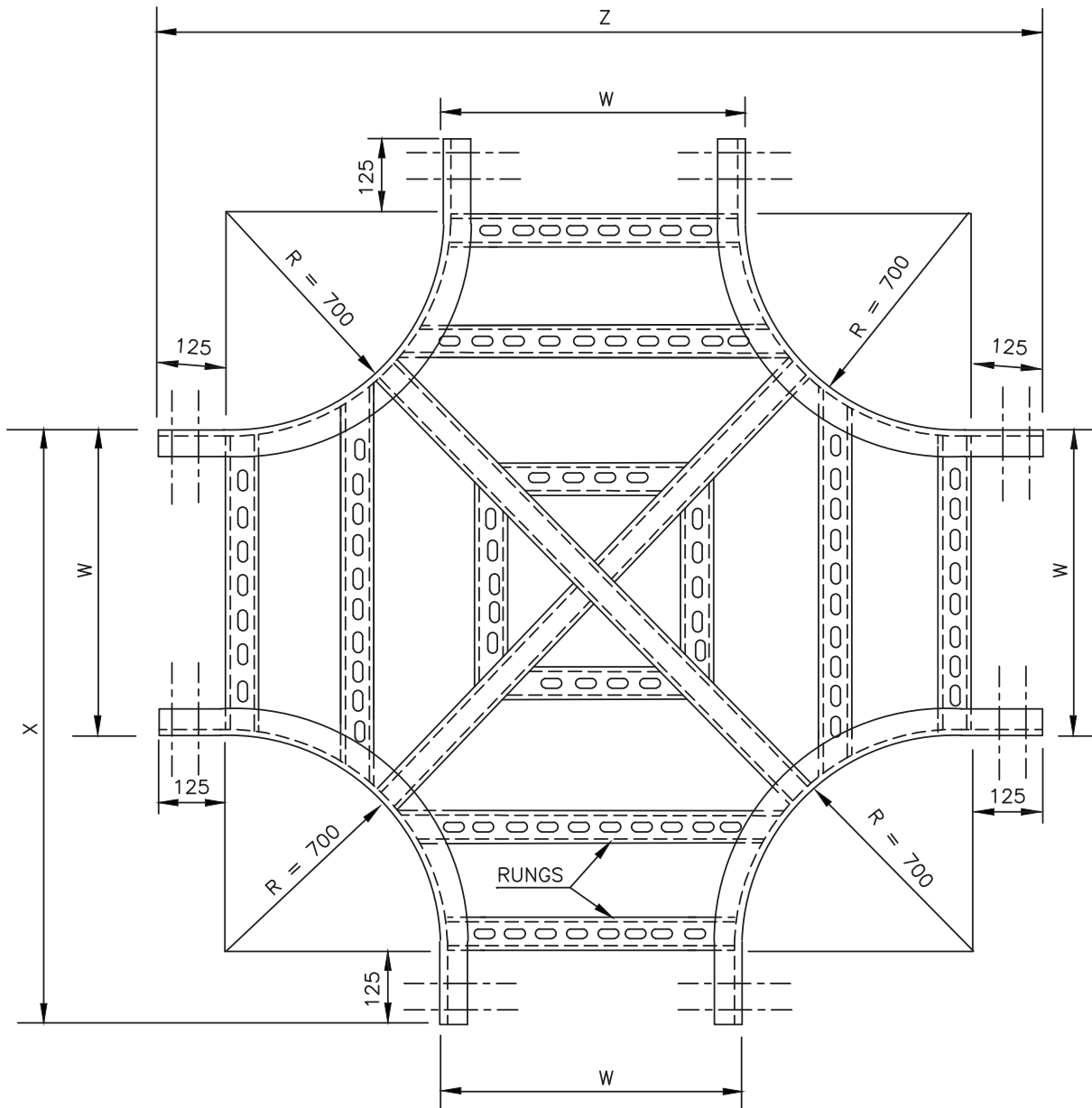


PLAN

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.

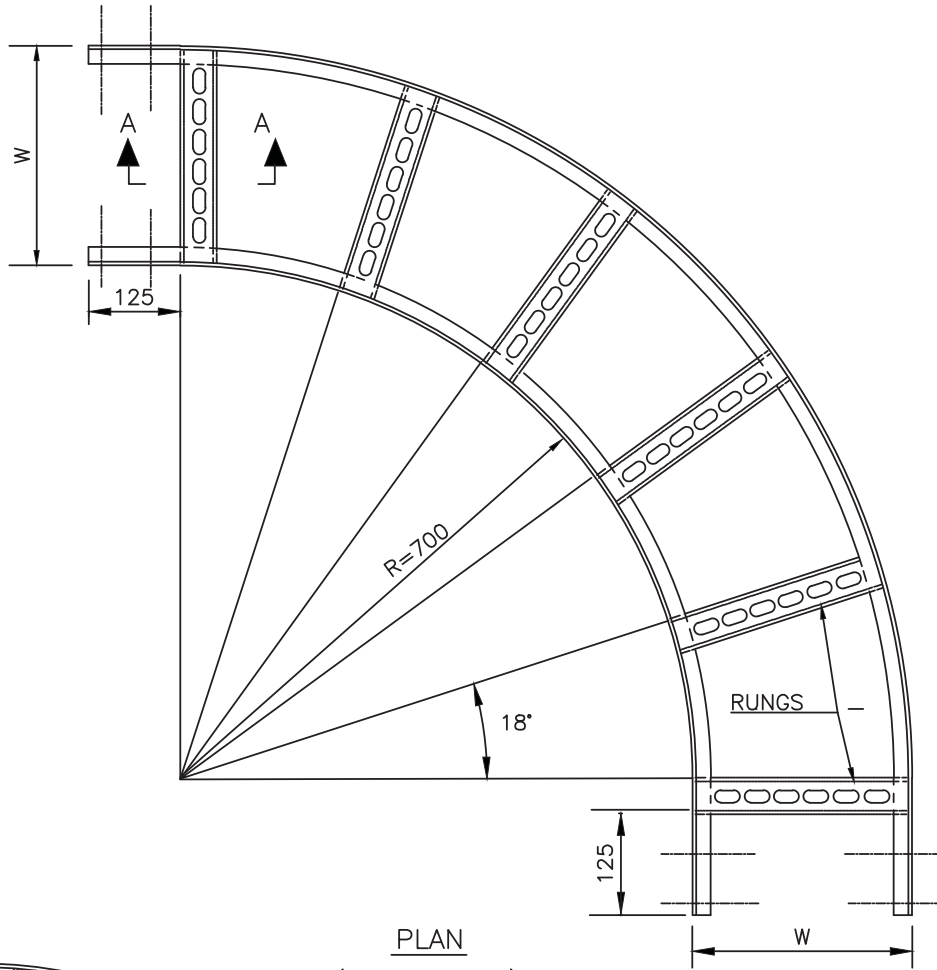


PLAN

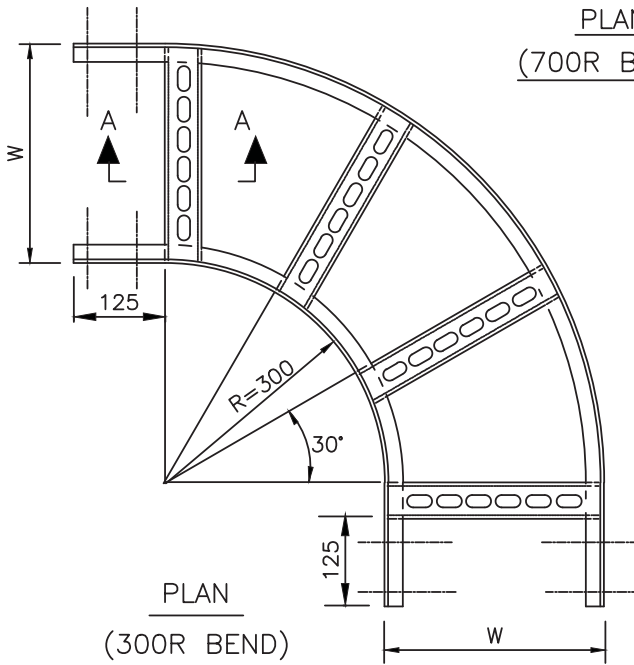
DESIGN TYPE	W	$X=R+W+125$	$Z=2R+W+250$
HC 900	900	1725	2550
HC 600	600	1425	2250
HC 450	450	1275	2100
HC 300	300	1125	1950

NOTES :-

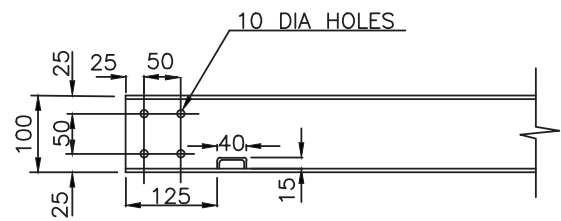
1. DISTANCE BETWEEN TWO RUNGS SHOULD BE APPROX. 300mm.
2. ALL DIMENSIONS ARE IN mm.



PLAN  
(700R BEND)

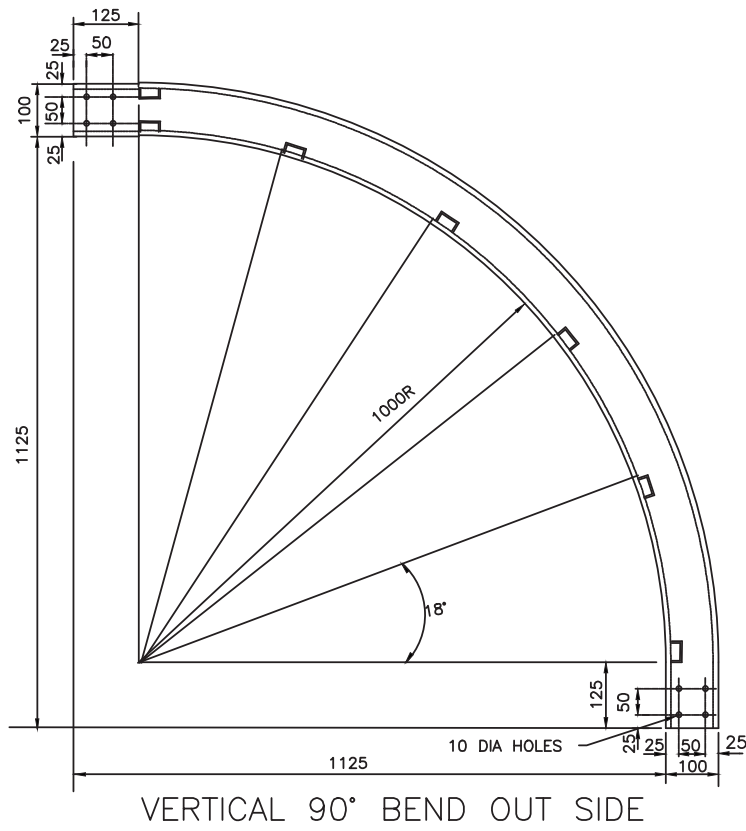
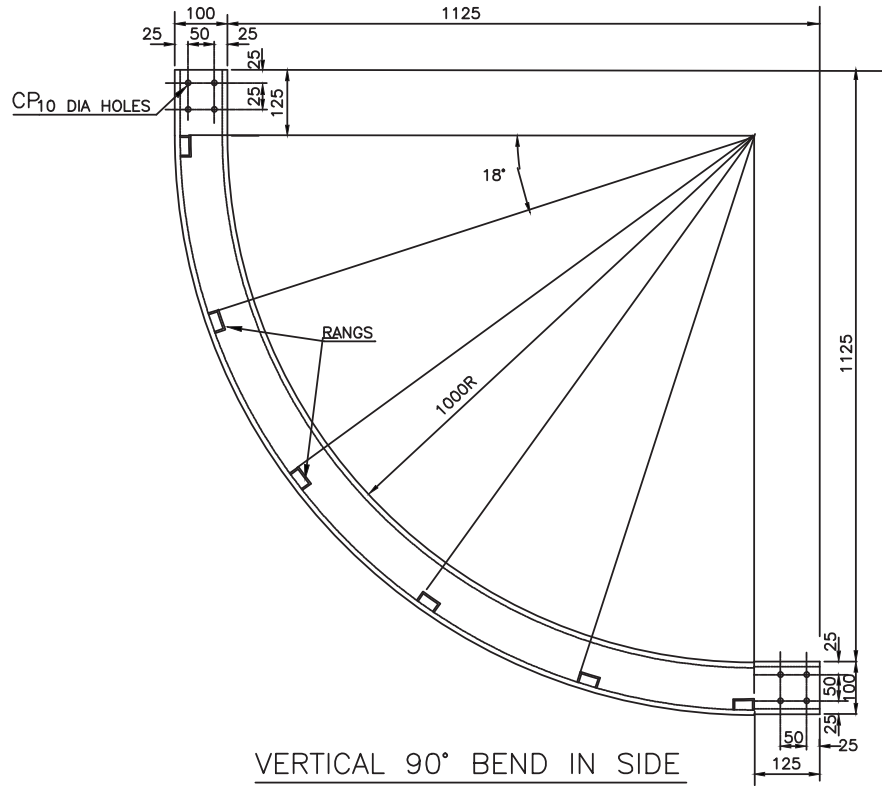


PLAN  
(300R BEND)

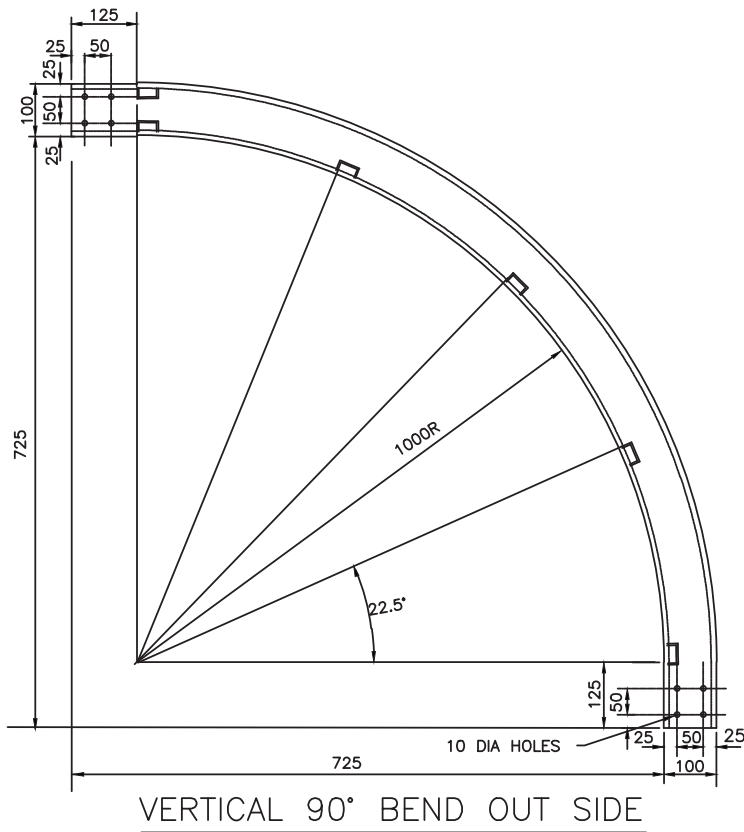
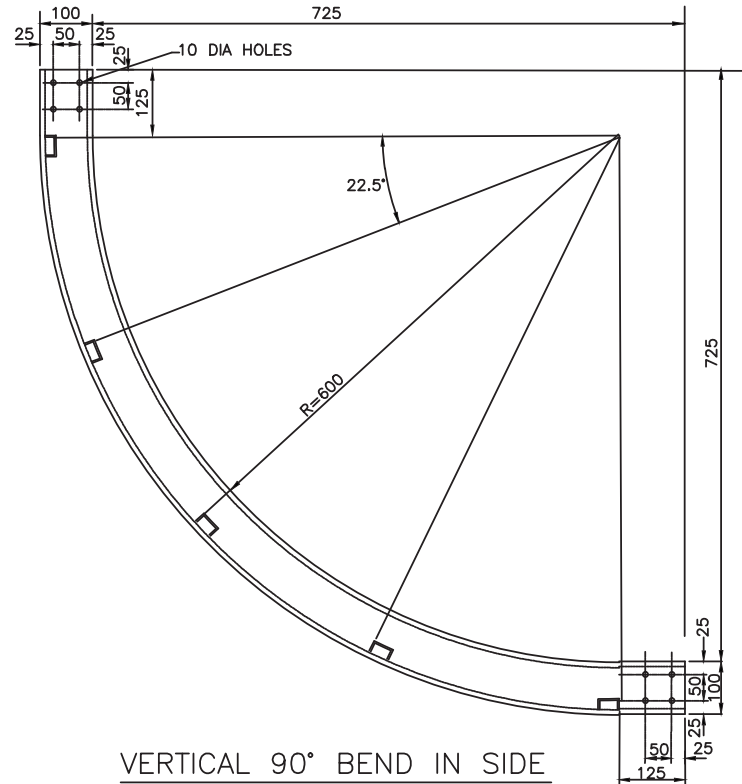


SECTION A-A

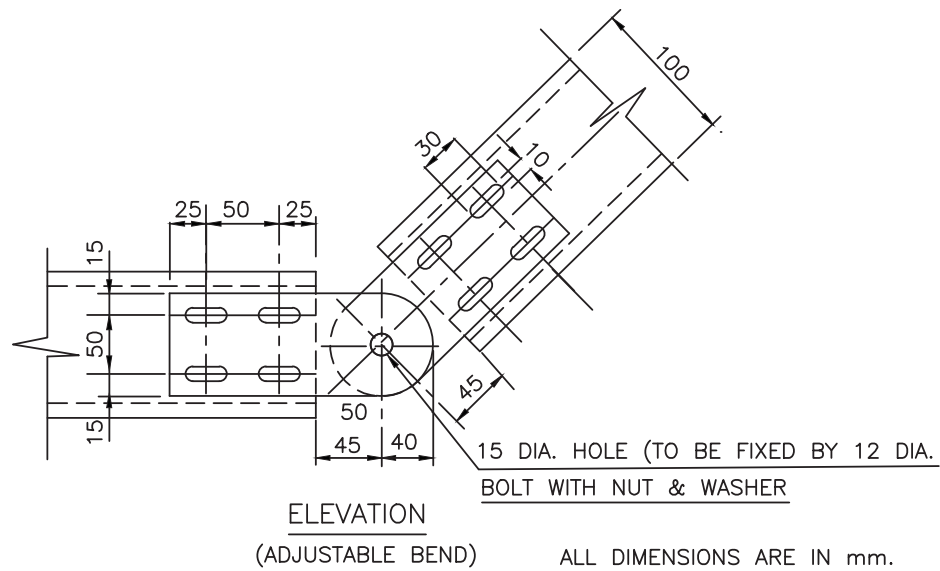
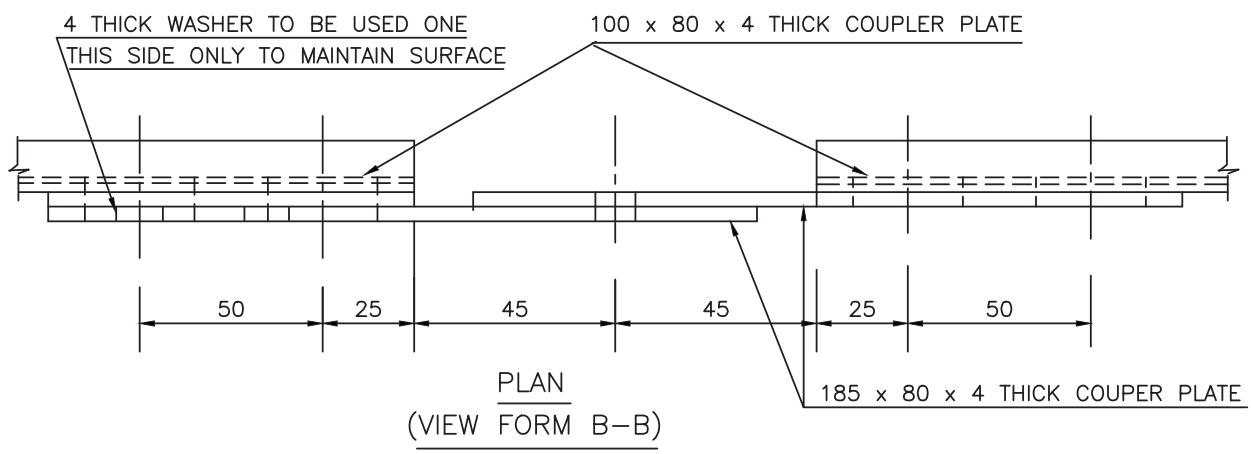
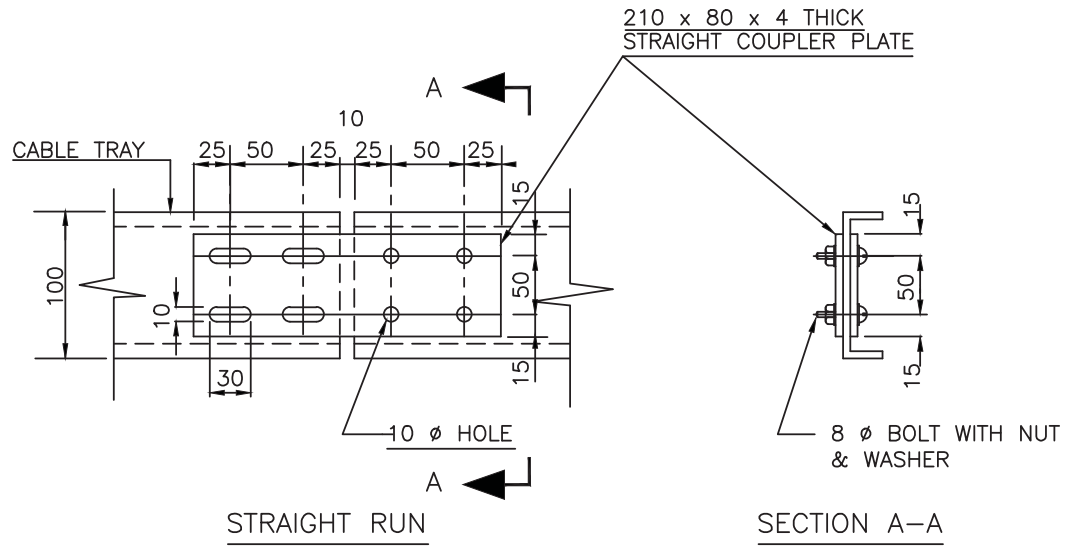
ALL DIMENSIONS ARE IN mm.



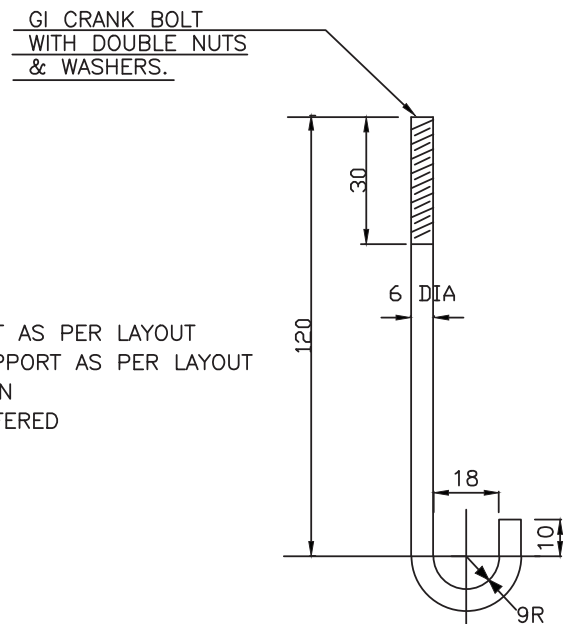
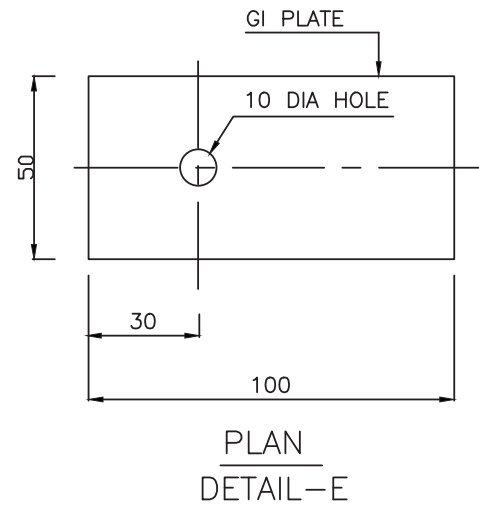
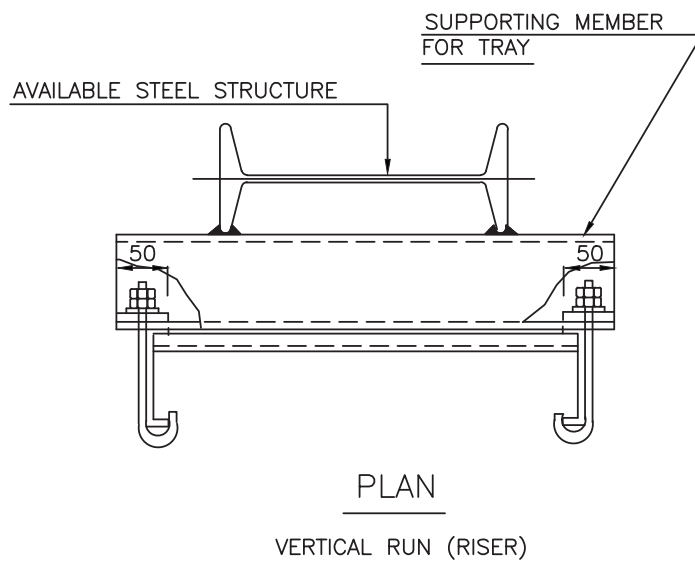
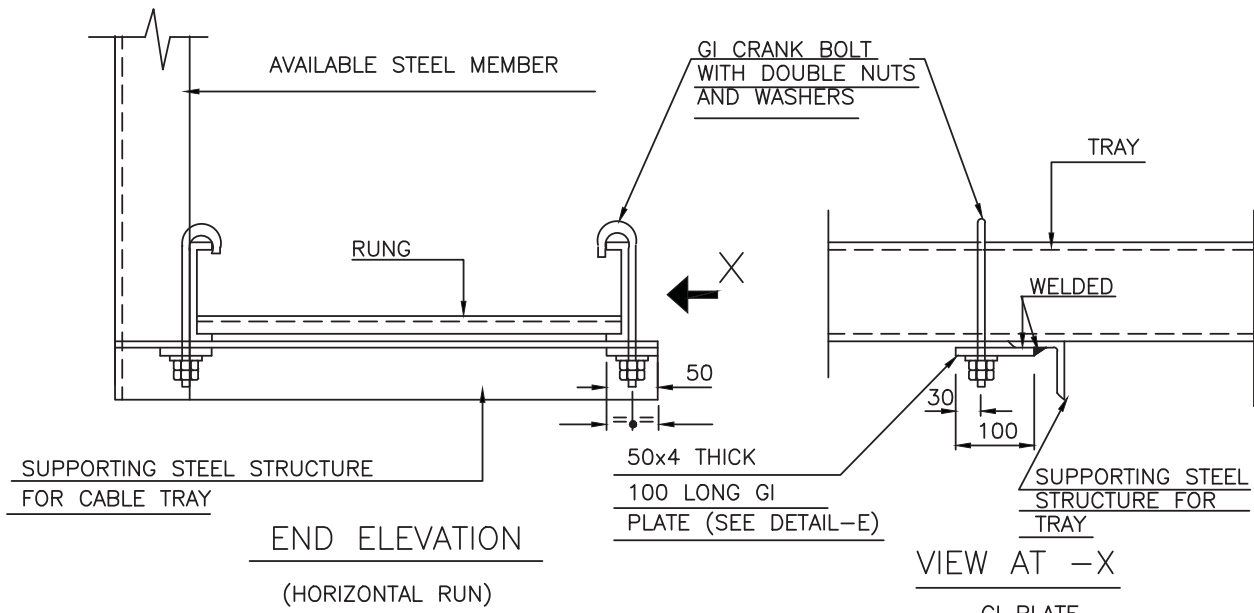
DIMENSIONS ARE IN mm.



ALL DIMENSIONS ARE IN mm.

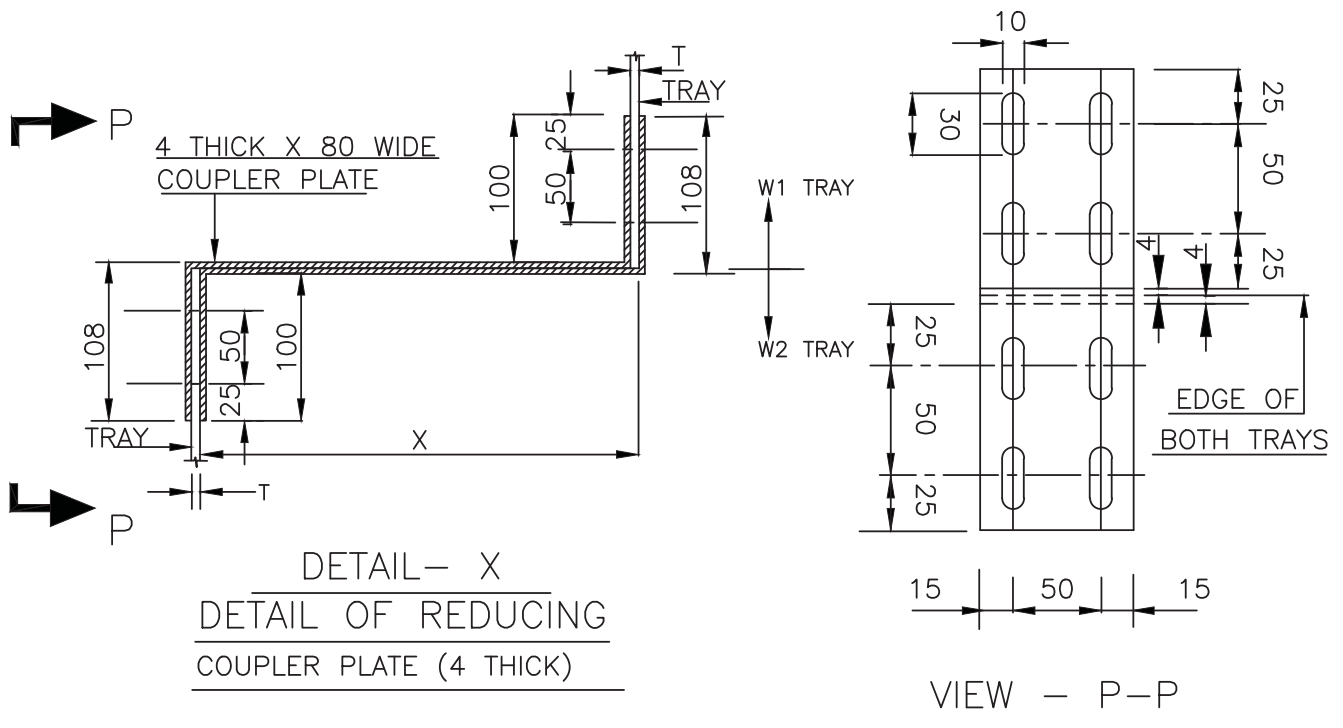
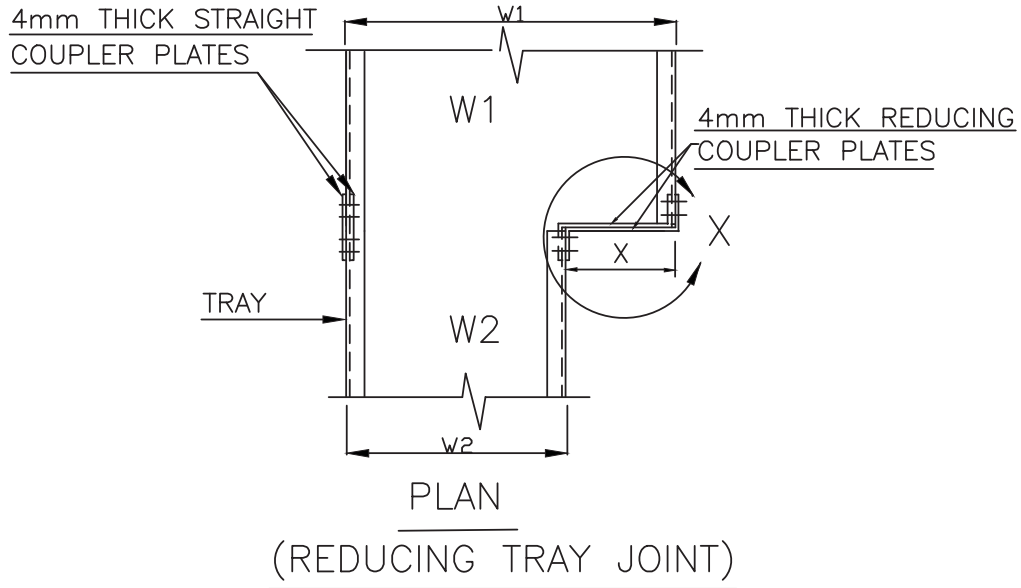






NOTES:-

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.



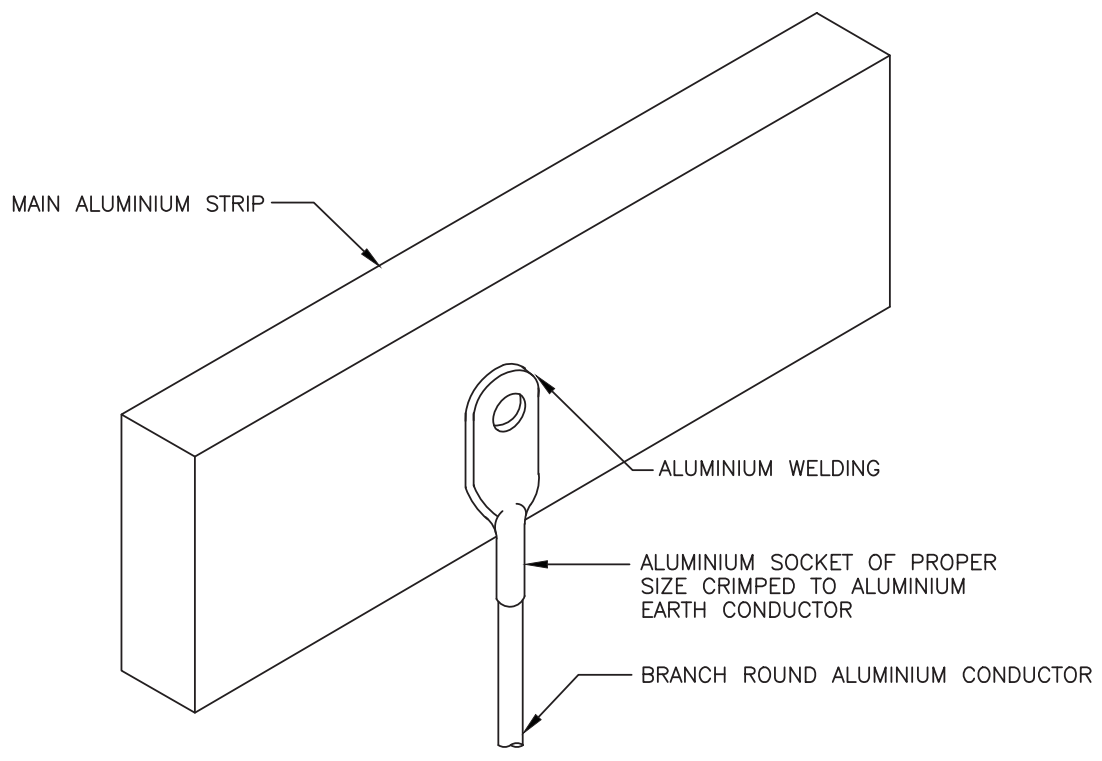
ALL DIMENSIONS ARE IN mm.

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

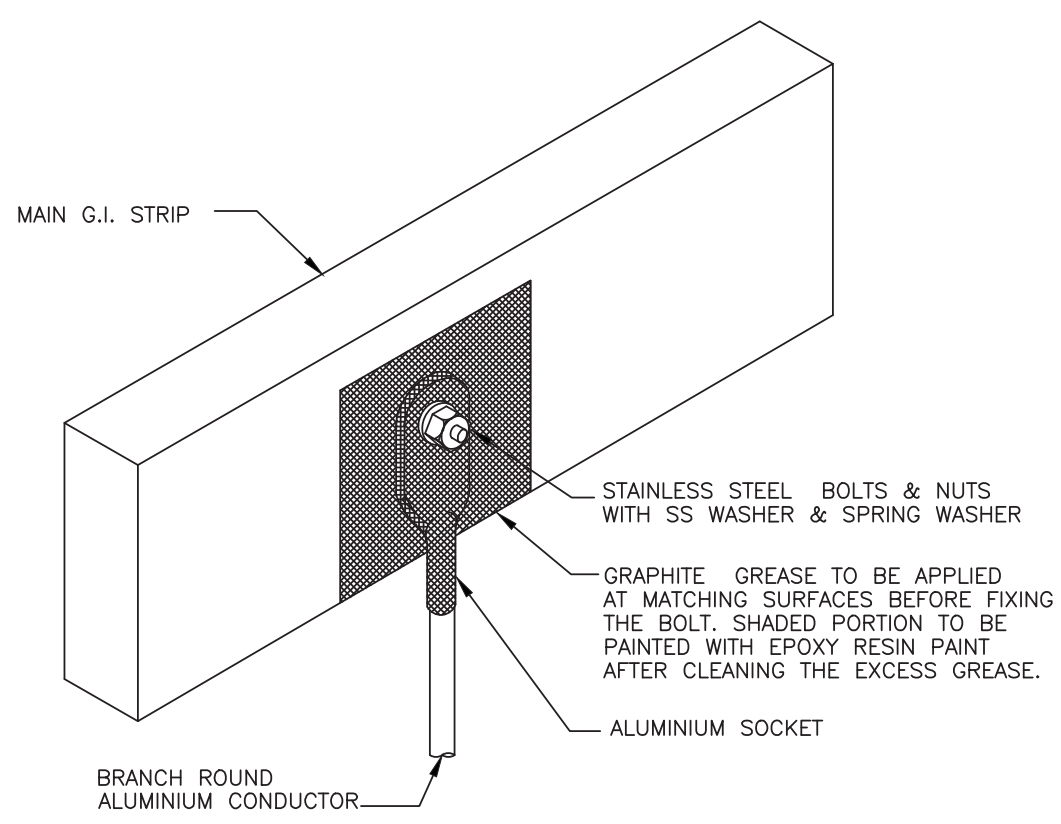
SL. No.	EQUIPMENT TO BE EARTHED	FAULT LEVEL (MVA)	G.I. STRIPS/WIRES		ALUMINIUM			REMARKS				
			MIN. SIZE (mm <sup>2</sup> )	SIZE TO BE USED (mm <sup>2</sup> )	SYMBOL	MIN. SIZE (mm <sup>2</sup> )	STRIPS/WIRES SIZE TO BE USED (mm <sup>2</sup> )		SYMBOL	1.1kv PVC SINGLE CORE CABLE SIZE (mm <sup>2</sup> )		
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	12	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	-DO-
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	-DO-
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	-DO-
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	-DO-
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	-DO-
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	-DO-

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

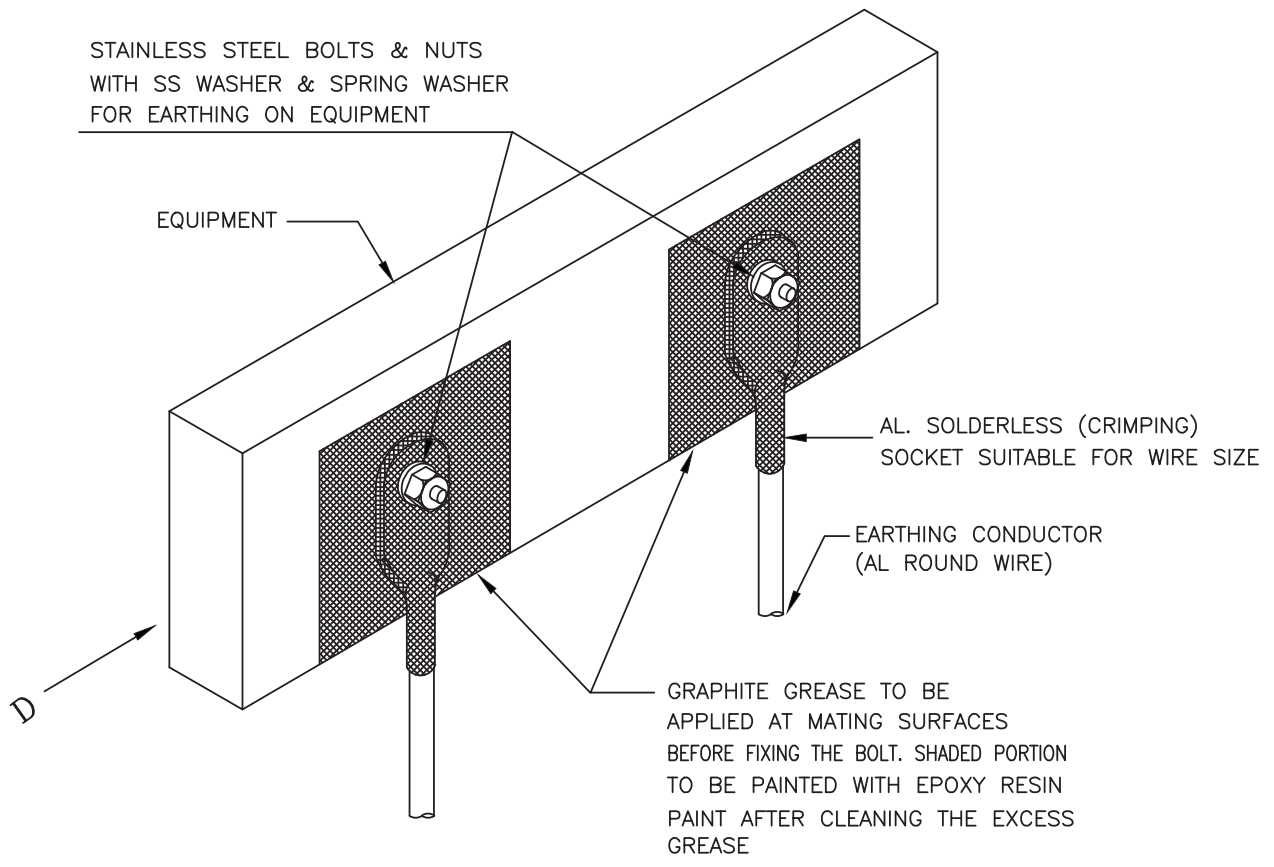
NOTE :--EARTHING CONDUCTOR SIZES FOR ITEMS AT SL.No.4,5,6 & 7 SHOULD BE CHOSEN AS HALF THE POWER CABLE SIZES ACTUALLY USED.



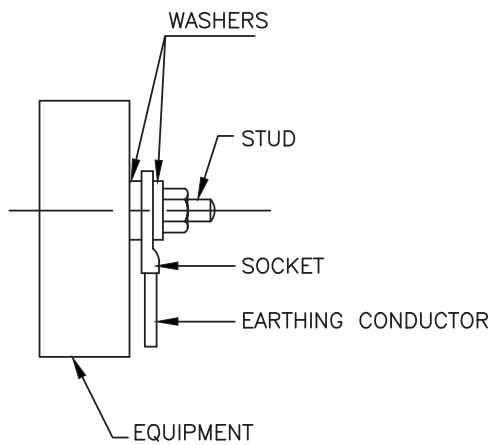
' T ' JOINT ALUMINIUM STRIP TO ROUND ALUMINIUM CONDUCTOR



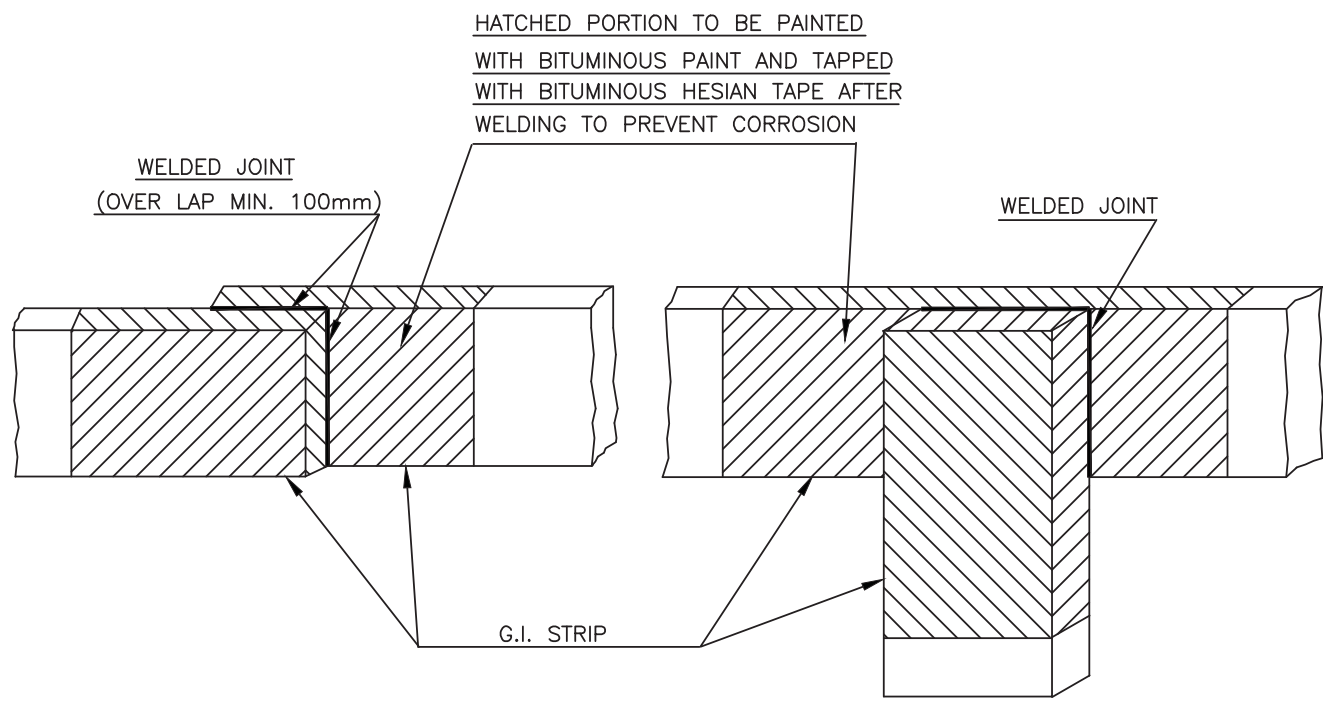
' T ' JOINT G.I. STRIP TO ROUND ALUMINIUM CONDUCTOR



ARRANGEMENT OF DOUBLE EARTH CONNECTIONS TO EQUIPMENT

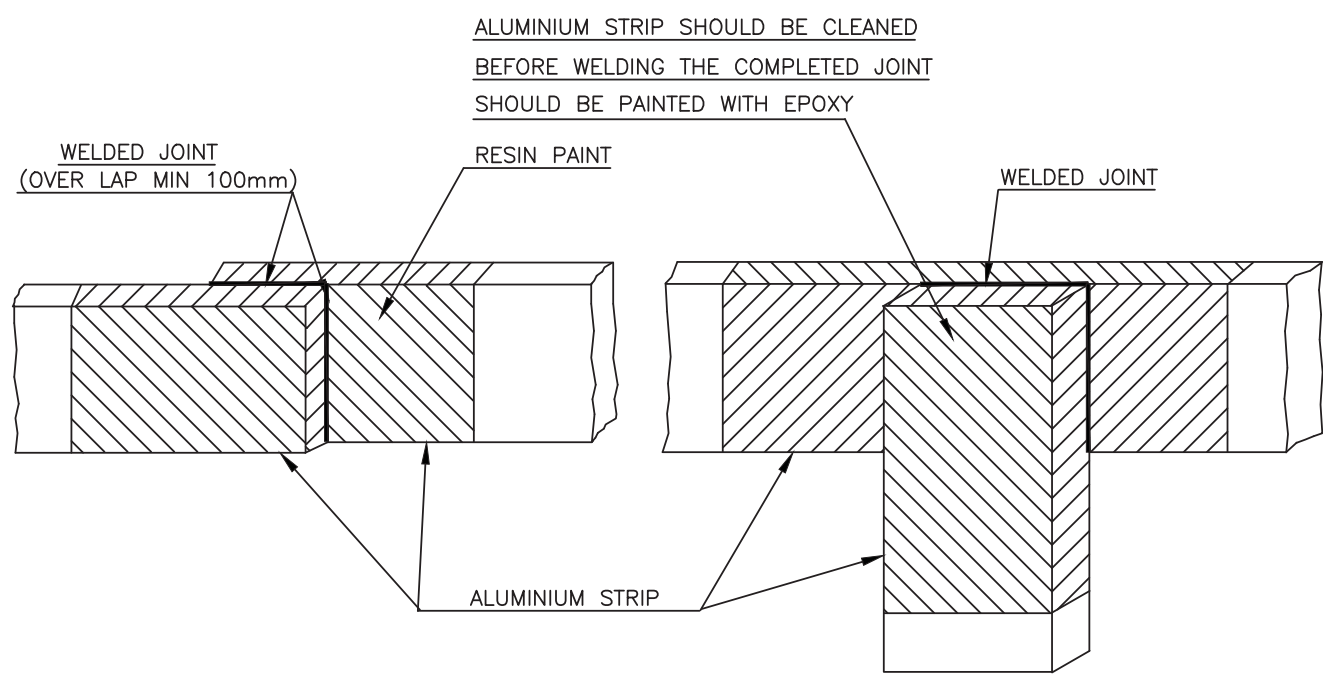


V I E W F R O M - D



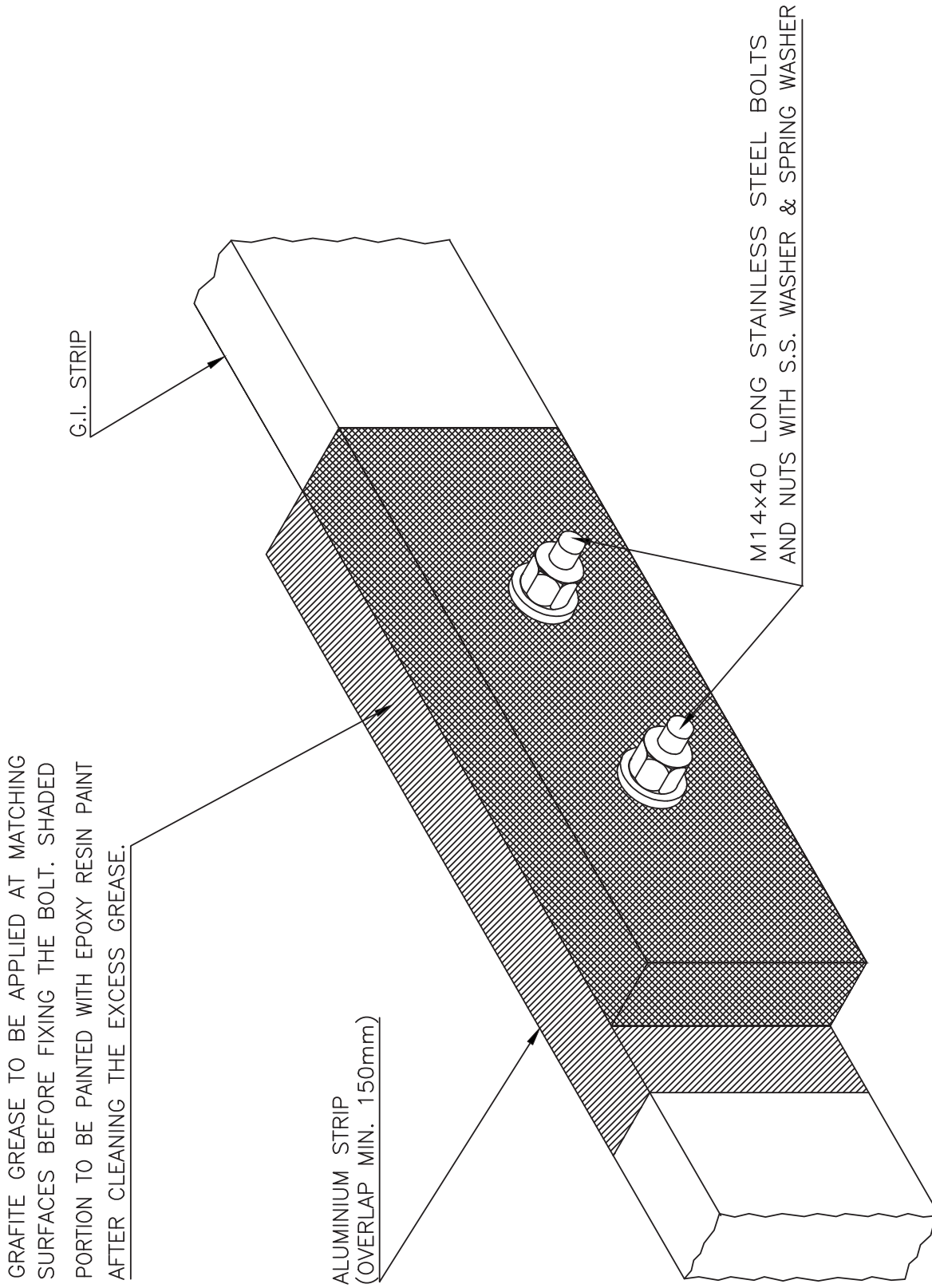
STRAIGHT JOINT G.I TO G.I. STRIP

" T " JOINT G.I. TO G.I. STRIP



STRAIGHT JOINT AL. TO AL. STRIP

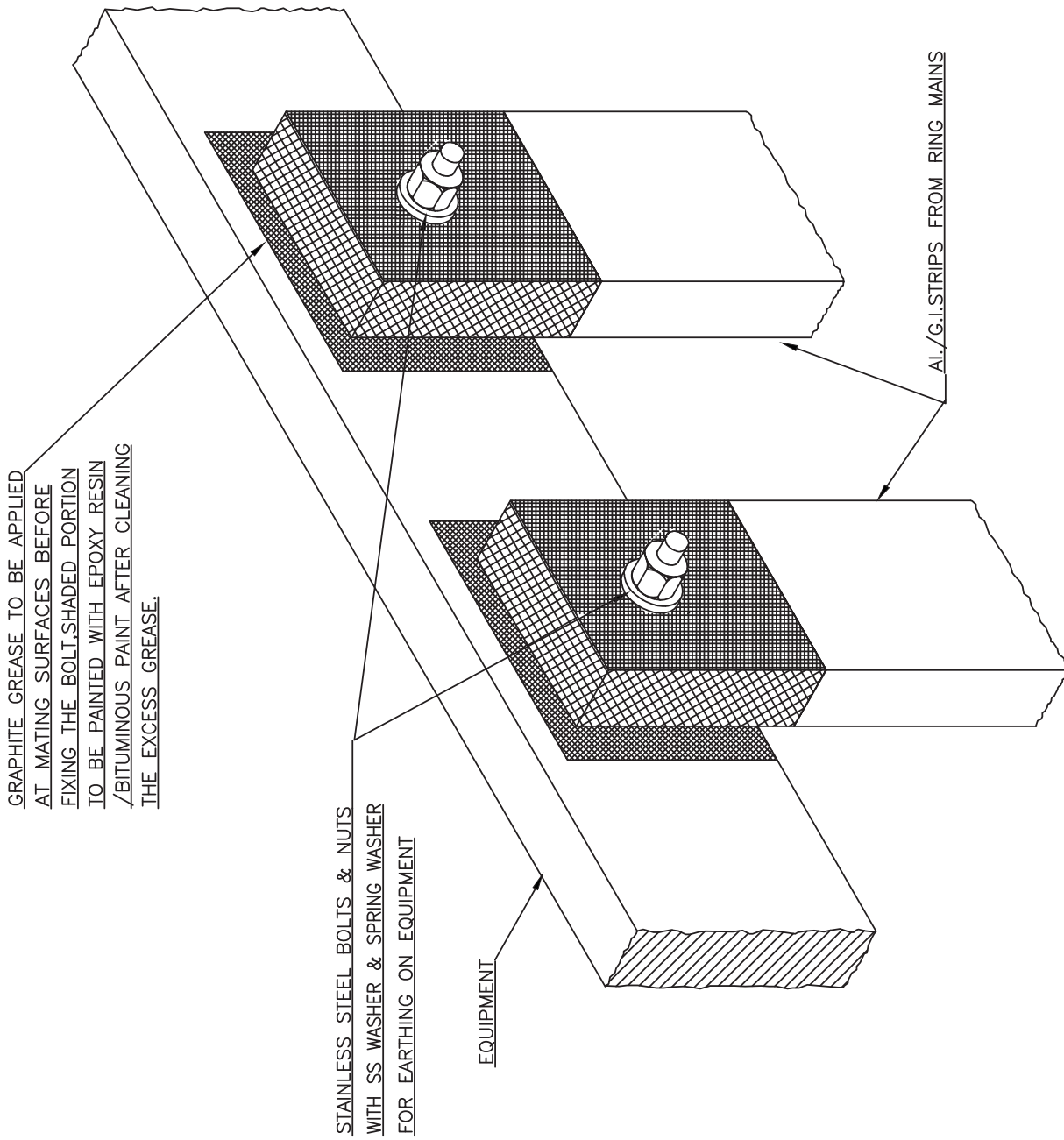
" T " JOINT AL TO AL STRIP



ARRANGEMENT OF LAP JOINT BETWEEN

AL. EARTH STRIP TO G.I. EARTH STRIP

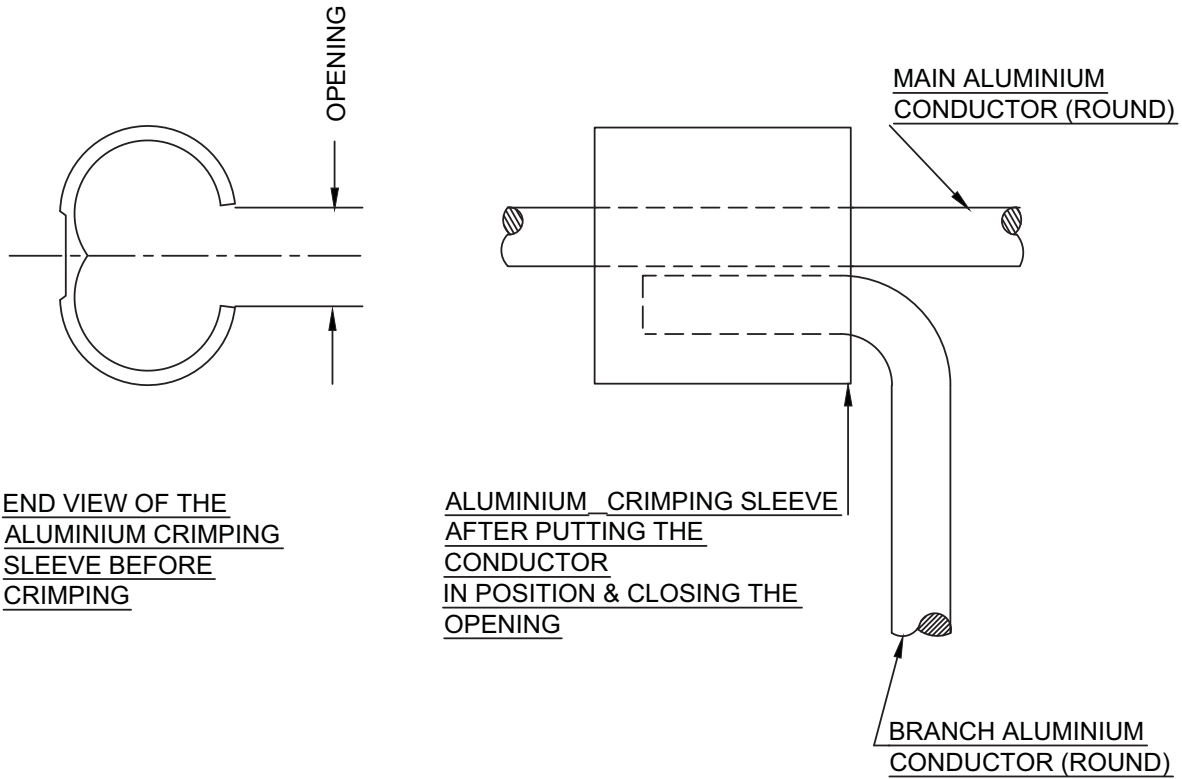




ARRANGEMENT OF DOUBLE EARTH CONNECTION ON EQUIPMENT

NOTE:–

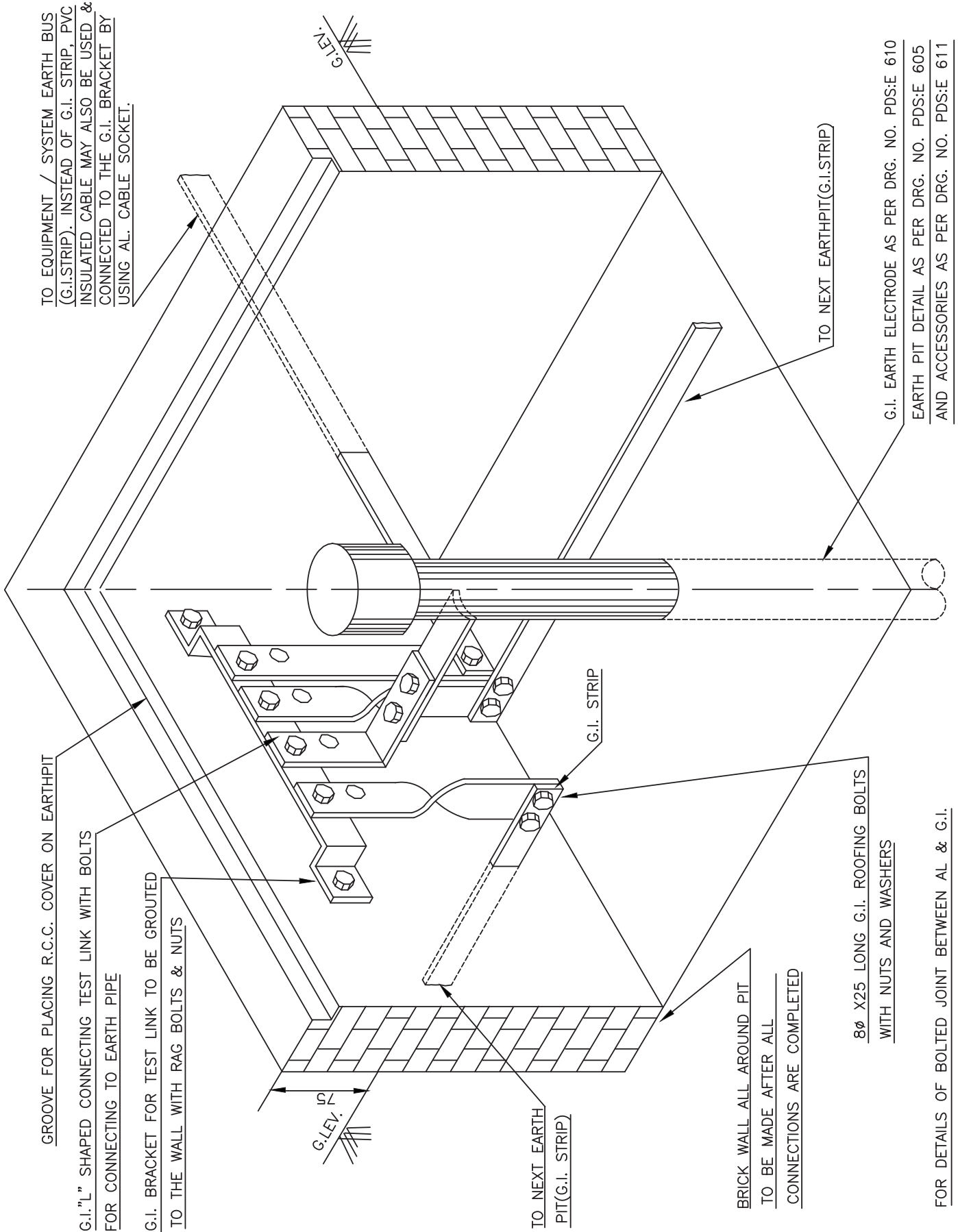
EPOXY RESIN PAINT SHALL BE USED FOR AL STRIP AND BITUMINOUS PAINT FOR G.I. STRIP.

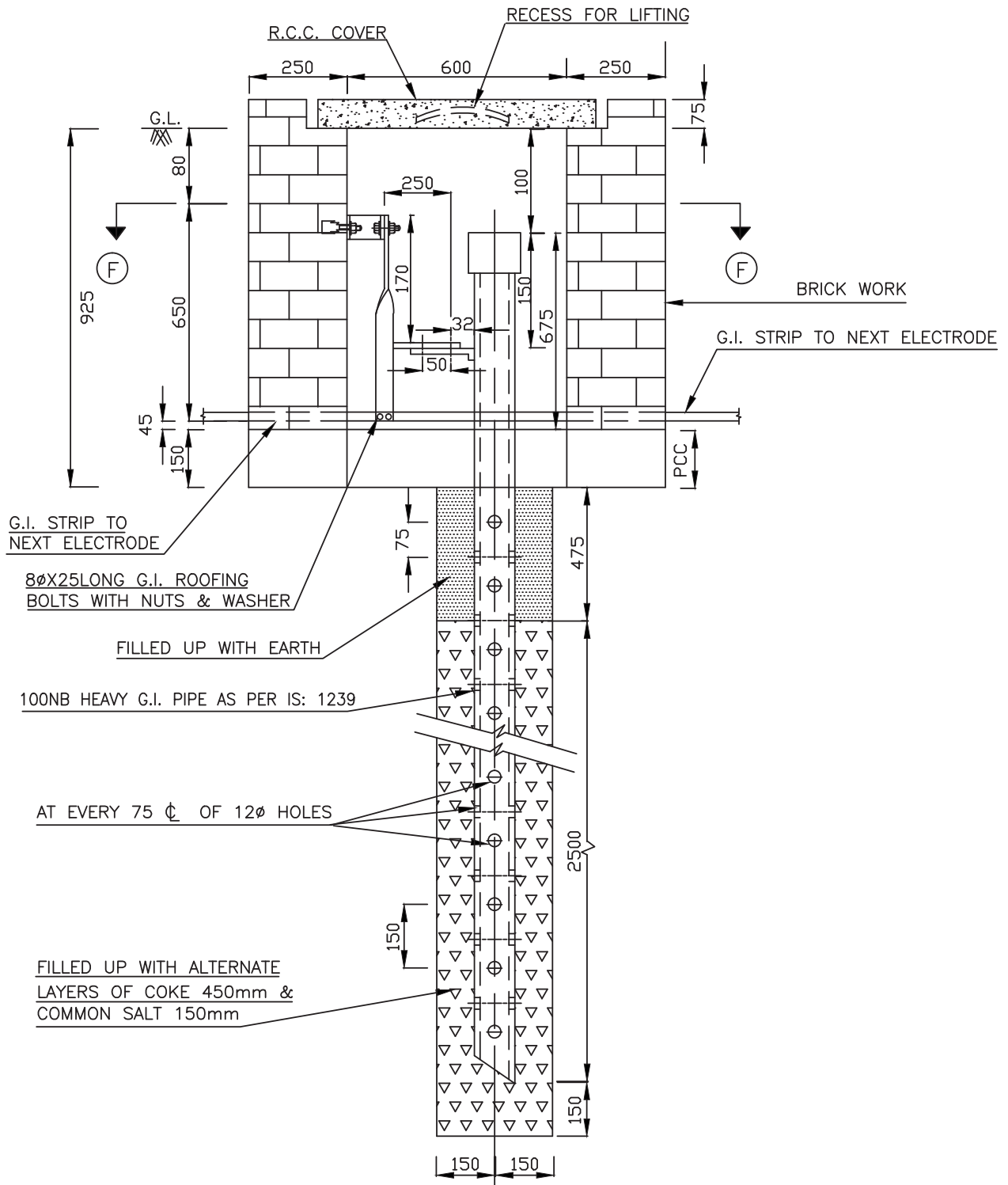


"T" JOINT ROUND ALUMINIUM CONDUCTOR TO ROUND ALUMINIUM CONDUCTOR ( CRIMPING TYPE )

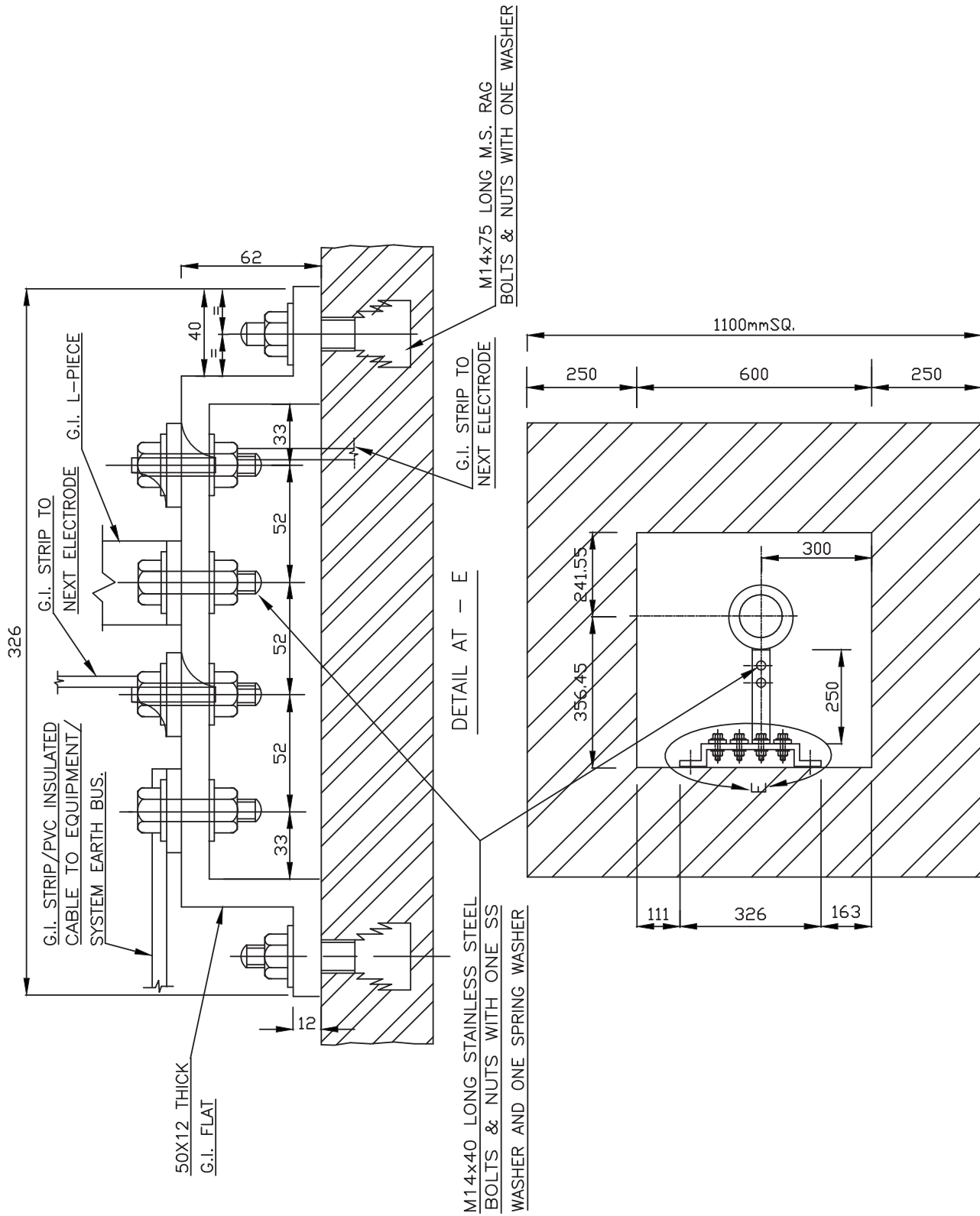
NOTE :-

USE CORRECT SIZE OF COMPRESSION DIES.





SECTIONAL ELEVATION OF EARTH PIT



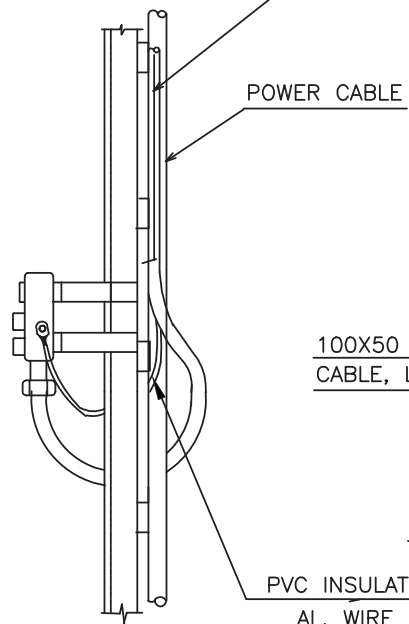
PVC INSULATED CONDUCTOR/ G.I.WIRE/  
AL. WIRE FOR EARTHING OF MOTOR

2 NOS. EARTHING CONDUCTORS

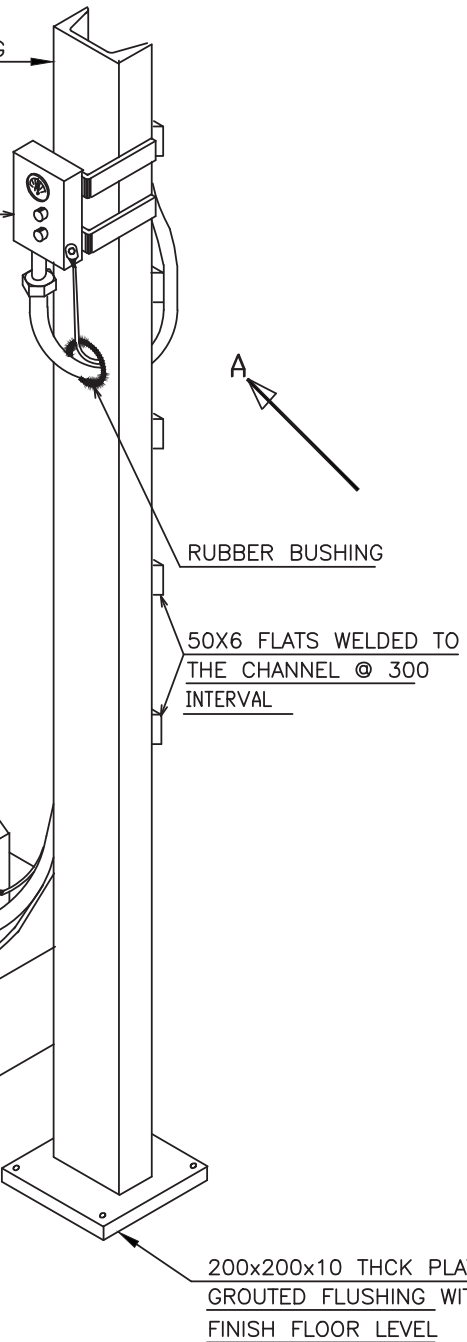
POWER CABLE

CONTROL CABLE

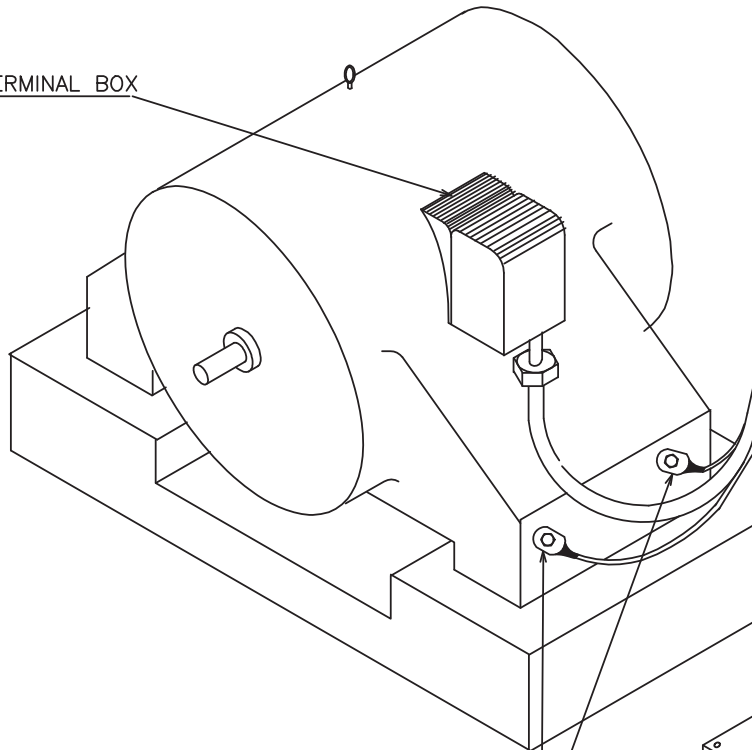
CABLE CLAMPING  
ARRANGEMENT

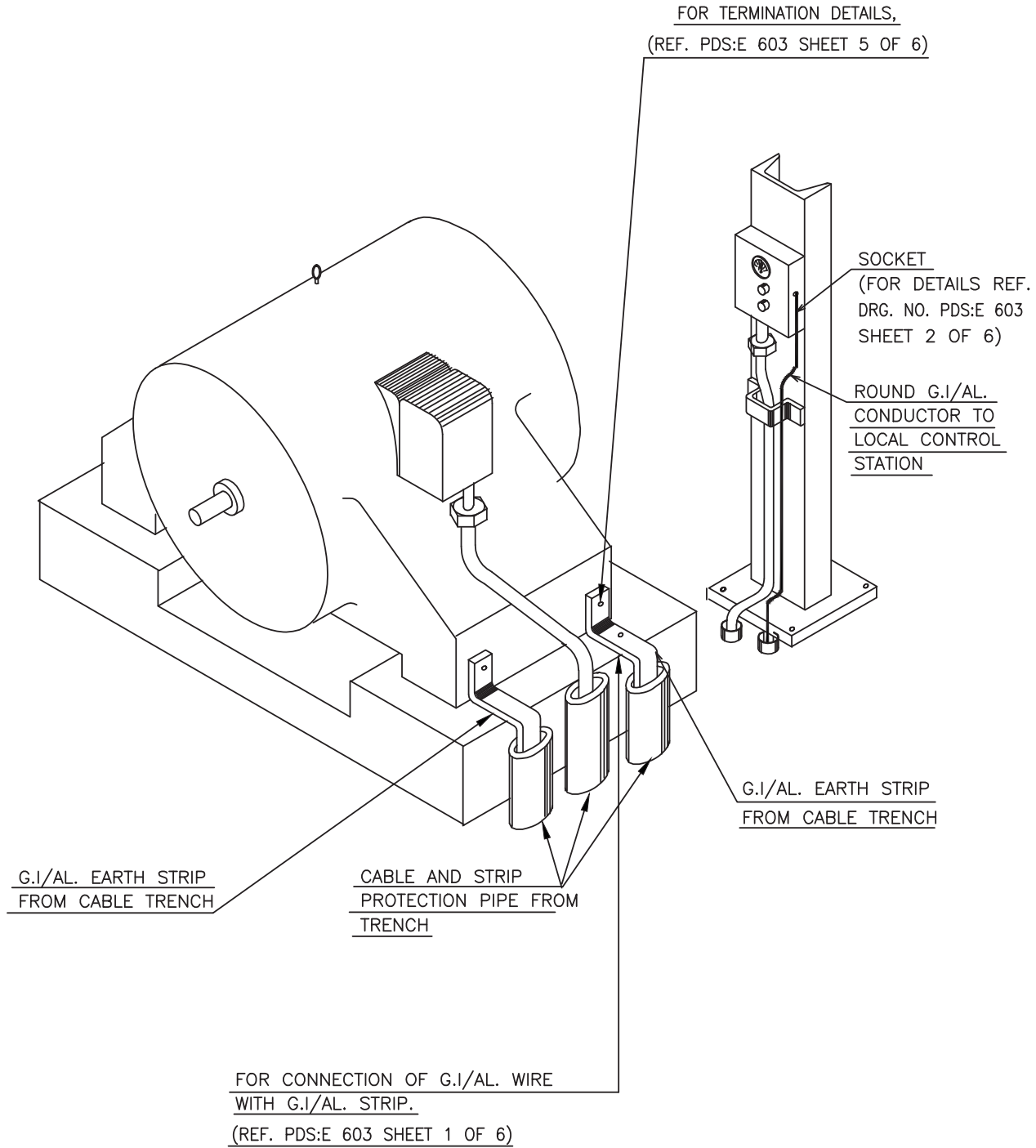


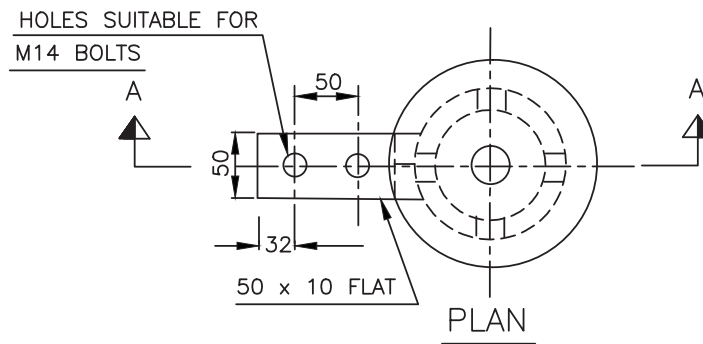
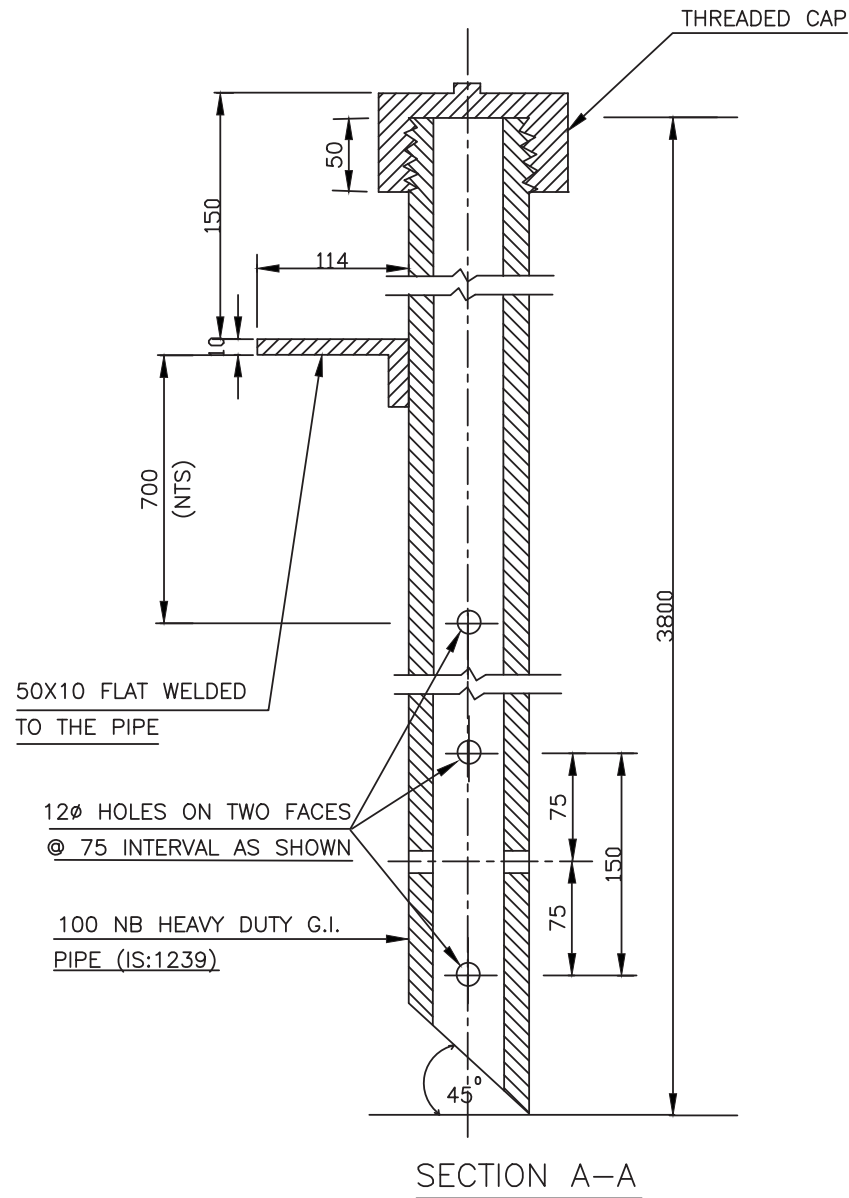
VIEW AT-A



MOTOR TERMINAL BOX



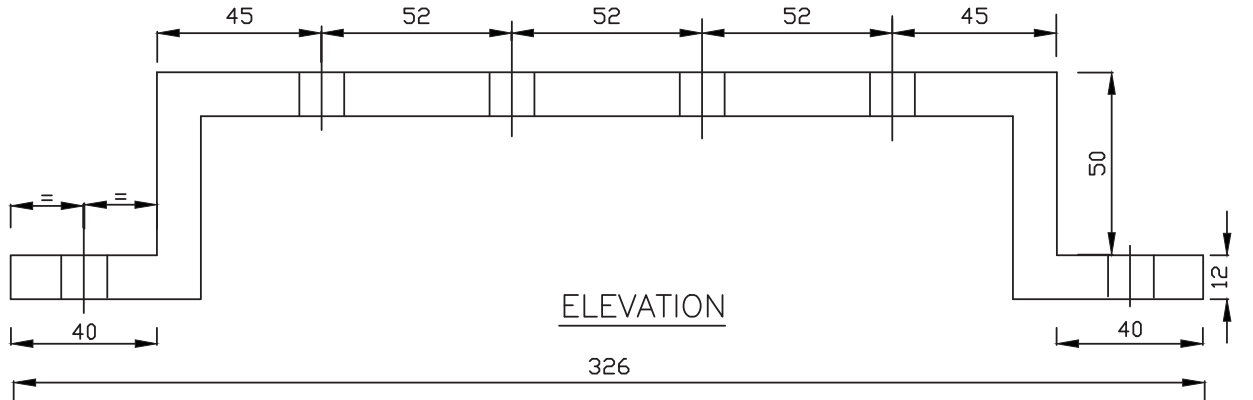




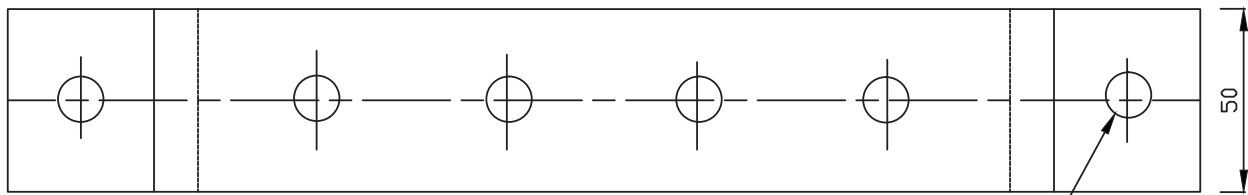
**NOTE:-**

1. 12 $\phi$  HOLES WILL BE PROVIDED AT 75mm INTERVAL ON TWO FACES THROUGHOUT THE LENGTH OF PIPE. THE FIRST ONE SHALL START 700mm BELOW THE WELDED FLAT.
2. ALL DIMENSIONS ARE IN mm.





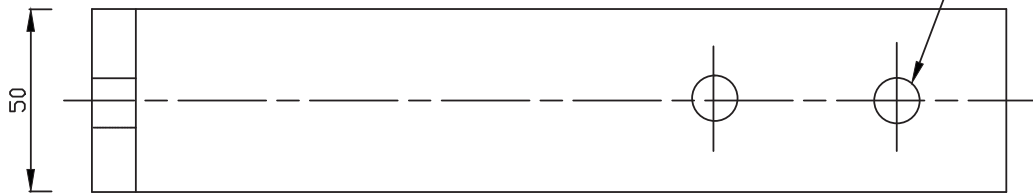
ELEVATION



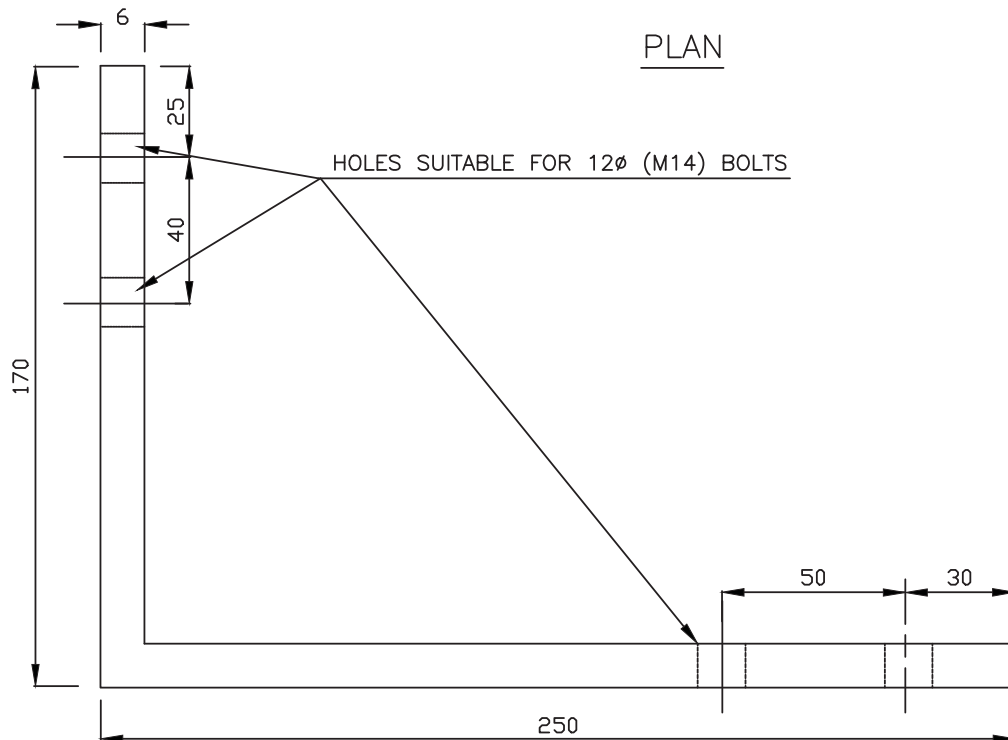
PLAN

G.I. TEST LINK

HOLES SUITABLE FOR 12 $\phi$  (M14) BOLTS



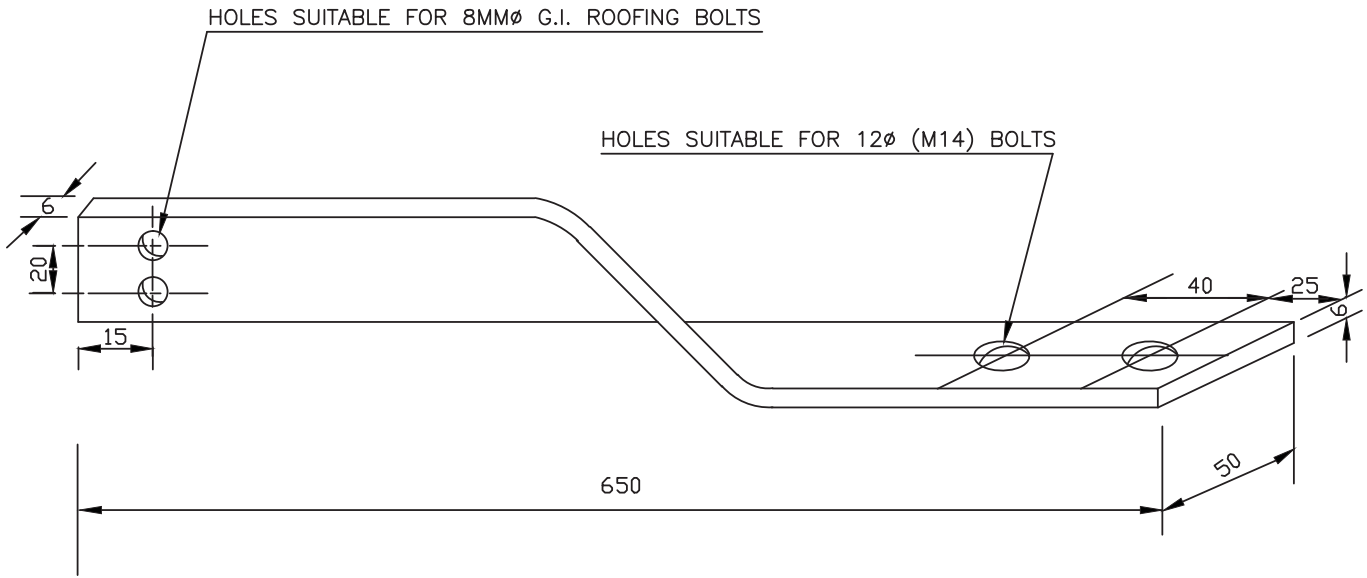
PLAN



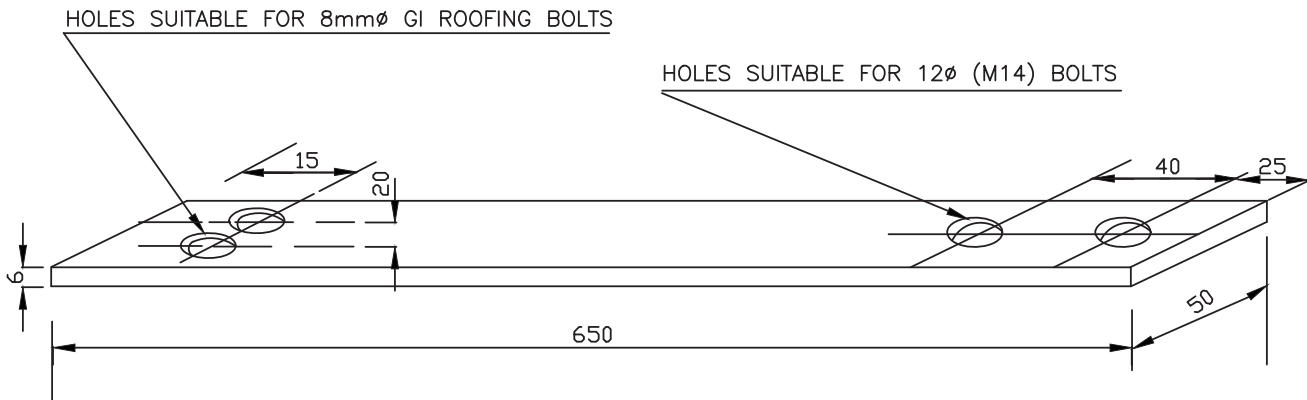
ELEVATION

G.I. 'L' PIECE

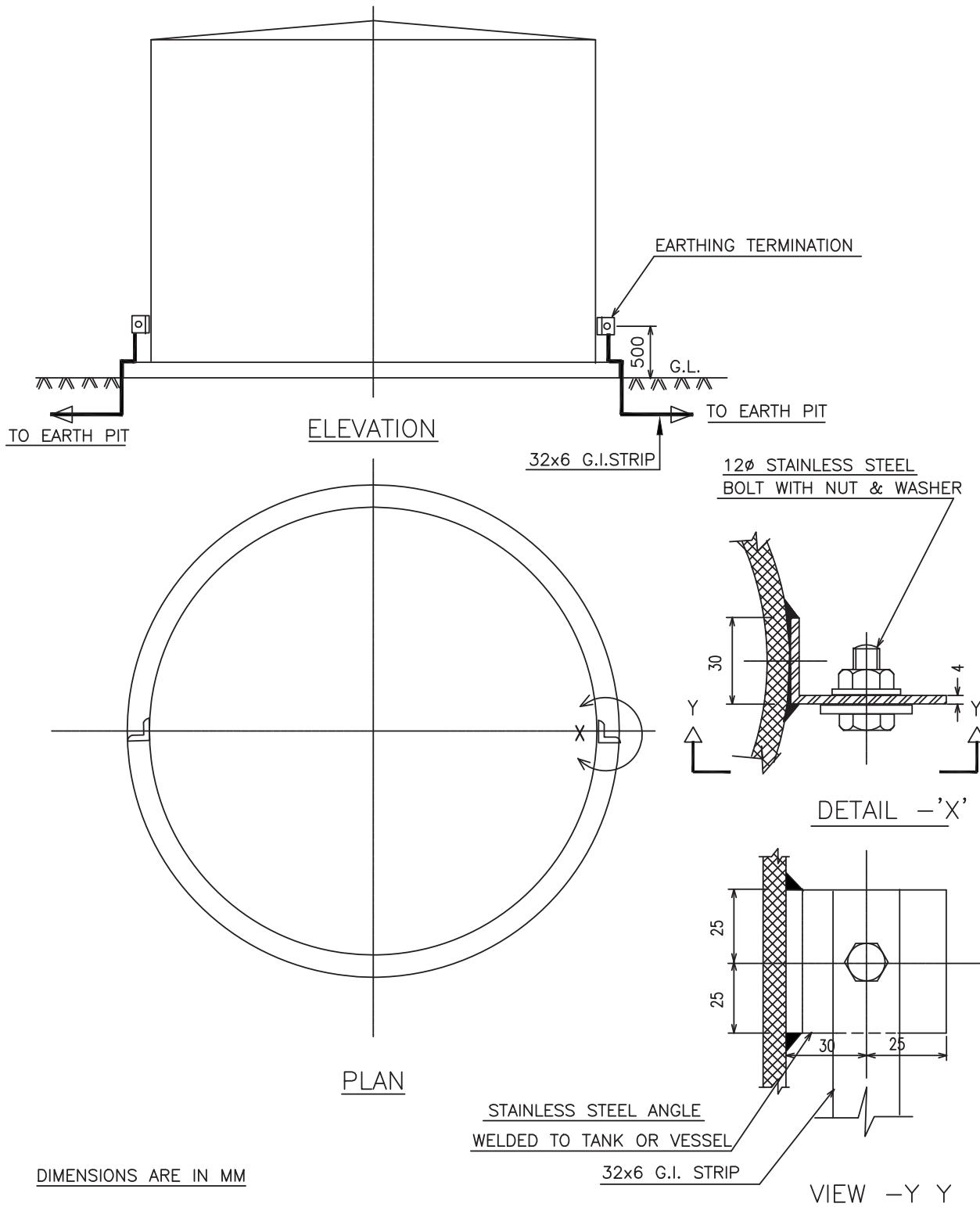
HOLES SUITABLE FOR 12 $\phi$  (M14) BOLTS



CONNECTING TWISTED ALUMINIUM FLAT PIECE

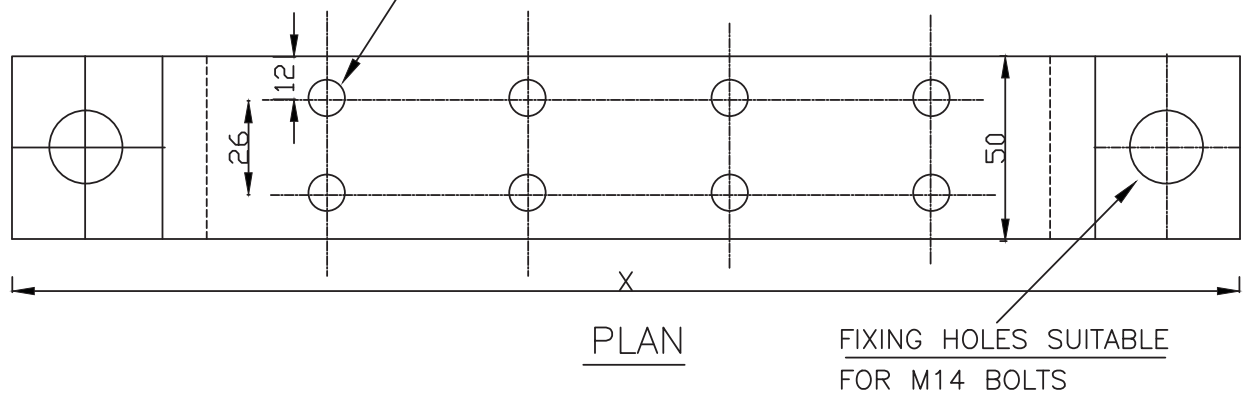
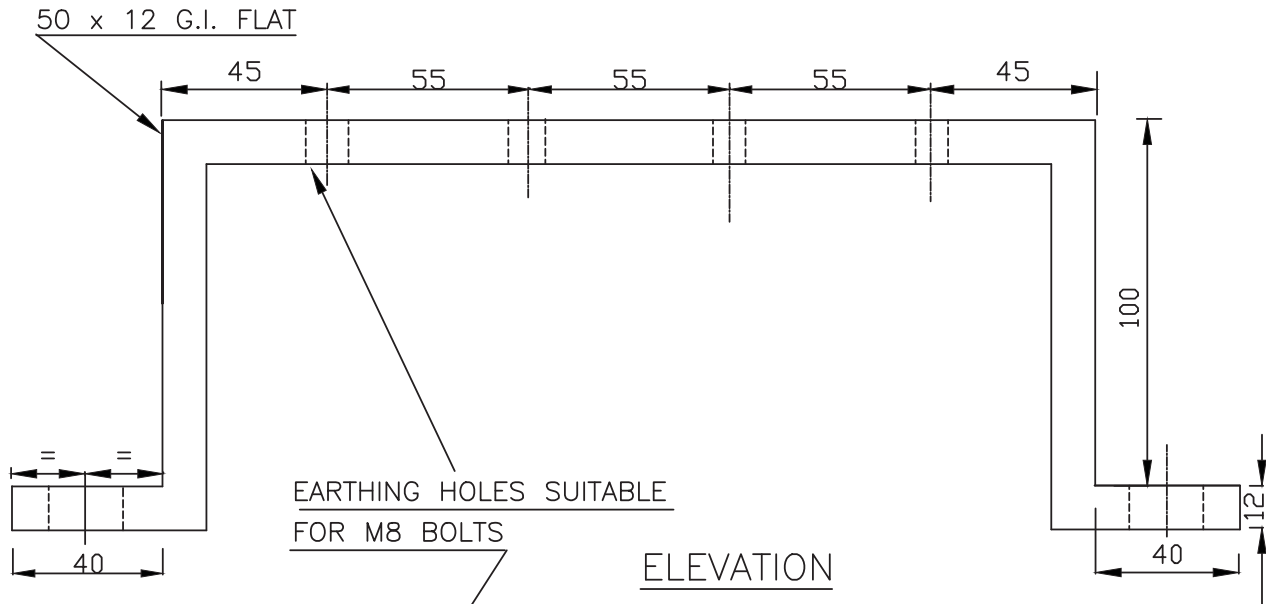


CONNECTING ALUMINIUM / G.I. FLAT PIECE



THE NO. OF EARTH CONDUCTOR SHALL BE AS FOLLOWS

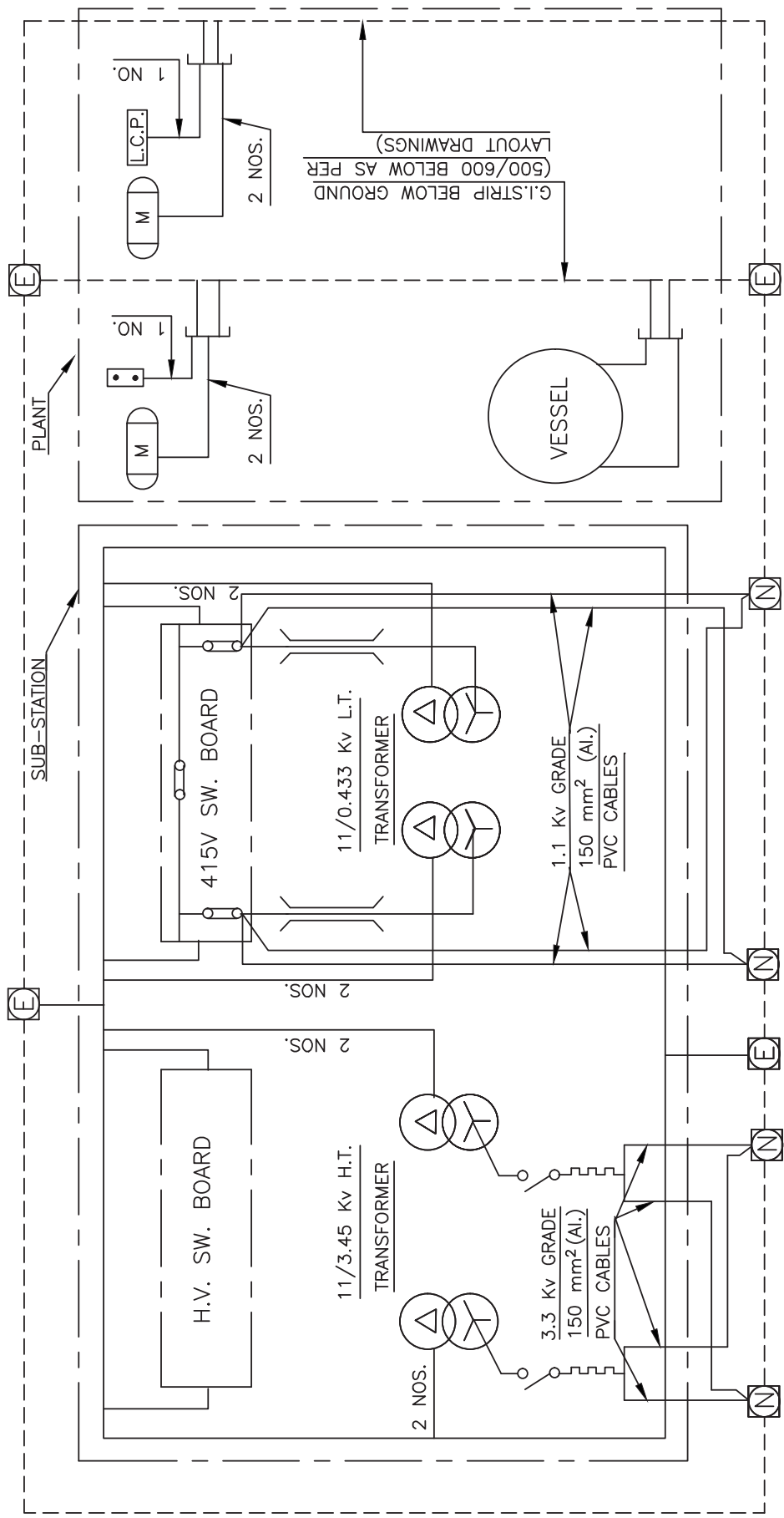
EQUIPMENT WITH ANY DIMENSION	HAZARDOUS AREA	NON-HAZARDOUS AREA
≤ 3 Mts.	1	1
> 3 Mts. ≤ 30 Mts.	2	1
> 30 Mts.	3	2



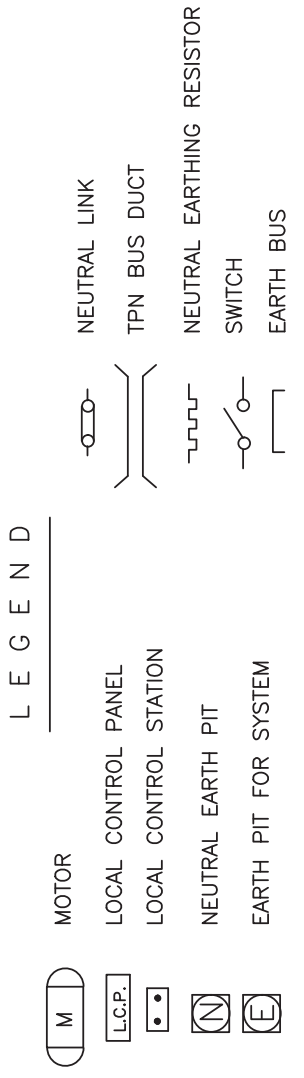
TYPE OF EARTH BUS	NO.OF EARTHING HOLES	OVERALL LENGTH x (mm)
1	8	335
2	10	390

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 - 6.0**


### **SCOPE OF WORK & TECHNICAL SPECIFICATION**

**FOR**

**BALANCE JOB OF SUPPLY, ERECTION, TESTING &  
COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM  
AND ALLIED FACILITIES**



**AT**

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

	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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	Temporary Fencing
	Contractor's Temporary Structures
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	Drawings and Documents
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	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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## 1.0 GENERAL

This specification shall be read in conjunction with the Schedule of Rates, specifications of work, drawings and any other documents forming part of this Contract wherever the context so requires.

Notwithstanding the sub-division of the document into these separate sections and volumes, every part of each shall be deemed to be supplementary of every other part and shall be read with and into the Contract so far as it may be practicable to do so.

Wherever it is stated in the Bidding Document that such and such a supply is to be effected or such and such a work is to be carried out, it shall be understood that the same shall be effected/carried out by the Contractor at his own cost, unless a different intention is specifically and expressly stated herein or otherwise explicit from the context. Contract value (also referred to as Contract Price) shall be deemed to have included such cost.

The materials, design and workmanship shall satisfy the applicable relevant Indian Standards, the job specifications contained herein & codes referred to. Where the job specifications stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied. In the absence of any Standard / Specifications / Codes of practice for detailed specifications covering any part of the work covered in this Bidding Document, the instructions / directions of Engineer- in-Charge will be binding on the Contractor.

It will be contractor's responsibility to bring to the notice of Engineer-in-charge any irreconcilable conflict in the contract documents before starting the work(s) of making the supply with reference which the conflict exists.


In the absence of any specifications covering any material, design of work(s) in the same shall be performed / supplies / executed in accordance with Standards Engineering Practice as per the instructions / directions of the Engineer-in-charge, which will be binding on the Contractor.

## 2.0 THE WORK

### 2.1 Scope of Work

The scope of work covered in this Contract will be as described in Annexure-1 to Technical Specifications, Job Specifications, Standard Specifications, Schedule of Rates, etc.



	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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## 2.2 Scope of Supply

The scope of supply covered in this Contract will be as described in Annexure – 2 Technical Specifications, Job Specifications, Standard Specifications, and Schedule of Rates etc.

## 2.3 Time Schedule - Deleted

2.3.1 The Work shall be executed strictly as per time schedule given in Annexure-3. The period of completion given includes the time required for mobilization as well as testing, rectifications, if any, retesting, demobilization and completion in all respects to the satisfaction of the Engineer-in-Charge.

A joint programme of execution of work will be prepared by the Engineer-in-Charge and Contractor. This programme will take into account the time of completion mentioned in 2.3.1 above.

Monthly/weekly execution programme will be drawn up by the Engineer-in-Charge jointly with the Contractor based on availability of materials, work fronts and the joint programme of execution as referred above. The Contractor shall scrupulously adhere to the Targets / Programmes by deploying adequate personnel, Construction Equipment, Tools and Tackles and also by timely supply of required materials falling within his scope of supply as per Contract. In all matters concerning the extent of target set out in the weekly / monthly programme and the degree of achievement, the decision of the Engineer-in-Charge will be final and binding on the Contractor.

Contractor shall give every day category-wise labour and equipment deployment report along with the progress of work done on previous day in the proforma prescribed by the Engineer-in-Charge.

## 3.0 Measurement of Works

As per Annexure – 4 to TECHNICAL shall apply.

## 3.1 Terms of Payment

Terms of Payment will be as specified in Annexure – 5 to TECHNICAL.

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### 3.2 Temporary Works

All temporary works, ancillary works, enabling works, including dewatering of surface and subsoil water, temporary drains at the work site, preparing approaches to working areas, wherever required for execution of the work, shall be the responsibility of the Contractor and all costs towards the same shall be deemed to have been included in the quoted prices.

### 3.3 Temporary Fencing

The Contractor shall at his own costs and expenses, erect and maintain in good condition temporary fences and gates along the boundaries of the site assigned to him. The Contractor shall fence with bamboo or other materials of sufficient strength for all excavations and shall light the same at night. The Contractor shall, except when authorised by the Engineer-in-Charge, confine his men, materials and plant etc. within the site of which he is given possession. The Contractor shall not use any part of the site for purpose not connected with the works unless prior written permission or consent to the Owner/Engineer-in-Charge has been obtained. Access to site shall be made only through the approved gateways. The Contractor shall maintain sufficient watchmen at site to the satisfaction of the Owner/Engineer-in-Charge.

### Deleted

### 4.0 Statutory Approvals



As per Particular Job Specification (PJS).

### 5.0 Quality Assurance

Detailed quality assurance programme to be followed for the execution of Contract under various divisions of works will be mutually discussed and agreed.

The Contractor shall establish document and maintain an effective quality assurance system as outlined in recognised codes.

The Contractor has to ensure the deployment of quality Assurance and Quality Control Engineer (s) depending upon the quantum of work.

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## 6.0 Working Hours

Depending upon the requirements, time schedule / drawn up programmes and the target set to complete the job in time the works may have to continue beyond normal working hours to the extent of round the clock and on holidays also for which no extra claim shall be entertained.

## 7.0 Responsibility of Contractor

Preparing approaches and working area for the movement and operation of the cranes and other construction equipments, levelling the area for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, facilities such as railway siding local labour etc.

The procurement and supply in sequence and at the appropriate time of all materials and consumables covered under Contractor's scope of supply shall be entirely the Contractor's responsibility. Contractor shall not use any of the equipment or materials issued to him by Owner for temporary works, manufacturing erection aids etc. Misuse of materials will be seriously viewed and deduction at penal rates will be made from the Contractor's bill for such quantities that are misused.

Contract Price is deemed to be inclusive of all expenses towards above responsibilities.


## 8.0 Additional Works / Extra Works

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.

## 9.0 SUPPLY OF WATER, POWER & OTHER UTILITIES

The Contractor shall be responsible at his own cost for arranging all the required Water, Power, land required for temporary site office, fabrication yard and other utilities, in the quantities and at the times required for performance of work under the contract. The contract price shall be deemed to include all costs towards the same.

The Owner/Consultant shall not supply water, power and other utilities.

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Contractor shall, if required by him, for the entire duration of the execution of the work make available near the site, land for construction of Contractor's office, Warehouse, Workshops and for any purpose in connection with providing infrastructure required for the execution of the Contract. The Contractor shall at his own cost construct all temporary buildings and provide suitable water supply and sanitary arrangement as required. On completion of the work undertaken by the Contractor, he shall remove all temporary works erected by him and have the site cleared as directed by Engineer-in-Charge. If the Contractor shall fail to comply with these requirements, the Engineer-in-Charge may at the expense 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 the Contractor shall forthwith pay the amount of all expenses so incurred and shall have no claims in respect of any such surplus material disposed of as aforesaid.

## 10.0 CONSTRUCTION

### 10.1 Rules and Regulations

Contractor shall observe in addition to Codes specified in respective specification, all national and local laws, ordinances, rules and regulations and requirements pertaining to the work and shall be responsible for extra costs arising from violations of the same.

### 10.2 Procedures


Various procedures and method statements to be adopted by contractor during the construction as required in the respective specifications shall be submitted to Engineer-in-Charge in due time for approval. No construction activity shall commence unless approved by Engineer-in-Charge in writing.

### 10.3 Security

If the work is being done in protected area, entry into the work area shall be restricted and governed by issue of photo gate passes by the Security. The Contractor shall arrange to obtain through the Engineer-in-Charge, well in advance, all necessary entry permits/gate pass for his staff and labour and entry and exit of his men and materials shall be subject to vigorous check by the security staff. The Contractor shall not be eligible for any claim or extension of time whatsoever on this account.

### 10.4 Drawings and Documents

Refer Job specifications/Technical specifications.

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### 10.5 Pre-fabrication Works

The contractor shall be required to pre-fabricate the pipelines & associated work and MS structure member etc.(if any) for the work away from the work site and transport the pre- fabricated material to work site at no extra cost to the Owner.

**Deleted**

### 10.5 Excavation by Blasting

Excavation by blasting is not permitted. However, if required in hard strata, other mechanical tools shall be used.

### 10.6 Construction Equipment & Mechanization of Construction Activities

Contractor shall, without prejudice to his overall responsibility to execute and complete the Work as per specifications and time schedule, adopt as far as practicable, mechanised construction techniques for major site activities. However, Contractor agrees that he will deploy the required numbers and types of the plant & machinery applicable for different activities in consultation with the Engineer-in-Charge during execution of works.

The Contractor shall mechanise the construction activities to the maximum extent by deploying all necessary construction equipment/machinery in adequate numbers and capacities.

Wherever Structural/Piping works are included in the scope, the Contractor's responsibilities shall include establishing and maintaining of a proper fabrication workshop with transportation facilities to site to carryout fabrication of steel structures, piping specials etc., preparing approaches working areas for the movement/operation of cranes and levelling the areas for assembly/erection to ensure effective mechanisation on the works. The contractor shall acquaint himself with availability of access, facilities such as railway siding, local labour etc. and the Contractor may have to build temporary access roads to aid his work and the quoted and agreed rates shall be deemed to include the same. It may be noted that all fabrication work shall be carried out in fully mechanised workshops to reduce site fabrication to minimum.

For speedy execution of work, Contractor shall also ensure use of computer software for at least the following:

- i) Billing
- ii) Planning & Scheduling
- iii) Progress Reporting

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- iv) Material Control & Warehousing
- v) Safety Records
- vi) Resource Deployment
- vii) Communication

Contractor further agrees that Contract price is inclusive of all the associated costs, which he may incur for actual mobilization, required in respect of use of mechanised construction techniques and that the Owner/Consultant in this regard shall entertain no claim whatsoever.

#### 10.7 Site Organization

The Contractor shall provide all necessary superintendence during the design and execution of the Works and as long thereafter as the Engineer-in-Charge consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. Such superintendence shall be given by sufficient persons have adequate knowledge of the operations to be carried out including the methods of preventing accident(s) for the satisfactory and safe execution of the Work. The workmen deployed by the Contractor should also possess the necessary licence etc., if required under any law, rules and regulations.


Subject to the provisions in the Contract Document and without prejudice to Contractor's liabilities and responsibilities to provide adequate qualified and skilled personnel on the Work, Contractor shall augment the same as decided by the Engineer-in-Charge depending on the exigencies of Work.

#### 10.8 General Safety Requirement during Construction at Site

After the award of the contract, detailed Health, Safety and Environment (HSE) programme to be followed for execution of contract under various divisions of works will be mutually discussed and agreed to in line with Section-7 of Technical / Commercial portion of NIT.

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.

#### 10.9 General Guidelines During and Before Erection

	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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The Contractor shall be responsible for organizing the lifting of the structural element / equipment in the proper sequence, that orderly progress of the work is ensured and access routes for erecting the other structures / equipments are kept open.

Verticality/alignment shall be maintained. Verticality shall be verified with Theodolites / advanced instruments.

## 11.0 TESTS, INSPECTION AND COMPLETION

### 11.1 Tests and Inspection

The Contractor shall carry out the various tests as enumerated in the technical specifications of this Bidding Document and technical documents that will be furnished to him during the performance of the work no extra cost to the owner.

All the tests either on the field or at outside laboratories concerning the education of the work and supply of materials by the Contractor shall be carried out by Contractor at his own cost.

The work is subject to inspection at all times by the Engineer-in-Charge. The Contractor shall follow all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of the Bidding document, the technical documents that will be furnished to him during performance of work and the relevant codes of practice.



The contractor shall provide the purposes of inspection access ladders, lighting equipment for testing, necessary instruments etc. at his own cost.

Compressed air for carrying out works shall be arranged by the Contractor at his own cost.

All results of inspection and tests will be recorded in the inspection reports, proforma, which will be approved by the Engineer-in-Charge. These reports shall form part of the completion documents. Any work not conforming to execution drawings, specifications or codes shall be rejected and the Contractor shall carryout the rectification at his own cost.

### 11.2 Hydrostatic Testing

Refer job Specification / Technical specifications.

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### 11.3 Final Inspection

After completion of all tests as per specification the whole work will be subject to a final inspection to ensure that job has been completed as per requirement. If any defect is noticed, the Contractor will be notified by the Engineer-in-Charge and he shall make good the defects at his own cost and risk with utmost speed. If, however, The Contractor fails to attend to these defects within a reasonable time (time period shall be fixed by the Engineer- in-Charge) then Engineer-in-Charge may have defects rectified at Contractor's cost.

### 11.3 Documentation

#### “AS BUILT” Drawings



Refer Job Specification / Technical Specifications.

### 11.4 Statement of Final Bills –Issue of No Demand Certificate

The final bill of Contractor shall be accompanied by no-demand certificate from various statutory / concerned Authorities.

## ANNEXURE TO TECHNICAL SPECIFICATION




	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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## ANNEXURES TO TECHNICAL SPECIFICATION

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Annexure-1	: Scope of Work
Annexure-2	: Scope of Supply
Annexure-3	: <b>DELETED</b>
Annexure-4	: Measurement Work
Annexure-5	: <b>DELETED</b>
Annexure-6	: List of minimum nos. of construction equipment to be deployed

	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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## **ANNEXURE-1 TO TECHNICAL SPECIFICATION:-**

### **1.0 SCOPE OF WORK**

Scope of work shall be as detailed in Job Specification, Technical Specifications, Schedule of Rates & various other parts of this Bidding Document.

## **ANNEXURE-2 (SCOPE OF SUPPLY)**

### **Contractor's Scope of Supply**

All materials scope of supply as per SOR & Job specifications required for successful completion of works in all respects shall be supplied by the Contractor and the cost of such supply shall be deemed to have been included in the quoted price without any additional liability on the part of Owner.

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### ANNEXURE-3.0 -DELETED

#### NOTE:

- 1.0) The time of completion shall be reckoned from the date of award of contract, which shall be the date of issue of Fax of Intent.
- 2.0) The time indicated is for completing all the works in all respects as per specifications, codes, drawings and instructions of Engineer-in-Charge.
- 3.0) It should be noted that the period of construction given above includes pre-construction survey, preparation of design, other execution document / drawings, procurement and supply of materials including their inspection & testing, mobilization at site, installation, construction, laying, fabrication, erection inspection, testing, rectification (if any), pre-commissioning, commissioning, demobilization and closure of contract etc. complete in all respects to the entire satisfaction of Owner/ Engineer-in-charge.
- 4.0) Mechanical Completion shall mean completion of pipeline work including pre-commissioning and make the system ready to start commissioning activities.

### MEASUREMENT OF WORK

(ANNEXURE-4)

	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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## MEASUREMENT OF WORK



### GENERAL

The mode of measurement shall be as mentioned in relevant standard specification incorporated in the Bidding Document. Any other mode of measurements not covered in above specifications shall be followed in accordance with relevant BIS codes/ Schedule of Rates/ Specifications etc. and/ or as decided by Engineer-in-charge.

Payment will be made on the basis of joint measurements taken by Contractor and certified by Engineer-in-charge. Measurement shall be based on “Approved for Construction” drawings, to be the extent that the work conforms to the drawings and details are adequate.

Wherever work is executed based on instructions of Engineer-in-charge or details are not adequate in the drawings, physical measurements shall be taken by Contractor in the presence of Engineer-in-charge.

Measurements of weights shall be in metric tonnes corrected to the nearest Kilogram. Linear measurements shall be in meters corrected to the nearest centimetres.

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The weights mentioned in the drawing or shipping list shall be the basis for payment. If mountings for panels etc. are packed separately, their erection weights shall include all mountings.

Welds, bolts, nuts, washers etc. shall not be measured. Rates for structural steel work shall be deemed to include the same.

No other payment either for temporary works connected with this Contractor for any other item such as weld, shims, packing plates etc. shall be made. Such items shall be deemed to have been included for in the rates quoted.



Measurement will be made for various items under schedule of rates on the following basis as indicated in the unit column.

- i) Weight : MT or Kg
- ii) Length : M (Metre)
- iii) Number : No.
- iv) Volume : Cu.M
- v) Area : Sq.M

#### **PIPING**



Length of pipes shall be measured along the curvilinear centre of the pipelines laid/installed and shall include all types of specials, fittings, mitre bends etc. but excluding all types of valves. Length of valves shall be excluded from piping measurement and shall be considered on number basis.

**Annexure-5 : DELETED**

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**DETAILS OF EQUIPMENTS TOOLS & TACKLES TO BE DEPLOYED**

**(Annexure-6)**

	<b>NIT For Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities</b> <b>AT</b> <b>TALCHER FERTILIZERS LTD.</b> <b>SCOPE OF WORK &amp; TECHNICAL SPECIFICATION</b>	PNPM/PC150/E121/SEC-IV-6.0	0	
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LIST OF MINIMUM NOS. OF CONSTRUCTION EQUIPMENT TO BE DEPLOYED ALONGWITH DEPLOYMENT SCHEDULE FOR SCOPE OF WORK (SOW) UNDER SOR

SI No	Description	Requirement	Month	End of Month 1 <sup>st</sup>	End of 2 <sup>nd</sup> Month	End of 3 <sup>rd</sup> Month	End of 4 <sup>th</sup> Month	End of 5 <sup>th</sup> Month			
1	JCB Or, Excavator/ Back-Hoe ( Hitachi 60 or equivalent										
2	Hydra-( 8-10 MT)										
3	Tyre Mounted Crane (20 MT)										
4	Diesel Welding Machine/ Welding Rectifier										
5	DG Set 120 kVA + Stabilizer										
6	Bevelling Machine										
7	External Clamp ND 8"/4"										
8	External X-ray Unit (Complete) /NDT UNIT										
9	Manual UT										
10	Gamma Ray Unit (Complete) /NDT UNIT										
11	Radiography Film Viewer										
12	Sand Blasting Unit (Complete)										
13	Air Compressor (Minimum 300 CFM)										



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14	Air Compressor (Minimum 600 CFM)	To be specified by bidder	To be specified by bidder
15	Holiday Detector		
16	Dewatering Pump		
17	Water Filling Pump of Adequate Capacity		
18	Dosing Pump of Adequate Capacity		
19	Pressurization Pump – Motorised ( Adequate capacity )		
20	Complete hydro testing kit (dead weight tester, pressure instrument, temperature inst. etc.		
21	Horizontal Augur Boring Machine		
22	HDD Machine with adequate pipe pulling capacity > 10T minimum along with complete accessories/ equipment		
23	Pneumatic Drill (Tractor Mounted for Blasting) with Compressor		
24	Pipe Trailers of adequate size		
25	Concrete mixture		

## HIRING / RECOVERY RATE FOR DEPLOYMENT OF MANPOWER

**(Annexure-6a)**



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1. The Labour rates are "all inclusive". These rates include but are not limited to all payroll costs and allowances, payroll taxes, fringe benefits, protective and/or special clothing, construction supplies required for work of a nature included in this contract, overhead, profit, insurance, transportation and travel time.
2. The rates are inclusive of providing hand tools, machinery such as welding machine, grinding machine, gas/welding cutting set and consumables such as fuel, lubricants, electrodes, filler wire, gases, grinding wheels where the concerned category of labour is expected to use in execution of the job but exclusive of all major equipment and machinery like cranes.
3. The normal time labour rates shall apply for all hours worked up to eight (8) hours in a day and overtime rates shall apply for all hours worked in excess of eight (8) hours in one working day, Sunday and Public Holidays. The payment for part of the day shall be made on prorata basis.



**NIT For Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities**  
**AT**  
**TALCHER FERTILIZERS LTD.**  
**SCOPE OF WORK & TECHNICAL SPECIFICATION**

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SL NO.	CATEGORIES	RATE PER DAY OF NORMAL HOURS (IN INR.)	RATE PER HOUR FOR OT, SUNDAY AND HOLIDAY (IN INR)
1	Engineer	3300	600
2	Foreman	2475	545
3	Supervisor	2475	545
4	Un skilled Worker	380	80
5	Gas Cutter	1155	215
6	Grinder	1155	215
7	Brick Mason	660	150
8	Stone Mason	660	150
9	Structural welder	1650	330
10	Qualified Arc welder – CS manual	1980	330
11	Auto Welding Welder	2500	550
12	Welder helper	380	150
13	Pipe Fitter	825	190
14	Structural Fitter	660	150
15	Pipeline Fitter	990	240
16	Mill Wright Fitter	990	240
17	Coater	660	152
18	Mechanic	660	152
19	Site Equipment Operator	660	152
20	Electrician	825	190
21	Fabricator	825	190
22	Carpenter	760	165
23	Plumber	660	150
24	Painter	660	150
25	Cable Joints	990	240
26	Instrumentation Technician	990	240
27	Insulator	660	150
28	Rigger	570	140
29	Bhisti (water man)	315	75
30	Heavy duty driver	910	215
31	Light duty driver	660	150
32	Sand Blaster	735	165

SIGNATURE OF THE BIDDER: .....

NAME OF THE BIDDER: .....



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**EQUIPMENT HIRING/RECOVERY RATES**  
(Annexure-6b)

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## HIRING /RECOVERY RATE FOR EQUIPMENTS

<b>Sr. No</b>	<b>DESCRIPTION OF EQUIPMENT</b>	<b>HIRING/ RECOVERY RATE (NOTE-1) (IN INR) RATE / DAY</b>
1	Pipe Layer / Side Boom – 70 T & Above Capacity	RS.9500.00
2	Pipe Layer / Side Boom - 60 T and above (but below 70 T) Capacity	RS.8500.00
3	Pipe Layer / Side Boom - 40 T and above (but below 60 T) Capacity	RS.8000.00
4	Excavator / Back Hoe-Series Ex 280/300 or Equivalent or above Capacity	RS.7500.00
5	Excavator / Back Hoe- Series Ex 200/260 or Equivalent	RS.7000.00
6	Rock Breaker attachment	RS.5600.00
7	Mono Drill Crawler Mounted/ Hand Drill (Pneumatic) for rock blasting	RS.3000.00
8	Pipe Bending Machine- For all sizes	RS.7000.00
9	Dozer With Ripper - D8 Or Equivalent	RS.7500.00
10	Dozer - D7 / D6 Or Equivalent	RS.4500.00
11	Horizontal Auger Boring Machine-For all sizes	RS.3500.00
12	Auto Welding Unit-with operators & technicians	RS.75000.00
13	Pipe facing (Beveling) machine (appropriate size) for Automatic Welding	RS.3000.00
14	Bevel Cutting Machine (Manual)	RS.600.00
15	Grinding machine	RS.200.00
16	Gas cutting set with cylinders	RS.350.00
17	AUT Machine with 2 operators	RS.15000.00
18	Semi Auto Welding Machines	RS.2000.00
19	DG Welding Machines(SMAW)	RS.1140.00
20	D.G. Sets : 62.5 KVA to 200 KVA (inclusive of generators)	RS.3000.00
21	Induction/Resistance Heating Equipment	RS.3000.00
22	Pipe Clamp (Pneumatic/Hydraulic)- Internal	RS.1000.00
23	Pipe Clamp – External	RS.500.00
24	X-Ray M/C – Internal Crawler	RS.2500.00
25	X-Ray M/C – External	RS.1800.00
26	Gamma Source	RS.760.00
27	Manual UT Machine with 2 operators	RS.500.00
28	Tyre Mounted Cranes (20 - 40 MT)	RS.4500.00
29	Hydra (8 – 10 MT)	RS.3500.00
30	HDD Rig with All Equipments & Accessories (Capacity 150 T and above)	RS.50000.00
31	Blast Cleaning Machine set	RS.250.00
32	Air Compressor – (300CFM)	RS.2000.00
33	Air Compressor - (450/600/800 CFM)	RS.2500.00
34	Air Compressor - (1100 CFM)	RS.2800.00
35	Water Lifting Pumps (400 m3/hr and above)	RS.850.00
36	Filling Pumps (400 m3/hr to 1000 m3/hr)	RS.900.00

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37	Pressurization Pump –Motorized	RS.3000.00
38	Dewatering Pump	RS.800.00
39	Dozing Pump	RS.250.00
40	Holiday Detector Unit	RS.400.00
41	Dead WT Tester	RS.200.00
42	Flat Bed / Semi low bed Trailer	RS.3500.00
43	Pipe Trailer for Coated Line Pipe	RS.3000.00
44	Dumper / Tippers	RS.1500.00

**NOTES:-**

1. Rates are inclusive of operators / drivers and POL.
2. Rates are inclusive of contractor's overheads & profit.
3. The recovery rates shall be the rates provided above plus 20% (twenty percent).



**SIGNATURE OF THE BIDDER:** \_\_\_\_\_

**NAME OF THE BIDDER:** \_\_\_\_\_

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### 3.0 JOB SPECIFICATION

#### (MAINLINE, & ASSOCIATED WORKS)

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## CONTENTS

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3.0	Scope of Work
4.0	Scope of Supply
5.0	Documents, Specifications, Standards & Drawings
6.0	Resources/ Facilities
7.0	Special Points pertaining to Specification

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## PROJECT DESCRIPTION

Talcher Fertilizers Limited is the Joint Venture of four major Public Sector Units – M/s Rashtriya Chemicals & Fertilisers Ltd. (RCF), M/s GAIL (India) Ltd. (GAIL), 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 will consist of Coal Gasification based Ammonia Synthesis Gas Plant and Urea Plant and is to be built at Talcher, Angul District, Odisha (India).

For this purpose Projects & Development India Limited (PDIL) – NOIDA has been engaged as a Consultant for carrying out the detailed engineering services for the proposed coal gasification based fertilizer project at Talcher, Odisha.

Under this project, requirement exists for Raw water, for which NIT is being published for Supply, Erection, Testing & Commissioning of Raw water System at Talcher Fertilizers Limited, Odisha.

Valve Stations shall be made at various locations on proposed steel pipeline net work at inter-distance of approx. 4km or as per instruction of Owner.

Entire pipeline network system laid under this tender scope shall be cathodically protected by providing CP system.



To cater the requirement of Raw Water for the Project, Talcher Fertilizers Limited intends to set up a Raw Water supply arrangement under one package. The Estimated Raw Water requirement for the complex is ~2400 m<sup>3</sup>/hr.

Testing of proposed steel pipeline system, associated above ground piping is covered under this tender.

Pre-commissioning & assistance in commissioning of entire proposed steel pipeline system and piping system are in scope of this tender.

Description of the facilities covered in the above are described in following clauses.



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## Main Pipeline for all sections

- Line Size: 36" NB (with inner lining/Painting)
- Line Length: As per SOR approx. for all pipeline sizes
- Class: SCH XS
- Pump Discharge Pressure : 15 kg/cm<sup>2</sup>
- Material of Pipe & Grade: API 5L  
GRADE, B, PSL1 Wall Thickness: 12.7MM
- Material of Pipe & Grade (CASING): IS-3589,  
10.0MMTHK material with Coltar Epoxy coated (Externally).
- Coating Material: 3LPE, COATED
- Design Code: AWWA M11 (Latest Edition)

Associated underground piping works along with installation of Flow tee & bends, flow meter etc.

PUMPS/EOT SET/CP SYSTEM AS WELL: - As per TS, Datasheets & SOR Buried installation of all types and sizes of valves on mainline & branch line.

## WORK TENDERED

The work tendered in this bid package consists of supply (in CONTRACTOR's scope), fabrication, installation, testing and commissioning of the Raw water supply arrangements including UG pipeline, pumps, flow meter, CP system ,EOT Cranes, electrical system , all other associated works.

All works of the section included in the scope will be done simultaneously from the date of issue of FOI. Bidder will organize and deploy equipment, materials and manpower accordingly to meet this requirement as per instruction of Engineer-in-charge.

## SCOPE OF WORK

The scope of work shall generally be, but not limited to the following:-

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## Procurement

CONTRACTOR shall procure and supply all the materials and equipments required for permanent installation of construction water supply arrangement and associated facilities in sequence and at appropriate time. All equipment, materials, components etc. shall be suitable for the intended service. CONTRACTOR shall obtain Owner's prior approval for the vendor List for procurement. Equipment requiring specialized maintenance or operation shall be avoided as far as possible. Equipment offered shall be field proven.

CONTRACTOR shall procure all materials, components, equipment, consumable etc. required for successful completion of the pipeline system. CONTRACTOR shall also procure and supply spares required for pre-commissioning and commissioning/ start up as recommended for all items supplied by him as per specifications provided in the bid package. Where no specification is available in the contract, the same shall be prepared by the CONTRACTOR based on the piping material specification and shall be subject to Owner's approval.

Material take-off with complete description of size, rating material and thickness.

Only single offer shall be provided by the bidder fully complying to specifications/drawings/ requirements for Owner's review and approval. CONTRACTOR shall provide for inspection of the items at vendor's works a reputed inspection agency and shall submit inspection reports for Owner's clearance.

Stores management including receipt, warehousing, preserving the material in good condition, issue of material to construction site, reconciling/ handing over surplus material to OWNER for OWNER supplied items.

Carryout proper documentation of inspection and quality assurance programmer for all equipment and bulk materials duly approved by OWNER. CONTRACTOR shall maintain an accurate and traceable listing of procurement records for the location, quality and character of all permanent materials in the Project.

CONTRACTOR shall immediately report to the OWNER of all changes which will affect material quality, and recommend any necessary corrective actions to be taken.

Compliance with vendors and supplier's instructions and recommendations for transportation, handling, installation & commissioning.

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## Construction

### General

All construction works shall be carried out as per "Approved for Construction" drawings, procedures, specification and applicable codes and standards. Any changes at site shall also need prior approval from the OWNER and revision of drawings. Construction drawings will be furnished to the Contractor in a phased manner and as per the requirement in accordance with the procurement and construction plan prepared and furnished by him & agreed by Owner/ Consultant.

### Statutory Approvals

The Owner shall provide to the Contractor the basic / in principal approval of ROU (Right of Use) of the land owning authorities, where pipeline is to be laid. However, the Contractor at his own initiative shall undertake all associated activities including Liaisoning & coordination work on day to day basis for obtaining all other necessary clearance, permits and licenses from concerned authorities for the performance of the work and the cost for the same shall be deemed to have been included in the quoted price. If any such permission, permit or license required for the performance of the work by the contractor can only be granted at the request or recommendation of the Owner, the Owner shall at the request of the Contractor, provide recommendatory letters to the contractor to obtain or procure the same. The contractor shall not, however be entitled to any additional compensation over and above contracted rates of services for any hardship or increased cost caused by any idleness, suspension or disruption of work or any other account whatsoever as a result of the inability of the contractor to undertake all associated activities including Liaisoning and coordination work mentioned above for obtaining the clearance(s), permit(s), license(s) aforesaid to match with the progress of the work nor shall the same constitute a ground for extension of time.

The Contractor shall comply with all the conditions and requirements issued by Authorities having jurisdiction in the area where the work is to be performed.

It shall be the Contractor's sole responsibility to make arrangements for land for setting up of its string fabrication yards, all storage areas for line pipe and other materials, wherever required, and all other work areas.

Providing schedules, progress reporting, organization chart at construction site, quality assurance plan and developing quality control procedures, as per requirements indicated elsewhere in the bid package.

Coordination and supervising the work of sub-contractors.

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Transportation of appropriate materials and taking delivery of Owner's supply materials if any, store, worksite, intermediate storage points, maintaining and operating an adequate material control procedure at worksite.

Fabrication of all piping, structural components as per approved drawings.

All civil / structural works, laying and preservation / commissioning of pipeline works shall be performed in accordance with relevant specifications and requirements enclosed elsewhere in the bid package.

CONTRACTOR shall provide complete details of manpower, equipment etc. to be deployed. Mobilizing and providing all equipments, manpower (skilled and unskilled), consumable and other resources etc. for each spread as required for the execution of the complete job defined herein and thereafter demobilizing the same upon completion of work.

Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work.

Deleted



All works related to testing, dewatering, swabbing, drying pre-commissioning and preservation / commissioning of the work tendered.

Idle time preservation of pipeline, if required.

All incidental and associated works and any other works not specifically listed therein but are required to be carried out to complete entire work related to SUPPLY, ERECTION, TESTING & COMMISSIONING OF RAW WATER SYSTEM AT TALCHER FERTILIZERS LIMITED, ODISHA.

## Main Pipeline

Familiarization of Pipeline Route

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Bidders are advised arrange to carry out survey and preparation of Alignment sheets, make site visits to familiarize themselves with all the salient features of terrain and available infrastructure along the pipeline route. Contractor shall be deemed to have considered all constraints and eventualities on account of site conditions along pipeline route while formulating his bid. Contractor shall not be eligible for any compensation in terms of cost and/ or time, on account of site conditions along pipeline route varying to any extent from whatever described in the Bid Package and the drawings furnished along with the Package.

### Topographic Survey

The contractor shall be deemed to have familiarized themselves with the pipeline route prior to quoting and take care of all the eventualities. No extra cost shall be admissible in any form at a later date. The survey drawings & details to the extent available are being furnished to the Bidder along with bid document. Any additional survey/ route survey and their details required either for local detours during execution or for which the survey work for sections of pipeline have not been carried out by owner, shall be carried out by contractor in similar manner without any extra cost to the owner. However, laying and construction of entire pipeline including detoured portion and pipeline section/sections of pipeline for which survey work has not been carried out by Owner, shall be within the scope of contractor without any cost implication. Contractor shall be deemed to have considered such survey works while formulating his bid.

### Soil Investigation/Survey

It shall be Bidder's responsibility to familiarize himself with sub-soil conditions along the pipeline route, and work out the lengths of pipeline to be laid indifferent subsoil conditions including quantum of rock / hard soil excavation that would be necessary, while formulating their bid. Unit rates for pipeline construction as quoted by Bidder shall include the above and be inclusive of all excavation. No extra compensation shall be payable to contractor for any kind of excavation whatsoever.

The survey drawings / documents detail to the extent available are being furnished to the bidder along with tender document. It shall be bidder's responsibility to verify the available data and satisfy himself with regard to accuracy and utility of data.

### Right-of-use (ROU)

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The contractor shall notify the owner the probable date of commencement of work at ROU site at least two(2) weeks in advance to enable the owner to arrange handing over the basic / in principle / specific approval of the ROU / site on the date requested. Should contractor fail in such notification, the owner shall not be liable for any claim by contractor, of whatsoever nature, for delay in the available of a ROU/ site.

Deleted.

Loading, unloading, handling, stacking, storing and transportation to workshop/work site of all materials that may be used for the construction of pipeline system either supplied by OWNER at their designated stack yard/ dump site/store and/ or by CONTRACTOR as the case may be.

The Owner shall provide to the Contractor the basic / in principle / specific approval of ROU (Right of Use) of the land owning authorities, where pipeline is to be laid. However obtaining all necessary clearances, work permits and Liaisoning / coordination works for ROU opening for laying of pipeline and its all crossing from concerned local / land owning authorities and respective OWNER's having jurisdiction, as applicable for performing the work including shifting/ relocation and restoration of telephone/ electrical poles and underground pipes and other utilities etc. as required by local authorities and as directed by OWNER shall be responsibility of contractor.

Stacking, clearing, grading, fencing of Right-of-Use (ROU) as required, trenching to all depths in all types of soil including soft & hard rock, controlled rock blasting (if permitted, however, permission / approval / NOC / work permit will be obtained by the contractor) by special techniques, chiseling or otherwise cutting etc. to a width to also accommodate the pipeline as per relevant standards, drawings, specification etc. transportation of coated pipes to ROU along the route, stringing, aligning, bending, welding, NDT including radiography by X-ray (Gamma ray will only be permitted in inaccessible area like tie-in pit etc., where Engineer-in-charge feels necessary and decision of Engineer In-charge shall be final & binding to the contractor) and ultrasonic (if required), inspection, field weld joint coating including supply of all materials, protective coating of long radius including supply of materials as per specifications, sand padding, laying and lowering of the pipeline, back filling, slope breakers as required, carrying out road, canal, utility and submerged minor water course crossings including bank stabilization of water course crossings as required, crossing of nallah/ canal by conventional method. Supply and installation supports wherever required, supply of select backfill material as required, clean-up, flushing, gauging, hydrostatic testing with the quantity of inhibitor as required, dewatering with the additive, at required dosage, swabbing, pre-commissioning and commissioning of complete pipeline system, including all associated works as per relevant specifications, standards and approved drawings.

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Welding of all tie-in joints including tie-in joints and bends on either side of major river crossings/ with adjoining pipeline installed by others/ other facilities as required, cutting of test header, rebeveling and tie-in with adjacent pipeline segments.

## FIELD WELD JOINT COATING

Field weld joint coating shall be by heat shrink sleeve with min. thickness equal to the corresponding pipe coating thickness, shall be used for field joint coating and bends as per ISO 21809-3:2016 Table 14 Type 14B-2, compatible with 3LPE coating supplied by Seal for Life Industries-Covalence/Dirax or Canusa.

However, for HDD Joint Coating fiber glass reinforced heat shrinkable sleeve shall be fiber glass re-enforced radiation cross linked heat shrinkable wraparound sleeve-DIRAX or equivalent for a maximum operating temperature of (+) 60°C (T max) and shall conform to designation EN 12068 - C HT 60 UV. For the buried valve at stations (molded piece, valves, elbows etc) the two part novolac liquid epoxy coating shall be used as per Type 2/3 DIN EN 10289.



Deleted.

Installation of casing pipes (by open cut/ trenchless method) assembly, including supply of all materials viz. casing pipe, casing insulators and end seals, vents and drains etc. complete, at cased crossings as per the drawings/ specifications enclosed with bid package. Cased crossings shall be installed at locations indicated in alignment sheets or as per SOR or as per instruction of owner. The number of crossings indicated in alignment sheets or as in SOR is subject to change based on engineering, construction and statutory requirements or the requirements of the authority having jurisdiction over a utility crossing.

All works/ provisions including installation of slope breakers to be provided in the trench in areas where slope is more than 1 in 10.

Sand/ soft soil padding around pipe wherever required in areas where trenching has been done in hard soil area / rocky area including supply of sand/ soft soil. The thickness of sand/ soft soil padding at the top of coated pipe shall be minimum 150 mm and bottom of coated pipe shall be minimum 150 mm or as per standard drawing.

Installation of all inline/ online instruments/ valves/ insulation joints / appurtenances etc. as per requirements of approved drawings.

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## Crossings

**There are approx. 14 no. of Road crossings, 2 no.'s of Railway crossings and 2 no.'s of Canal crossings**

Major numbers of crossings to be encountered for this project are as under: - [See Clause no-8.2 (List of Crossings)] for all crossing,

Major number of crossings shall be crossed by heaviest wall thickness carrier pipe among available pipes at site or as per approved drawings/ as decided by Engineer-in-charge.

### a) Road Crossings

Contractor shall firm-up the method of crossing of roads such as open cut/boring up in consultation with concerned authorities and Owner. The Contractor shall also take due care to identify and take due precautions so as not to disturb or damage the utilities like cables, water lines and other structures.

After laying the pipeline in a road crossing by open cut method, the Contractor shall either completely backfill the road & make ready for restoration or completely restore the road to its original condition depending upon instructions of Owner / EIC.

While laying the pipeline in road crossings by open cut method the Contractor should ensure that the traffic is not stopped during the execution of work. This may be done by cutting half of the road at a time so as to enable the traffic to pass on the remaining half of the road. Alternatively, the Contractor can provide diversion roads to maintain the flow of traffic.

The Contractor shall provide proper caution boards during day time and danger lights during night time when the cutting operation of the road is going on. For cased crossings, the pipeline should be taken through the casing pipe which should be at least 1.2 metres below the road top as specified or as per the requirements of local authorities, whichever is higher. All national highway and state highway as indicated in relevant drawings/ alignment sheets/ or as directed by Engineer-in-charge shall be cased crossing.

### b) Railway Crossings



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The general arrangement drawings for railway crossings shall be approved by Indian Railways and construction shall be carried out accordingly. These drawings shall be made available to the Contractor at appropriate time during the execution of the project. Pipeline at railway crossings shall be provided with a casing pipe. The casing pipe shall be at least three nominal pipe sizes larger than carrier and shall be installed by boring/ jacking. It should be noted that the extent of casing pipe generally specified by Railways, is 15.0m beyond centrelines of the outermost tracks on either side or 0.6 meter beyond the ROU limits of railways on either side, whichever is more. All railway crossings shall be cased crossings. The railway crossing shall comply with the requirements of API 1102 and Indian Railway regulations. The crossing angle shall be as close to 90° as possible

**c) Crossings of rivers/ streams/ canals by conventional method:**

- i) No damage should be caused to any irrigation sources, while laying the pipeline through canal crossings.
- ii) The flood banks of the River/ Canal should be brought to the original condition, if they are damaged by the laying of the pipeline. Stabilisation of banks shall be carried out as per requirements of concerned authorities.
- iii) In general the top of the pipeline shall be taken at least 1.5 metre below the scour level of river crossing. If scour level is not known minimum 2.5m cover should be kept unless specified otherwise.
- iv) The top of pipeline shall be at least 1.5m to 2.0m below the drain/ canal bed unless specified otherwise.
- v) Pre-construction survey, preparation of the detailed construction methodology/ plan and time etc. shall have to be finalised by Contractor in consultation with concerned authorities having jurisdiction over canals/ rivers. Company shall provide assistance by providing introductory letters.
- vi) Pre-construction surveys, preparation of detailed construction method statement and calculations for Owner's approval.
- vii) Geo-technical investigations, if required.
- viii) Site preparation, arranging required land for setting up of string fabrication yard and obtaining necessary clearances, permits from concerned authorities.

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- ix) Preparation of pipeline Launch way, continuous concrete coating of pipes, repair of damages to corrosion and concrete coating, string preparation, field welding, NDT including radiography, pretest of completed strings, corrosion and concrete coating of field joints. Trenching, laying at approved depth, stabilization of banks, post installation hydro-test, capping, providing and installing of markers, etc.
- x) The major canals with lining/ perennial canals need to be crossed by HDD/ boring method only.

#### **d) Crossings by Horizontal Directional Drilling (HDD)**

Contractor shall cross the roads / water crossings by HDD method at various depth in different locations as directed by Owner / Consultant either as per site conditions or as per instruction received from concerned authorities, whichever will be higher / stringent and decision of Owner / Consultant in this regard shall be final & binding to the contractor. Before start of HDD, the contractor shall ascertain by pre-construction survey all underground obstacles namely electrical/ telecommunication cable, foreign pipeline, water line, drain/ sewerage line etc. and prepare crossing profile drawings showing all elevations & levels. The contractor shall also ascertain the type of soil & their terrain whether rocky or normal by way of trial pit or by geo-technical survey in case of river etc. before start of job. The contractor shall submit procedure profile drawing with complete design calculations of HDD as per requirement of ASME B31.8/ OISD norms and safety requirement that pipe is not under stress during and after crossing for Owner/ Consultant's approval prior to start the execution of works. Contractor shall determine the minimum allowable elastic bend radius for pipe from the following considerations:-

- i) Maximum longitudinal stress during installation

Total maximum longitudinal stress in the pipeline due to tension and bending at any location shall not exceed 90% of the SMYS of the pipe material. Contractor shall in order to check this requirement evaluate the maximum tensile forces to which the pipeline is subjected to at any phase of its installation during the pulling operation.

- ii) Maximum equivalent stress during final hydrostatic test

After installation the pipeline shall be hydrostatically tested (for 6 hours) at a pressure stipulated in the Special Conditions of Contract / relevant Particular Job Specification. During hydrostatic testing the combined equivalent stress in the pipeline due to bending and test pressure shall not exceed 90% of the SMYS of pipe material.

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- iii) Maximum equivalent stress during service  
Permissible values of maximum equivalent stress during service shall be governed by therequirements of ANSI B31.8/ B31.4 as applicable.

### Hydrostatic Testing, Dewatering, Swabbing and Drying of Pipeline

Contractor shall hydro test the pipeline as per specification enclosed with tender. The test duration shall be **minimum 6 hours**. After successful completion of hydrostatic testing of the pipeline, Contractor shall dewater the pipeline.

Pre-hydro testing of aboveground mainline section shall be carried out separately and test duration shall be **minimum 6 (six) hours**.

#### i) Leak Detection

Contractor shall submit a detailed procedure for detection of anticipated/ probable leak which is likely to be found during hydro test. Such method of detection shall consume minimum possible time to complete the hydro test activity within contractual completion schedules. This procedure needs prior approval.

#### ii) Hydrostatic Test Pressure

The pipeline shall be hydrostatically tested to a minimum test pressure 1.4 times the design internal pressure and in no case test pressure of the pipeline shall exceeds 1.5 times the design internal pressure.


### Priorities

The Contractor shall start the execution work for entire length of and shall deploy adequate manpower, machinery, tool & tackles etc. accordingly.

However, Owner may, at its sole option, assign priority of construction to either any spread or any section in spread of total pipeline length or to any part/ segment of the work. Contractor shall comply with such priority of execution and their deployment without any time and cost implication to the Owner.

### Restoration of ROU

Clean-up and restoration of ROW and other conveniences like road, &cultivable land etc. to original conditions as per specification and drawings to the entire satisfaction of OWNER and/ or Authorities having jurisdiction over the same, including disposal of

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surplus construction materials to a location identified by CONTRACTOR approved by local authority without causing any disturbance to environment, locals and to the entire satisfaction of OWNER.

Upon restoration of ROU the Contractor shall furnish documentary evidence in support of acceptance of the same duly signed by land Owner without any extra cost.

Preparation and submission of as built drawings, pipe books, of major activities, and project records as per specification and instructions of the OWNER including furnishing of all Test Certificates/Inspection Reports for all materials used for permanent installation in as mentioned elsewhere in this document.

**Idle Time Preservation of the Pipeline – (if required) ROW Clearing**

During ROU clearing, the shrub/ trees & vegetation shall be cut off at ground level roots intact.

**Pre-commissioning and Commissioning Assistance**

Drying and pre-commissioning including supply of all materials, manpower of the complete pipeline system.

Making the entire system ready for commissioning and providing assistance during the complete duration of commissioning operations.

**Painting**

- Painting (including supply of all materials) of all piping, structural steel elements for pipe supports, and all structural miscellaneous items as required and as directed by Owner’s. Paint shall be suitable for highly corrosive environment as per TFL/PDIL Spec. (TS-2001) Painting shall include primer and finish coats as per specifications. Prior to painting surface shall be sand blasted as per instruction of Engineer-in-charge.

**INTERNAL LINING FOR PIPELINE**

Entire Pipelines shall be provided with internal lining as two component, 100% solid, solvent free liquid epoxy with 500micron total DFT(min)

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## SCOPE OF SUPPLY

Material to be supplied by Contractor.

### Line pipe with 3LPE Coating, Fittings & Valves,

#### Pipeline as per following spec.

- Line Size: 36" NB (with inner lining/Painting)
- Line Length: As per SOR approx. for all pipeline sizes
- Class: SCH XS
- Pump Discharge Pressure : 15kg/cm<sup>2</sup>
- Material of Pipe & Grade: API 5L  
GRADE, B, PSL1 Wall Thickness: **12.7MM**
- Material of Pipe & Grade (CASING): IS-3589, **10.0MMTHK** material with Coltar Epoxy coated (Externally).
- Coating Material for Main line: 3LPE, COATED Design Code: AWWA M11 (Latest Edition)



Line pipes & above Size valves as per details indicated in SOR shall be supplied by Bidders.

Supply of PUMPS/EOT SET/CP SYSTEM & Battery Bank etc.:- As per TS, Data-sheets & SOR attached in this Tender document.

All machined surfaces shall be properly greased and shall be maintained and protected from damages.

### Repairs of Pipe Defects

Immediately prior to aligning pipe for welding, the bevelled ends of each joint of pipe and the area immediately adjacent thereto (at least 25 mm from the edge on the inside and outside of the pipe) shall be thoroughly cleaned of paint, rust mill scale, dirt or other foreign matter by use of power driven wire buffing wheels, disc sanders, or by other method approved by OWNER'S. This shall be done at no extra cost.

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## Material to be supplied by Contractor

The procurement and supply, in sequence and at the appropriate time, of all materials and consumables required for completion of the work as defined in this Bid document, shall be entirely the CONTRACTOR'S responsibility and item rates quoted for the execution of the CONTRACT shall be inclusive of supply of all these materials. The material to be supplied by the Contractor shall be as per specification and preferred make or duly approved / recommended for use by TFL. The materials will be, but not by way of limitations, as follows:-

### Main pipeline

Field joint coating material for coated pipes comprising of heat shrinkable wrap around sleeves complete with adhesive/ other suitable material compatible with pipe coating material as mentioned in this specification.

Coating repair material compatible and suitable for coated line pipe comprising of repair patches complete with adhesive.

### Internal lining/Painting



Supply of compressed air and other consumables, tools and tackles required for venting, pre-drying, purging and filling of mainline.

Supply of bare casing pipe including all other material like casing insulators, end seals, vent & drain assembly etc. for cased crossing if required as indicated in SOR.

Supply of all Type & Size of Gasket, Bolts & Nuts, consumables etc. as per Specification.

### Piping

- a) Pipe Support materials, U bolts, clamps, clips, Rubber pads for piping works.

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- b) Shims, wedges and packing plates (machined wherever required).
- c) Supply of all Types & Size of Gasket, Bolts & Nuts etc as per Specification.
- d) Painting material.

**All painting materials. Paint shall be suitable for highly corrosive environment For Pipe lines**

The procurement and supply, in sequence and at the appropriate time of all materials and consumable required for completion of the WORK as defined in the contract shall be entirely the Contractor's responsibility and item rates quoted for the execution of the contract shall be inclusive of supply of all these materials (including 4.1). The materials are, but not by way of limitations, as follows as applicable for carbon steel pipeline/piping:

- i. All consumable for welding such as oxygen, acetylene, inert gases and all types of electrodes, filler wire, solder wire, brazing rods, flux etc. for welding/cutting and soldering purposes.
- ii. All materials for all types of pipeline markers including paints conforming to normal corrosive environment as per spec, cement, sand, reinforcement etc.
- iii. All equipment and consumables required for hydrostatic testing like pumps, compressor, pressure and temperature gauges, Corrosion inhibitor for water used for hydrostatic testing, including water for testing.
- iv. All materials required for continuous concrete coating for providing negative buoyancy to the pipeline wherever required.
- v. All materials and consumable required for external field weld joint coating and protective coating of bends as per specifications including supply of coating materials as specified above ,field weld joint coating material for carrier pipes used for uncased HDD crossings.

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- vi. All material and consumable items required for external coating of 450 micron thick 2 component high build epoxy for buried piping, flanges, valves, etc., required.
- vii. All materials required for repair of damaged corrosion coating of line pipe.
- viii. All materials required for sand/soft soil padding around pipeline and select approved quality backfill, bank stabilization of water crossings, etc.
- ix. All materials required for repair/restoration of pavements, roads, bunds other structures affected/damaged by Contractor's construction activities. Materials shall be equivalent/superior to those used for original construction of the facility.
- x. All materials/compressed air as required for cleaning, gauging, filling, dewatering, swabbing for CS pipeline etc.
- xi. All temporary materials required for filling, pressurizing and dewatering in connection with hydrostatic testing including pipes, flanges, blind flanges fittings, temporary gaskets, nuts, bolts, clamps, strainers etc. required for fabrication of test headers and all consumables.
- xii. All types of bolts, studs, nuts and gaskets of all sizes and ratings, thickness as required for the permanent installation in piping system in accordance with the relevant material specification. All fittings like elbows, tees, reducers, swages weldolets, nipples, flanges, blind flanges, spectacle blind flanges, valves, pipes pressure gauge (with calibration certificates) and of all ratings.
- xiii. All types of coating and painting materials including primers, paints, solvents, sand blasting materials, cleaning agents, compressed air etc. shall be suitable for normal corrosive environment.
- xiv. Casing Pipe, Casing insulators and end seals and materials for casing vents and drains as per drawings.
- xv. All steel materials such as structural steels, reinforcement steels and steel for all types of supports, foundations, ladders, platforms, etc.
- xvi. All materials and equipment required for all types of tests such as radiography ultrasonic testing, magnetic particle and dye penetrant examination.
- xvii. Shims, wedges and packing plates (machined wherever required)



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- xviii. All materials for civil and structural works, grouting etc., including casing end seals required in pit.
- xix. deleted
- xx. All safety tools/tackles/devices/apparatus/equipment, etc. including ladders and scaffolding as required.
- xxi. All materials for corrosion protection of buried piping, pipe fittings, valve casing pipes, etc.
- xxii. All materials, equipment, labour for required pre-commissioning / commissioning works and works for tag off on existing charged lines including supply of required quantity of Compressed air.
- xxiii. Heat shrink sleeve/ field jointing coating material.
- xxiv. All other materials not specifically listed herein, but required for the execution of the WORK
- xxv. Engaging of third party inspection agency (TPIA) approved by the owner or owner's representative to carryout inspection of materials. BVIS/DNV/TUV/LLOYD are approved TPIA to carryout inspection.

## General

All consumables for welding such as oxygen, acetylene, inert gases and all types of electrodes suitable for pipes of grades as specified in the specification, low hydrogen electrodes, filler wire, solder wire, brazing rods, flux etc. for welding / cutting and soldering purpose.

Equipment like hydrostatic pump etc., water and corrosion inhibitor for water used for hydrostatic testing including all pipes, fittings and equipment, metallic blinds, temporary gaskets as required for filling, pressurizing and flushing in connection with hydrostatic testing completion.

All materials required for pre-commissioning of the pipeline.

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All pipes, fittings and equipment metallic blinds temporary gaskets as required for filling, pressuring and dewatering in connection with hydrostatic testing completion.

All consumables for welding of structural steel.

Materials and equipment required for all types of test such as radiography, magnetic particle and dye penetrate examination.

All safety tools/tackles, devices / apparatus / equipment etc. including ladders and scaffoldings etc. complete as required.

Supply of compressed air and other consumables, tools and tackles required for venting, predrying, purging and filling of station piping. Air compressor needed for producing compressed air required for pipeline pre-commissioning.



Any other material not specifically listed herein, but required for the execution of the work.

## **DOCUMENTS, SPECIFICATION, STANDARDS AND DRAWINGS**

Owner shall furnish tender purpose drawings, other typical standard drawings attached with respective technical specifications.

No construction small or big shall be carried out without proper construction drawings duly approved by Owner.

After Completion of construction & commissioning of pipeline system, Contractor shall incorporate all the correction in drawings, prepare and issue the drawings "as-built drawings" as listed below to Owner as final submission of drawings. For Mainline pipeline alignment sheet, all X-ing details, all CP drawings, pipe book etc. For final submission only 4 sets of documents plus the original transparencies shall be handed over by Contractor. Any construction done by Contractor without duly approved drawings shall be wholly at his risk and cost. Contractor shall also submit soft copy of pipe book in excel alongwith hard copy. Soft copy of all as-built drawings shall be also submitted in AutoCAD. Video graphy/ photograph of all major activities/ milestone achieved shall also be arranged and submitted by the Contractor. For details

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of documentation to be submitted for mainline and terminal refer enclosed specification for documentation for pipeline construction enclosed elsewhere with the tender.

## Specifications

The work shall be carried out by CONTRACTOR strictly in accordance with the specifications enclosed in this document.

## RESOURCES FACILITIES

### Recruitment of Personnel by Contractor

The Contractor shall not recruit personnel of any category from among those who are already employed by the other agencies working at the sites but shall make maximum use of local labour available.

### Construction Water and Power Supply

No water and power will be provided by the owner. It should be the responsibility of the contractor to arrange water and power at his own cost.

### Land for Residential Accommodation



Owner shall not provide any land for residential accommodation of contractor's staff and labour

## DOCUMENTATION

### "As Built" Drawings

Notwithstanding the provisions contained in standard specifications, upon completion of WORK, the CONTRACTOR shall complete all of the related drawings to the "AS BUILT" stage and provide the OWNER, the following: -

- a) One complete set of all original tracings.
- b) Soft copy of all the as built drawings prepared in AutoCAD in one set of rewritable compact Disc and photographs covering measure activities at site.

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- c) The Contractor shall submit coloured photographs covering all the activities of pipeline constructions highlighting the progress or other areas of work in 2 sets to Engineer-in-charge at site office along with monthly progress report. Similarly photographs for problem areas should be submitted well in advance with a proposed methodology to execute the works and meet the construction schedule. The cost of same shall be deemed to be inclusive in the rates and no separate payment shall be made.
- d) All as-built drawings as mentioned in specification for documentation enclosed elsewhere in the tender.

### Completion Document

The CONTRACTOR in THREE sets shall submit the following documents in hard binder, as a part of completion documents: -

- a) Welding Procedure Qualification Report.
- b) Welder Qualification Report.
- c) Radiographic Procedure Qualification.
- d) Radiographic Report along with radiographs (Radiographs only with the original).
- e) Batch Test Certificate from manufacturers for electrodes.
- f) final Hydrostatic and other Test results and reports.
- g) All other requirements as specified in the respective specifications.
- h) Test results and reports.
- i) Pre-commissioning/commissioning checklist.
- j) Completion Certificate issued by Owner's Site Engineer.
- k) No claim certificate by the Contractor.
- l) Consumption statements of steel and cement certified by Owner's Site Engineer.
- m) Completion certificate for embedded and covered up works wherever applicable.
- n) Recovery statement, if any.
- o) Statement for reconciliation of all the payments and recoveries made in the progress bills.
- p) Copies of deviation statement and order of extension of time, if granted.

### SPECIAL POINTS PERTAINING TO SPECIFICATION

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### Preliminary Activities, Design and Detailed Engineering

Contractor shall carry out all preliminary activities, surveys of utilities to the extent required for main pipeline and distribution/ branch lines, laying underground pipelines and prepare alignment sheets, crossing drawings along with bill of material with all details necessary for construction of the main and branch lines. The minimum pipeline cover shall be kept as follows:

### Pipeline Burial Requirement

The entire pipeline shall be buried and provided with a minimum cover as given in Table below :

<b>PIPELINE BURIAL REQUIREMENTS</b>	
<b>Location</b>	<b>Min. Cover (m)</b>
a) Minor water crossing/canal/nala	1.5
b) Cased / Uncased road / cart track crossings	1.2
c) Cased railway crossings	1.7
d) Drainage, ditches at roads / railway crossings	1.0
e) Other location including rocky areas	1.0

### Note:

- i) The depth of cover shall be measured from the top of the pipe coating to the top of the undisturbed surface of soil or the top of graded working strip, whichever is lower. The fill material in the working strip shall not be considered in the depth of cover.
- ii) The cover shall be measured from the top of road, as the case may be;
- iii) Soft soil / sand padding of minimum 100 mm thickness or as mentioned in standard drawing (whichever is stringent) to be provided around the pipeline where gravel / hard soil or rocky area is encountered.

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## LIST OF CROSSINGS

### 1) Road Crossing/NHI


<b>Sl. No.</b>	<b>Chainage</b>	<b>Length(mtrs)</b>	<b>Area</b>	<b>Methodology</b>
1	330-360	30	Amlapada Road Near Pump House	HDD/AUGER BORING
2	510-540	30	Medical Road	HDD
3	1770-1800	30	Old NH Road	HDD/AUGER BORING
4	1890-1920	30	NH-53	HDD/AUGER BORING
5	2970-3000	30	DIG Office Road	HDD
6	3480-3510	30	Hatatota Main Road	HDD/AUGER BORING
7	3810-3840	30	Ganesh Vihar	HDD
8	4580-4650	70	Gandhi Chowk	HDD
9	5400-5430	30	Near Railway Gate	HDD/AUGER BORING
10	7410-7440	30	Under NTPC Conveyor	HDD
11	7560-7595	35	Angul-Talcher PWD Road	HDD/AUGER BORING
12	8940-8970	30	New Hensmul Road	HDD
13	9150-9180	30	Hensmul Road	HDD
14	9570-9580	10	Near FCI Boundary	HDD
<b>Total</b>		<b>445</b>		

### 1) Railway Crossings

<b>Sl. No.</b>	<b>Chainage</b>		<b>Area</b>	<b>Methodology</b>
1	2220-2250	30	Near Irrigation Canal	AUGER BORING
2	5010-5040	30	Busy Railway Crossing(Talcher Station)	HDD/AUGER BORING
<b>Total</b>		<b>60</b>		

### 2) Canal/Nallah Crossings

<b>Sl. No.</b>	<b>Chainage</b>		<b>Area</b>	<b>Methodology</b>
1	1950-2010	60	Irrigation Canal(NH-53)	HDD/BRIDGE
2	4770-4800	30	Between Railway Crossing & Gandhi Chowk	HDD/Through Pedestal
<b>Total</b>		<b>90</b>		

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## SECTION-VI

### WELDING SPECIFICATION (PNCN-TS-0906)

FOR

PIPELINES

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- ANNEXURE-1 DESTRUCTIVE TESTING
- ANNEXURE-2 ULTRASONIC INSPECTION



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### ANNEXURE-3 RADIOGRAPHY

EXHIBIT-A ELECTRODE QUALIFICATION TEST RECORD



EXHIBIT-B STRESS RELIEF HEAT TREATMENT  
PROCEDURE SPECIFICATION

EXHIBIT-C WELDING PROCEDURE QUALIFICATION TEST RECORD

EXHIBIT-D WELDER QUALIFICATION TEST RECORD

EXHIBIT-E WELDERS IDENTIFICATION CARD

EXHIBIT-F RADIOGRAPHIC PROCEDURE FOR PIPE WELDING

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## SCOPE

The requirements stated herein shall be followed for the fabrication of all types of welded joints of carbon steel piping systems connected with the pipeline and related facilities.

The welded pipe joints shall include the following:



- a) All line pipe joints of the longitudinal and circumferential butt-welded and socket welded types.
- b) Attachments of castings, forgings flanges and other supports to pipes.
- c) Welded manifold headers and other sub-assemblies.
- d) Welded branch connections.
- e) Joints in welded / fabricated piping components.
- f) The attachments of smaller connections for vents, drain drips and other instrument tapings.

Any approval granted by the OWNER shall not relieve the CONTRACTOR of his responsibilities and guarantees.

## APPLICABLE CODE AND STANDARDS

All welding work, equipment for welding, heat treatment, other auxiliary functions and the welding personnel shall meet the requirements of the latest editions of the codes, standards and specifications listed below:

- a) Code for Water works as per AWWA & B31.4 and its Distribution Piping Systems.

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- b) Standard for welding of Pipelines and Related Facilities, API 1104, ASME Sec. IX
- c) Specification for welding Electrodes and Filler Materials ASME Sec. II C
- d) Non-Destructive examination, ASME Sec. V

## BASE MATERIALS

In general carbon steel is used in this specification. The details of material specifications are given in the welding specification Chart attached along with other project data sheets. The CONTRACTOR will arrange and maintain the record of test certificates of all the materials for the reference of the welding engineer.

## WELDING CONSUMABLES

- i) The CONTRACTOR shall provide at his own expense all the welding consumables necessary for the execution of the job such as electrodes, oxygen, acetylene etc. and these shall bear the approval of the OWNER.
- ii) The welding electrodes, filler wires supplied by the CONTRACTOR shall conform to the class specified in the welding specification chart attached along with other project data sheets. The materials shall be of the make approved by the OWNER.
- iii) The electrode shall be suitable for the welding process recommended and the base metal used. Physical properties of the welds produced by an electrode recommended for the welding of a particular base metal shall not be lower than the minimum values specified for the base metal unless otherwise specified in the Welding Specification Chart and shall correspond to the physical properties of the class of electrode adopted. The choice of electrode shall be made after conducting the required tests on the electrodes as per relevant standards, and shall be the sole prerogative of the OWNER.
- iv) The CONTRACTOR shall submit batch test certificates from each electrode manufacturer giving details of physical and chemical tests carried out by them for each batch of electrodes to be used.

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- v) Electrode Qualification test records shall be submitted as per the Exhibit A (attached) in respect of the electrodes tested by the CONTRACTOR for obtaining the approval of the OWNER.
- vi) All electrodes shall be purchased in sealed containers and stored properly to prevent deterioration. The electrodes removed from the containers (except cellulosic coated electrodes) shall be kept in the holding ovens, at the temperature recommended by the electrode manufacturer. Ovens shall be used for the low hydrogen electrodes only. Out of the oven time of electrodes before they are consumed shall not exceed the limits recommended by the electrode manufacturer. The electrodes shall be handled with care to avoid the any damage to the flux covering. Different grades of electrodes shall be stored separately. Cellulosic electrodes used shall however be used as per the specific recommendations of manufacturer.
- vii) The electrodes used shall be free from rust, oil, grease, earth and other foreign matter, which affect the quality of welding.
- viii) Shielding Gas

The composition and the purity of shielding the gas when required by the welding processes other than shielded metal arc welding, when permitted by the OWNER shall bear the approval of the OWNER. Where appropriate, gases or gas mixture of the following quality shall be used.

1. Argon gas complying with BS 4265
2. Carbon dioxide gas complying with type 1 specified in BS 4105
3. Gas mixtures that have been proved to be satisfactory as a result of procedure approval tests.

When a gas mixture is used, which has specified additions, e.g 2% O<sub>2</sub>, 5% CO<sub>2</sub> the variation of such addition shall not exceed  $\pm 10\%$  of that stated. Moisture content shall correspond to a dew point of -30oC or lower.

## EQUIPMENT & ACCESSORIES

The CONTRACTOR shall have sufficient number of welding and cutting equipment auxiliaries and accessories of sufficient capacities to meet the target schedules.

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All the equipment for performing the heat treatment, including transformers, thermocouples, pyro-meters, automatic temperature recorders with suitable calibration arrangements etc shall be provided by the CONTRACTOR, at his own expense and these shall bear the approval of the OWNER. Adequate means of measuring current and voltage shall be available.

Redoing of any work necessitated by faulty equipment or operation used by the CONTRACTOR will be done at his own expense.

## WELDING PROCESSES

Welding of various materials under this specification shall be carried out using Shielded Metal Arc Welding process (SMAW) with the approval of the OWNER.


The welding processes to be employed are given in the welding specification chart attached along with other project data sheets. Any deviation desired by the CONTRACTOR shall be obtained through the express consent of the OWNER.

Automatic process shall be employed only with the express approval of the OWNER. The welding procedure adopted and the consumables used shall be specifically approved.

A combination of different welding processes or a combination of electrodes of different classes / makes could be employed for a particular joint only after duly qualifying the welding procedures to be adopted and obtaining the approval of the OWNER.

## BEVEL CLEANING / BEVEL INSPECTION

The Line Pipe supplied by OWNER shall have bevel ends as specified in the applicable specification for the Line Pipe attached with the Bid Package. Any modification thereto, if required by the CONTRACTOR due to his special welding technique, shall be carried out by the CONTRACTOR at his own cost. Before welding, all the rust and the foreign matter shall be removed from the bevelled ends by power operated tools. This shall be effected inside and outside and for a minimum distance of 25 mm from the edge of the weld bevel. The bevels shall be thoroughly inspected at his stage. If any of the ends of the pipe joints are damaged to the extent that, in the opinion of the OWNER, satisfactory weld spacing cannot be obtained and

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local repair by grinding cannot be successfully done, the damaged ends shall be cut and bevelled to the satisfaction of the OWNER, with an approved bevelling machine. Manual cutting and weld repairs of bevels is not allowed. Should laminations, split ends or inherent manufacturing defects in the pipe be discovered, the lengths of pipe containing such defects shall be removed from the line to the satisfaction of OWNER. On pipes, which have been cut back, a zone extending 25 mm back from the new field bevel, shall be ultrasonically tested to the requirement of the line pipe specification to ensure freedom from laminations. The new bevel shall be 100% visual and 100% dye penetrate / MPI tested. A report shall be written for all the testing and records kept.

## ALIGNMENT AND SPACING

Immediately prior to line-up CONTRACTOR shall inspect the pipe ends inside and outside for damage, dents, laminations etc. Pipe for welding shall be set up, correctly spaced, allowing for the temperature changes during welding. Incorrect alignment shall in no circumstances be sprung in to position. Temporary attachments of any kind shall not be welded to the pipe. Welds joining the sections of the pipeline, valve installation or similar welds classified as tie-in welds shall be made in the trench.

Seam orientation of welded pipe shall be selected to ensure that at the circumferential welds, the longitudinal welds shall be staggered in the top 90° of the pipeline, or 250 mm whichever is the lesser. A longitudinal joint shall pass an appurtenance of a structural element at a minimum distance of 50 mm.

Every effort shall be made to reduce misalignment by the use of the clamp and rotation of the pipes to the best fit. For pipe of same nominal wall thickness the offset should not exceed 1.6 mm. the offset may be checked from outside using dial gauges. Any branch connection sleeve, etc. shall be at least 150 mm from any other weld. The welds for fittings shall be so located that the toe of the weld shall not come within 50 mm of any other weld. Cold dressing is permissible only in cases of slight misalignment and may only be carried out with a bronze headed hammer. Hot dressing shall not be permitted. When welding pipes of different wall thickness (as directed by OWNER) a special transition piece shall be used. This shall have a minimum of 1:4 taper. The welds shall be subject to both ultrasonic and radiographic inspection.

The root gap shall be accurately checked and shall conform to the qualified welding procedure. The use of internal line up Clamps is mandatory for pipe diameters 10" and above. However, in some cases (tie-in welds, flanges, fittings, diameter of pipe 10" etc.) where it is impossible to use internal clamps, an external line-up clamp may be used.

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The internal line-up clamp shall not be released before the entire first pass has been completed.

When an external line up clamp is used, all the spaces between the bars or at least 60% of the first pass shall be welded before the clamp is released and the pipe remaining adequately supported on each side of the joint. Segments thus welded shall be equally spaced around the circumference of the pipe. Slag shall be cleaned off and the ends of the segments shall be prepared by grinding, so as to ensure continuity of the weld bead.

## WEATHER CONDITIONS

The parts being welded and the welding personnel shall be adequately protected from rain and strong winds. In the absence of such a protection no welding shall be carried out. The completed welds shall be suitably protected in case of bad weather conditions.

## WELDING

### Root Pass

- a) The root pass shall be made with the electrodes / filler wires recommended in the welding specification chart attached along with the other project data sheets. The size of the electrodes used shall be as per the approved welding procedure.
- b) Position or roll welding may be permitted. Separate procedures shall be submitted and qualified for up hill, down hill, vertical and roll welding. The vertical up method of welding shall be used for the root pass of the tie-ins, special crossings, fittings and special parts, fillet welds repairs and when an external line up clamp is used. The down hill welding may be used for the root run welding of tie-ins and special crossings when (a) the edges are machined or have equivalent preparation (b) line up clamps are used and the fit up is geometrically and mechanically similar to one of the ordinary line welding without misalignment or unevenness.

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- c) The root pass of butt joints shall be executed properly so as to achieve full penetration with complete fusion of the root edges. Weld projection inside the pipe shall not exceed 3 mm wherever not specified by the applicable code.
- d) Any deviations desired from the recommended welding technique and electrodes indicated in the welding specification chart shall be adopted only after obtaining express approval of the OWNER.
- e) Welding shall be continuous and uninterrupted during a pass.
- f) On completion of each run, craters, welding irregularities, slag etc. shall be removed by grinding and chiseling.
- g) While the welding is in progress care shall be taken to avoid any kind of movement of the components, shocks, vibration and stresses to prevent occurrence of weld cracks.
- h) Fillet welds shall be made by shielded metal arc welding process irrespective of the thickness and class of piping. Electrode size shall not exceed 3.25 mm diameter for the socket joints. At least two passes shall be made on the socket weld joints.
- i) Penning shall not be used.


## Joint Completion

In case of manual welding, the first pass shall be carried out by a minimum of two welders, working simultaneously and so placed as to cause minimum distortion of the pipe.

The number of welders and the allowable welding sequences shall be as those laid down in the qualified welding procedure specification. Once the deposit of the first pass has been started, it must be completed as rapidly as possible, reducing interruptions to the minimum. The welding and wire speed shall be approximately same as that established in the qualified welding procedure specification.

The pipe shall always be adequately supported and must not be bumped or shaken during welding. The clamp shall be removed, as indicated in clause 8.0 above. Before



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starting the second pass, the first pass shall be cleaned and flatted with rotating grinders.

The interruption between completion of the first pass and starting the second pass shall be as stated in the procedure specification, normally not exceeding four minutes.

For crack prevention a top and bottom reinforcement of at least one electrode shall be applied before lowering the pipe on the skid.

The welding speed selected shall enable production of a beaded which is sufficiently thick and which shows no under cutting.

The time lapse between the second and the third pass shall be as stated in the procedure specification, normally not exceeding five minutes. After completion of the third or following passes, welding operations may be suspended, so allowing the joint to cool down, provided that the thickness of the weld metal deposited is equal to at least 50% of the pipe thickness. Upon restarting, depending on the materials, wall thickness and welding process, a preheating of at least 100oC shall be applied. Subsequent passes upto weld completion shall be protected to avoid rapid cooling, if meteorological conditions so dictate. Cleaning between the passes shall be done carefully so as to reduce the possibility of inclusions.

The electrode starting and finishing points shall be staggered from pass to pass. Arc strikes outside the bevel on the pipe surface are not permitted. Arc-strike or arc-burn on the pipe surface outside the weld, which are caused accidentally by electrical arcs between the electrode, electrode holder, welding cable or welding cable round and the pipe shall be removed by grinding in accordance with a procedure approved by the OWNER and the repair checked by ultrasonic, radiographic, magnetic particle or dye penetrant tests which the OWNER feels necessary. The pipe wall thickness after grinding shall not be less than the minimum thickness limit permitted for the pipe. Repair of arc strikes by welding is prohibited.

The completed weld shall be carefully brushed and cleaned and shall appear free from spatters, scales, etc.

These requirements apply not only to completed welds but also to the bare strip atleast so wide as to allow full skid examination at both ends of the pipe to allow a good ultrasonic inspection when it is required.

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## HEAT TREATMENT- Deleted


## INSPECTION & TESTING

### General

- a) The OWNER'S Inspector shall have free access to all the concerned areas, where the actual work is being performed. The CONTRACTOR shall also afford the OWNER'S inspector all means and facilities necessary to carry out inspection.
- b) The OWNER is entitled to depute its own inspector to the shop or field where pre- fabrication and erection of pipelines are being done, with (but not limited to ) the following objectives.
  - i) To check the conformance to relevant standards and suitability of various welding equipment and the welding performance
  - ii) To supervise the welding procedure qualification.
  - iii) To supervise the welders' performance qualification.
  - iv) To check whether shop / field welding being executed in conformity with the relevant specifications and codes of practice followed in pipe construction.
- c) CONTRACTOR shall intimate sufficiently in advance the commencement of the qualification tests, welding works and acceptance tests, to enable the OWNER'S INSPECTOR TO BE PRESENT TO SUPERVISE THEM.

### Welding Procedure Qualification

- a) Welding procedure qualification shall be carried out in accordance with the relevant requirements of API 1104 latest edition or other applicable codes and CONTRACTOR SHALL SUBMIT THE WELDING PROCEDURE SPECIFICATIONS IN FORMAT AS PER Exhibit-C(attached) immediately after the receipt of the order.
- b) OWNER'S inspector will review, check and approve the welding procedure submitted and shall release the procedure for procedure

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qualification tests. The procedure qualification test shall be carried out by the CONTRACTOR under field conditions at his own expense. A complete set of the test results in format as per Exhibit-C (attached) shall be submitted to the OWNER'S Inspector for approval immediately after completing the procedure qualification test and at least 2 weeks before the commencement of actual work. Standard tests as specified in the code shall be carried out in all cases. In addition to these tests, other tests like radiography, macro / micro examination, hardness tests, dye penetrant examination charpy v-notch etc. shall be carried out on the specimens. It shall be the responsibility of the CONTRACTOR to carry out all the tests required to the satisfaction of the OWNER'S Inspector. The destructive testing of welded joints shall be as per Annexure-I.

### **Welder's qualification**

- a) Welders shall be qualified in accordance with the API 1104 and other applicable specifications by the CONTRACTOR at his expense. The butt weld test pieces of the qualification test shall meet the radiographic test requirements specified in Clause 12.5 and Annexure-3 of this specification. The OWNER's inspector shall witness the test and certify the qualification of each welder separately. Only those welders who have been approved by the OWNER'S inspector shall be employed for welding. CONTRACTOR shall submit the welder qualification test reports in the standard format as shown in Exhibit – D and obtain express approval before commencement of the work. It shall be the responsibility of CONTRACTOR to carry out qualification tests of welders.
- b) The welders shall always have in their possession the identification card as shown in Exhibit-E and shall produce it on demand by the OWNER'S Inspector. It shall be the responsibility of the CONTRACTOR to issue the identity cards after the OWNER has duly certified it.
- c) No welder shall be permitted to work without the possession of identity card.
- d) If a welder is found to perform a type of welding or in a position for which he is not qualified, he shall be debarred from doing any further work. All welds performed by an unqualified welder shall be cut and redone by a qualified welder at the expense of the CONTRACTOR.

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## Visual Inspection

OWNER shall carry out inspection of all welds as per the latest editions of the applicable codes and specifications. All finished welds shall be visually inspected for parallel and axial alignment of the work, excessive reinforcement, concavity, shrinkage, cracks, under-cuts, dimensions, surface porosity and other surface defects. Undercutting adjacent to the completed weld shall not exceed the limits specified in the applicable standard / code.

## Non-destructive Examination.

The non-destructive examination shall mainly consist of examination using x-ray radiography as detailed in Annexure-3.



Radiographic examination of one hundred percent (100%) girth welds will be required by the OWNER. Welds shall meet the standards of acceptability as set forth in API 1104 and as well as the requirements laid in subsequent paragraphs

The CONTRACTOR shall make all the arrangements for the radiographic examination of work covered by the specification at his expense.

The OWNER will review all the radiographs of welds and inform the CONTRACTOR regarding unacceptable welds. The decision of the OWNER shall be final and binding in this regard.

All the requirements mentioned in the specification shall be arranged and executed by the CONTRACTOR THROUGH HIS OWN RESOURCES. In addition, ultrasonic inspection is required in the following cases as per Annexure-2 of this Specification.

- a) When 20 mm or more are cut from the pipe end as supplied, the ends shall be ultrasonically inspected for an additional length of 20 mm to assure no laminations exist.
- b) When welds are repaired
- c) When in the opinion of OWNER, ultrasonic inspection is required to confirm or clarify defects indicated by radiography.

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- d) Welding of transition piece of pipe.

Standards of acceptability shall be strictly as per API 1104. Any requirement over and above, this mentioned anywhere in this specification shall not be applicable for this project.

Ultrasonic inspection – No UT is required for tie-in/ cut-out joints where more than 20mm cutting is involved. Dye penetration test for checking lamination is required.

Re-repair of joints shall be permitted as per API 1104 provided all procedure is followed as stipulated in API 1104

Gamma-ray radiography may be used for tie-in joint provided slow film like D4 radiography film is used by contractor for better sensitivity.



In addition, ultrasonic inspection may be required for certain critical welds of the pipeline (i.e. tie-ins, welding of valves, flanges) randomly selected at OWNER's discretion. All fillet and groove welds other than those radiographed shall be subjected to dye penetrant/MP inspection. The non-destructive test system used for inspecting welds must be approved by the OWNER.

## Acceptance criteria

Weld quality as judged on the basis of the acceptability criteria mentioned below :

- i) Any weld, which as a result of radiographic and/or ultrasonic examination in the opinion of OWNER exhibits imperfections greater than the limits, stated in API 1104 latest edition or as superseded in this article shall be considered defective and shall so be marked with an identification point marker.
- ii) In addition to the API 1104 the weld containing cracks including crater cracks, roots defects ( like lack of fusion, lack of penetration & Burn though etc.) regardless of size are not acceptable.

Suitable records shall be maintained by the CONTRACTOR as desired by the OWNER on the day to day work done on welding radiography, ultrasonic testing. The CONTRACTOR shall present the records of the OWNER on day-to-day basis and whenever demanded, for approval.

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## Destructive Testing

The OWNER has the authority to order the cutting of upto 0.1 % of the total number of welds completed for subjecting to destructive tests at no extra cost to OWNER. The destructive testing of weld joints shall be made as per Annexure-I.

In addition, welds already cut out for defects for any reason may also be subjected to destructive testing. The sampling and the re-execution of welds shall be carried out by the CONTRACTOR at his own expense. If the results are unsatisfactory, welding operations shall be suspended and may not be restarted until the causes have been identified and the CONTRACTOR has adopted measures, which guarantee acceptable results. If it is necessary in the OWNER's opinion the procedure shall be re-qualified. The weld joint represented by unsatisfactory welds shall stand rejected unless investigation proves otherwise.

## REPAIRS OF WELDS

With the prior permission of OWNER welds, which do not comply with the standards of acceptability, shall be repaired or the joint cut out and re-welded.

A separate welding procedure specification sheet shall be formulated and qualified by CONTRACTOR for repair welds simulating the proposed repair to be carried out. Separate procedures are required to be qualified for (a) through thickness repair (b) external repair and (c) internal repair. Welder shall be qualified in advance for repairs. The root pass, the repairs opening the root, shall be replaced by the vertical uphill technique. The procedure shall be proven by satisfactory procedure test to API-1104 including the special requirements for the specifications, and shall also be subjected to metallographic examination, hardness surveys and Charpy tests to determine the effects of repair welding on the associated structure.

Root sealing or single pass repair deposit shall not be allowed. Internal root defects shall be ground thoroughly and welded with a minimum of two passes. However, while grinding the repairs, care shall be taken to ensure that no grinding marks are made on the pipe surface anywhere.

The repair shall be subjected, as a minimum requirement to the same testing and inspection requirements as the original weld. Re-radiography of the repaired area shall be carried out. In addition, a minimum of 6" weld on either side of the repaired area



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shall be re- radiographed. A 100 % ultrasonic test shall be done at the repaired area externally. Any repaired area that is wide, irregular or rough shall be rejected and a full cut out shall be done.

Repairs are limited to a maximum of 30 % of the weld length. Not more than two repairs are permitted on the same location. All repairs shall be carried out the day after initial radiography or earlier. A full report of all repairs made shall be submitted every day to the OWNER.



### **Weld Rejected by Accumulation of Defects**

Where a weld is rejected by the accumulation of defect clause, as defined by API-1104 and this specification, repairs within these limitations are permitted. Defects in the filling and capping passes shall be repaired preferentially.

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PIPING CLASS:	IS1239							
MATERIAL SPECIFICATION	PIPES	CS						
	FITTING	-A234 Gr. WPB, B16.9						
	FLANGES	-A105, B16.5						
	OTHERS	-						
BASE METAL 'P' NO								
WELDING PROCESS	GROOVE JOINTS							
	BUTT				OTHER THAN BUTT			
	ROOT PASS	SMAW	FILLER PASS	SMAW	ROOT PASS	SMAW	FILLER PASS	SMAW
	FILLET / SOCKET JOINTS				SMAW			
WELDING MATERIALS	GROOVE JOINTS							
	BUTT				OTHER THAN BUTT			
	ROOT PASS		FILLER PASS		ROOT PASS		FILLER PASS	
	FILLET / SOCKET JOINTS				E7018			
	BACKING RING		-		CONSUMABLE INSERT		-	
JOINT PREPARATION	<b>AS PER ASME</b>							
GASES	PURGING	-		SHIELDING	-			
GAS COMPOSITION	PURGING	-		SHIELDING	-			
PREHEATING	PRE HEAT TEMP	10°C Min		POST HEATING	-100°C			
CONTINUITY OF WELDING AND PREHEAT REFFER CL 10.2								
POST WELD HEAT TRETMENT	HOLDING TEMP	-595-650		HOLDING TIME	-1 Hr per Inch thk			
	RATE OF HEATING	-200C/hr max		MIN HOLDING TIME	-1 Hr			
	METHOD OF COOLING	-Controlled		RATE OF COOLING	-			
MECHANICAL PROPERTY REQUIREMENTS CHARPY 'V' NOTCH IMPACT TEST VALUE				MIN	22 J	AVERAGE	27 J	
				AT TEMPERATURE		0°C		
CODE OF FABRICATION	API 1104 and Welding Specification							
<u>TECHNICAL NOTES:</u>								



	<b>WELDING SPECIFICATION CHART</b>	PNPM/PC150/E/111/SEC-VI-6.2	0	
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### TECHNICAL NOTES

1. Welding, heat treatment and non destructive testing shall be carried out in accordance with the requirement of API-1104 and additional requirement specified in the specification. In case of conflict between code and specification more stringent conditions shall be applicable.
2. No welding shall be carried out without preheating the joint to 10°C (50 °F) when the ambient temperature is below 10°C (50 °F).

For fillet welds complete welding may be carried out using the electrodes recommended for filler passes.

3. All weldments & HAZ shall meet the hardness requirements of 300 HV10 during procedure qualification. If the hardness exceeds 300 HV10 the joints shall be heat treated at temp. 1100-1250 °F for one hour. The heating and cooling rates shall be decided during procedure qualification subject to a maximum of 200 °C/Hr. Hardness testing shall be carried out by Vickers hardness tester during welding procedure qualification test only. No hardness test is required for production welds.
4. The electrodes used shall meet the following additional requirement :

Specification	UTS (Min.) (As welded)	Impact (As welded)
E7018-G	52.7 kg/mm <sup>2</sup>	20 ft. lb. at 0°C
E7018-I	52.7 kg/mm <sup>2</sup>	-
E6010	-	-
E6018	-	20 ft. lb. at 0°C

5. All the weldments & HAZ shall meet the impact test requirement of 20 ft. lb at 0°C.
6. **Electrodes, Rods, Wires and Fluxes**


Electrodes shall be stored in the makers' airtight containers until required for use. Electrode heaters shall be used on Job SITE, for low hydrogen types of electrodes. 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**




**TECHNICAL SPECIFICATION  
FOR  
3-LAYER POLYETHYLENE COATING  
OF LINEPIPES  
(ONSHORE)**

REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD
00			Issued			

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## 1.0 SCOPE

This specification covers the minimum requirements for supply/arrangement of all materials, plant, equipment, plant sites, consumables, utilities and application including all labour, supervision, inspection and tests etc. for application of external anti-corrosion coating of pipes by using 3 Layer Side Extruded Polyethylene coating conforming to DIN-30670, 1991, 'Polyethylene Coating for Steel Pipes and Fittings' and the requirements of this specification.

## 2.0 REFERENCE DOCUMENTS

Reference has also been made to the latest edition of the following standards, codes and specifications. The edition enforce at the time of floating the enquiry shall be termed as latest edition.

- a. ASTM D-149 : Standard Test Methods of Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Frequencies.
- b. ASTM D-257 : Standard Test Methods for D-C Resistance or Conductance of Insulating Materials.
- c. ASTM D-543 : Standard Method of Test for Resistance of Plastics to Chemical Reagents.
- d. ASTM D-570 : Standard Method of Test for Water Absorption of Plastics.
- e. ASTM D-638 : Standard Method of Test for Tensile Properties of Plastics.
- f. ASTM D-792 : Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- g. ASTM D-1238 : Test Method for Flow Rates of Thermoplastics by Extrusion
- h. ASTM D-1525 : Test Method for Vicat Softening Temperature of Plastics
- i. ASTM D-1603 : Test Method for Carbon Black in Olefin Plastics
- j. ASTM D-1693 : Test Method for Environmental Stress Cracking of Ethylene Plastics
- k. ASTM D-2240 : Test Method for Rubber Property - Durometer Hardness
- l. ASTM D-3895 : Test Method for Oxidative - Induction Time of Polyolefins by

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### Differential Scanning Calorimetry

- m. ASTM G-42 : Tentative Methods for Cathodic Disbonding of Pipeline coatings Subjected to Elevated or Cyclic Temperatures.
- n. API RP 5L1 : Recommended Practice for Railroad Transportation of Line pipe.
- o. API RP 5LW : Transportation of Line Pipe on Barges and Marine Vessels
- p. DIN EN 10204 : Metallic Products - Types of Inspection Documents
- q. DIN 53735 : Testing of Plastics: Determination of Melt Index of Thermoplastics.
- r. ISO 8502 – 3 : Preparation of Steel Substrates before Application of Paints and Related Products – Part 3 - Assessment of Dust on Steel Surfaces Prepared for Painting (Pressure Sensitive Tape Method)
- s. ISO 9002 : Quality Systems : Specification of Production and Installation
- t. ISO 11124 : Preparation of Steel Substrates before Application of Paints and Related Products
- u. SIS 055900 : Preparation of Steel Substrates before Application of Paints and Related Products - Visual Assessment of Surface Cleanliness
- v. API 5L : Specification for Line Pipe
- w. ASME B31.8 : Gas Transmission and Distribution Piping Systems.
- x. ASME B31.4 : Liquid Transportation Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols
- y. CSA Z245.20-98 : External Fusion Bond Epoxy Coating for Steel Pipe.

The CONTRACTOR shall be familiar with the requirements of these documents and shall make them readily available at the coating plant to all persons concerned with carrying out the works specified in this specification.


### **3.0 PLANT SCALE AND INSTALLATION**

- 3.1 CONTRACTOR shall size coating plant(s) after evaluating the scale of work and the time schedule required for the works. Coating plant(s), both new and existing, shall be installed into a yard whose geometry and dimensions are such as to allow the

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execution of a continuous work schedule. For this purpose the CONTRACTOR shall ensure non-stop work execution owing to prohibitive adverse weather conditions and install requisite equipment and plant in roofed and adequately weather protected areas.

- 3.2 Plant equipment, machinery and other facilities shall be in first class operating condition to at least meet the job requirements of quality and production. Worn out and improvised plants are not acceptable.
- 3.3 The CONTRACTOR shall, at his own responsibility and cost, provide and prepare all necessary area for the storage of bare and coated pipe and all other materials, for coating yard, stock-piling and other temporary installation. For each area, CONTRACTOR shall provide necessary agreements as required with the land owner(s) / relevant Authorities, and, on work completion, to clean and pay settlement and claims for damages, as applicable.
- 3.4 The CONTRACTOR shall at its own responsibility and cost, provide for water and power supply and other utilities and consumables and obtain authorization regarding access roads and other permits required for the execution of works conforming to all the requirements of the governing Authorities.
- 3.5 The CONTRACTOR shall at its own expense provide a fully equipped laboratory and test facilities with adequate inventory to carry out tests required for the procedure qualification and regular production. Outside testing for qualification and regular production is not acceptable to COMPANY.
- 3.6 The CONTRACTOR shall be fully responsible for adherence to all statutory regulations applicable for handling and disposal of the hazardous chemicals during the coating works.
- 3.7 The CONTRACTOR shall be responsible for obtaining all statutory approvals / clearances from relevant Authorities including Pollution Control Board, as applicable for the coating plant(s).

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#### **4.0 MATERIALS**

- 4.1 The three layer coating system shall comprise of a powder epoxy primer, polymeric adhesive and a polyethylene top coat. Coating materials shall be suitable for the service conditions and the pipe sizes involved. The coating materials i.e. epoxy powder, adhesive and polyethylene compound shall have proven compatibility. The coating system and materials shall be pre-qualified and approved by COMPANY. CONTRACTOR shall obtain prior approval from COMPANY for the coating system and coating materials.
- 4.2 The coating materials Manufacturer shall carry out tests for all properties specified in para 5.3.1 and 5.3.2 for each batch of epoxy, adhesive and polyethylene compound. In addition, the Manufacturer shall also furnish Infra-red Scan for each batch of epoxy powder. The coating materials Manufacturer shall issue test certificates as per DIN EN 10204, 3.1B for each batch of materials supplied to CONTRACTOR and the same shall be submitted to COMPANY for approval prior to their use.
- 4.3 In addition to Manufacturer's certificate, the CONTRACTOR shall draw samples from each batch of epoxy, adhesive and polyethylene in the presence of COMPANY Representative and test for the following properties at the coating yard at least one week prior to its use, to establish compliance with the Manufacturer's test certificates.
- a. **Epoxy Powder:**
- i. Gel Time
  - ii. Cure time
  - iii. Moisture content
  - iv. Thermal Characteristics (Tg1, Tg2, ΔH)
- b. **Adhesive:**
- i. Specific Gravity
  - ii. Melt Flow Rate

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iii. Vicat Softening Point

c. **Polyethylene:**

i. Melt Flow Rate

ii. Specific Gravity

iii. Vicat Softening Point

iv. Moisture Content

v. Oxidative Induction Time

In case of failure of any of the above tests in a batch, that batch of material shall be tested for all other tests required as per para 5.3.1 and 5.3.2 including the tests which failed. If all tests pass, the batch shall be accepted for coating. If any of the tests fail, entire batch of material shall be rejected and shall not be used for the coating.

4.4 All materials to be used shall be supplied in sealed, damage free containers and shall be suitably marked with the following minimum information:

a. Name of the Manufacturer

b. Type of Material

c. Batch Number

d. Place and Date of Manufacture

e. Shelf Life/Expiry Date (if applicable)


f. Quantity

All materials noted to be without above identification shall be deemed suspect and shall be rejected by COMPANY. Such materials shall not be used for coating and shall be removed from site and replaced by CONTRACTOR at his expense.

4.5 CONTRACTOR shall ensure that all coating materials are properly stored in accordance with the Manufacturer's recommendation at all times, to prevent damage and deterioration in quality prior to use.

4.6 CONTRACTOR shall be required to use all materials on a date received rotation basis, i.e. first in-first used basis.



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## **5.0 FUNCTIONAL REQUIREMENTS AND PROPERTIES OF COATING**

5.1 The coating must be able to withstand a maximum in service operating temperature of +65°C and shall conform to 'S' Type of coating as per DIN 30670. In addition, in open storage the coating must be able to withstand a temperature of at least +80°C, without impairing its serviceability and properties specified.

5.2 The top coat polyethylene used shall be black readymade compound, fully stabilized against influence of ultraviolet radiation (i.e. sunlight), oxygen in air and heat (due to environmental temperature as specified above). No appreciable changes shall occur during exposure to such environments up to at least a period of 6000 hours. The CONTRACTOR shall submit certificate from Manufacturer in this regard.

### 5.3 Properties

Properties of coating system and coating material shall comply the requirements indicated in subsequent paragraph. In case the coating / material properties are tested as per test methods / standards other than specified herein below, the same may be accepted provided the test procedures and test conditions are same or more stringent than the specified.

#### 5.3.1 Properties of Epoxy Powder and Adhesive

CONTRACTOR shall choose such a brand of epoxy powder and adhesive that will achieve the functional requirements and properties of coating system as specified in para 5.1 and 5.3.3 of this specification respectively. Epoxy powder properties shall be as per CSA Z245.20.98. The colour of epoxy powder shall be either green or dark red or any other colour approved by COMPANY except grey colour. Copolymer grafted adhesive shall have the following properties.


S.NO.	PROPERTIES	UNIT	REQUIREMENT	TEST METHOD
1	Melt Flow Rate (190°C/2.16 Kg)	g/10 minutes	1.0	ASTM D1238
2	Vicat Softening point	°C	100 min.	ASTM D1525
3	Specific gravity	-	0.926 min.	ASTM D792

### 5.3.2 Properties of Polyethylene Compound

S.NO.	PROPERTIES	UNIT	REQUIREMENT	TEST METHOD
1	Tensile Strength @ + 25°C	N/mm <sup>2</sup>	17 min.	ASTM D638
2	Melt Flow Rate (190°C / 2.16 kg)	g/10 minutes	0.25 min.	ASTM D1238 or DIN 53735
3	Specific Gravity @ + 25 °C	-	0.926 min. (MDPE) 0.941 min. (HDPE)	ASTM D792
4	Hardness @ + 25 °C	Shore D	50 min.	ASTM D2240
5	Water Absorption, 24 hours, @ + 25 °C	%	0.05 max.	ASTM D570
6	Volume Resistivity @ + 25°C	Ohm-cm	10 <sup>15</sup> min	ASTM D257
7	Dielectric withstand, 1000 Volt/sec rise @ + 25 °C	Volts/mm	30,000 min.	ASTM D149
8	Vicat Softening point	°C	110 min.	ASTM D1525
9	Elongation	%	600 min.	ASTM D638
10	Oxidative Induction Time in Oxygen at 220°C, Aluminium pan, no screen	Min	10	ASTM D3895
11	Environmental Stress Crack Resistance (ESCR) (for F50) - Medium Density, Condition "C" - High Density, Condition "B"	Hours	300 300	ASTM D1693
12	Carbon Black Content	%	2 min.	ASTM D1603

### 5.3.3 Properties of Coating System

S.NO.	PROPERTIES	UNIT	REQUIREMENT	TEST METHOD
1	Bond Strength (using Type 2 Test Assembly i.e. Dynamometer) - @ 20±5°C - @ 60±5°C	Kg/cm	8.0 min. 5.0 min.	DIN 30670
2	Impact Strength (min. of 30 impacts on body along the length. No breakdown allowed when tested at 25 kV)	Joules per min of coating thickness	7 min.	DIN 30670
3	Indentation Hardness - @ 23±2°C - @ 70±2°C	Mm	0.2 max 0.3 max	DIN 30670
4	Elongation at Failure	%	300 min.	DIN 30670
5	Coating Resistivity (*)	Ohm-m <sup>2</sup>	10 <sup>8</sup> min.	DIN 30670
6	Heat Ageing (*)	-	Melt flow rate shall not deviate by more than 35% of original value	DIN 30670
7	Light Ageing (*)	-	Melt flow rate shall not deviate by more than 35% of original value	DIN 30670
8	Cathodic Disbondment - @+65°C after 30 days - @+65°C after 48 hrs	Mm radius of disbondment (**)	15 max. 7 max.	ASTM G42
9	Degree of Cure of Epoxy - Percentage Cure, ΔH - ΔTg	% °c	95 +3 / -2	CSA Z 245.20-98 (***)

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- \* Test carried out in an independent laboratory of national/ international recognition on PE top coat is also acceptable.
- \*\* Disbondment shall be equivalent circle radius of total unsealed area as per ASTM G42.
- \*\*\* Temperature to which the test specimens are to be heated during cyclic heating shall however be as per the recommendations of epoxy powder manufacturer.

## **6.0 MEASUREMENT AND LOGGING**

CONTRACTOR shall maintain records in computer using MS ACCESS database Software containing all the relevant data of individual pipe and pipe coating including pipe number, heat number, diameter, length, wall thickness, defects, coating number, batches of materials, sampling, testing, damages, repairs, rejects and any other information that COMPANY considers to be relevant and required for all incoming bare pipes and COMPANY approved outgoing coated pipes as applicable. CONTRACTOR's documentation shall be designed to ensure full traceability of pipe and coating materials through all stages of coating and testing. CONTRACTOR shall submit this information in the form of a report at the agreed intervals. The above data shall be provided in MS ACCESS format in Compact Disc (CD), CONTRACTOR shall provide one Computer Terminal to COMPANY Representative for monitoring / tracking of the above. The CONTRACTOR shall also submit the material balance details to COMPANY for information at the end of each shift.

## **7.0 COATING PROCEDURE AND QUALIFICATION**

- 7.1 Upon the award of the CONTRACT, the CONTRACTOR shall submit within two (2) weeks, for COMPANY approval, a detailed report in the form of bound manual outlining, but not limited to the following:
- a. Details of plant(s), locations, layout, and capacity and production rate(s).
  - b. Details of the equipment available to carry out the coating works including surface preparation, epoxy powder application and its recycling system, adhesive & polyethylene extrusion, moisture control facilities available for coating materials.
  - c. Details of process control and inspection equipment required for the coating process such as temperature control, thickness control, holiday testers, etc.


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- d. Details of chemicals pre-treatment facilities including process control and inspection equipment for phosphoric acid wash, de-ionised-ionised water wash and chromate wash.
- e. Facilities in the yard for unloading, handling, transport, production, storage, stockpiling, loading of bare and coated pipes and warehouses for storage of other coating materials.
- f. Plant Organisation Chart and availability of manpower including coating specialist.
- g. Details of utilities/facilities such as water, power, fuel, access roads and communication etc.

After approval has been given by COMPANY, no change in plant set-up shall be made. However, unavoidable changes shall be executed only after obtaining written approval from COMPANY.

7.2 At least two (2) weeks prior to the commencement of production coating, a detailed procedure of CONTRACTOR's methods, material proposed, etc., shall be formulated by CONTRACTOR and submitted for COMPANY's approval in the form of a bound manual. The procedure shall include, but not limited to the following information and proposals:


- a. Pipe inspection at the time of bare pipe receipt.
- b. Steel surface preparation, including preheating, removal of steel defects, method of pipe cleaning, dust removal, abrasive blast cleaning and surface profile; methods of measurements and consumables.
- c. Complete details of chemical pre-treatment viz phosphoric acid wash, de-ionized water wash, and chromate wash including product data sheets, health and safety sheets and manufacturer's recommended application procedure.
- d. Pipe heating, temperatures and control prior to epoxy application.
- e. Complete details of raw materials including current data sheets showing values for all the properties specified together with quality control and application procedure recommendations from manufacturer(s).
- f. Application of FBE powder, adhesive and polyethylene, including characteristics, temperature, line speed, application window, curing time, etc.

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- g. Quenching and cooling, including time and temperature.
- h. Quality Assurance System, Quality Plan, Inspection and Test Plan and reporting formats, including instrument and equipment types, makes and uses, etc
- i. Detailed method of repair of coating defects duly classified depending upon nature and magnitude of defects and repair thereof including coating stripping technique
- j. Details of instrument and equipment calibration methods including relevant standards and examples of calibration certificates.
- k. Complete details and inventory of laboratory and equipment for procedure qualification and regular production
- l. Pipe handling and stock piling procedures
- m. Sample of recording and reporting formats, including laboratory reports, certificates and requirement as per clause 6.0 of this specification.
- n. Complete details of test certificates for raw materials including test methods and standards used.
- o. Test certificates from PE compound manufacturer for tests for thermal aging, coating resistivity and aging under exposure to light. These test certificates shall not be older than three years.
- p. Health, Safety and Environment Plans.
- q. Storage details of coating materials and chemicals.
- r. Continuous temperature monitoring at various stages of coating

Procedure Qualification Tests (PQT) shall be carried out only after obtaining written approval of the above procedure from COMPANY. No change in the procedure shall be made after approval has been given by the COMPANY. However, unavoidable changes shall be executed only after obtaining written approval from COMPANY.

- 7.3 Prior to start of production, the CONTRACTOR shall, at his expense, carry out a coating PQT for each pipe diameter on max. wall thickness, for each type of pipe, for each coating material combination, and for each plant, to prove that his plant, materials, and coating procedures result in a quality of end product conforming to the properties stated in clause 5.3, relevant standards, specifications and material manufacturer's recommendations. CONTRACTOR shall give seven (7) working days notice to witness all procedures and tests.

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A batch representing a normal production run, typically 15 pipes, shall be coated in accordance with the approved coating procedure and the coating operations witnessed by COMPANY Representative. Out of these pipes, at least one pipe shall be coated partly with epoxy and partly with both epoxy and adhesive layers.

At least 5 (five) test pipes shall be selected by COMPANY Representative for coating procedure approval tests and shall be subjected to procedure qualification testing as described hereinafter. All tests shall be witnessed by the COMPANY Representative. Out of 5 (five) test pipes, 1 (one) pipe partly coated with epoxy and partly coated with both epoxy and adhesive layers shall be included. Remaining 4 (four) test pipes shall be have all three layers.

During PQT, the CONTRACTOR shall qualify various procedures forming a part of coating operations as detailed subsequently.

#### 7.4 Qualification of Procedures

##### 7.4.1 Epoxy Powder Application & Recycling


During pre-qualification, air pressure in the epoxy spray guns, satisfactory functioning of monitoring system, line speed vs. coating thickness, etc. shall be established. Dew point of air used to supply the fluidised bed, epoxy spray system and epoxy recycling system shall be recorded during the PQT.

Also, the CONTRACTOR shall remove samples of reclaimed powder from the reclamation system. These samples of reclaimed powder shall be subject to a detailed visual examination, thermal analysis and moisture content tests. The properties of the reclaimed powder shall be within the range specified by the Manufacturer of epoxy powder. In case the properties of the reclaimed powder are out of the range specified by the Manufacturer, CONTRACTOR shall not the use the reclaimed powder during the regular production.

##### 7.4.2 Pipe Pre-heating

The CONTRACTOR shall establish the temperature variation due to in-coming pipe temperature, line speed variation, wall thickness variation, emissivity, interruptions, etc. and document the same during the PQT stage. During PQT, proper functioning of pipe temperature monitoring and recording system including alarm/hooter shall be demonstrated to the COMPANY Representative.

##### 7.4.3 Surface Preparation

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The procedure to clean and prepare the pipe surface shall be in accordance with the requirements of this specification. The ratio of shots to grits shall be established during procedure qualification testing, such that the resultant surface profile is not dished and rounded. The qualification shall be performed through a visual inspection, measurement of roughness and check of the presence of dust in the abrasive blast cleaned pipe surface.

#### 7.4.4 Chemical Pre-treatment

##### 7.4.4.1 Phosphoric Acid Wash followed by De-ionised Water Wash

The procedure to apply the chemical pre-treatment viz. phosphoric acid wash followed by de-ionised water wash shall be in accordance with the recommendations of the manufacturer and shall result in intended cleaning requirements of this specification. Working solution preparation, maintaining concentration, application procedure including method of spreading, spreading rate, drying times, etc. depending upon the cleanliness/temperature of the incoming pipe and the line speed shall be established. Temperature of the chemical, pipe pre-heat temperature vs. line speed vs. dwell time, rinsing procedure, testing & control, rectificatory measures, drying procedure etc. shall be clearly established during PQT. Also the quality of the deionised water shall be established during PQT.

##### 7.4.4.2 Chromate Treatment

The procedure to apply the chromate treatment shall be in accordance with the recommendations of the manufacturer. Working solution preparation, maintaining concentration, application procedure including method of spreading, spreading rate, drying times, etc. depending upon the temperature of the incoming pipe and the line speed shall be established. Temperature of the chemical, pipe pre-heat temperature vs. line speed, pipe heating after chromating and time limit within which the pipe to be heated, testing & control, rectificatory measures, shall be clearly established during PQT.


#### 7.4.5 Coating Application

The COMPANY Representative will check the correctness of each coating application operation, values of the main parameters of each operation, pre-heating pipe surface temperature prior to epoxy powder application temperature, line speed, fusion bonded epoxy curing time, temperature and flow rate of co-polymer adhesive and polyethylene, etc. and the same shall be recorded. These values shall be complied with during regular production.

#### 7.5 Qualification of Applied Coating

##### 7.5.1 Tests on pipe coated partly with epoxy and partly with epoxy & adhesive layers



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a. Degree of Cure

Epoxy film samples (minimum 4 no.) shall be scrapped from the coated pipe and the samples shall be taken for cure test using Differential Scanning Calorimetry (DSC) procedure. Care shall be taken to remove the samples of full film thickness avoiding inclusion of steel debris. Glass transition temperature differential ( $\Delta T_g$ ) and % cure ( $\Delta H$ ) shall comply with the specified requirements.

b. Epoxy Layer Thickness

Epoxy layer thickness shall be checked at every one metre spacing at 3, 6, 9 and 12 o'clock positions. The thickness shall comply with the specified thickness requirements.

c. Adhesive layer Thickness

Adhesive layer thickness shall be checked at every one metre spacing at 3, 6, 9 and 12 o'clock positions. The thickness shall comply with the specified thickness requirements.

d. Holiday Inspection

Entire pipe shall be subject to holiday inspection and the test voltage shall be set to exceed 5 v/micron of epoxy thickness specified for the portion coated only with epoxy layer.

e. Adhesion Test


i. Adhesion Test (24 hrs or 48 hrs) shall be carried out on the epoxy coated pipe. Test method, no. of test specimen and acceptance criteria shall comply CSA Z.245.20-98, Table 4.

ii. Adhesion of FBE shall also be separately determined at ambient temperature at two locations by the "St Andrews Cross" method and the test shall comply with the specified requirements.

f. 2.5° Flexibility Test

2.5° Flexibility test shall be carried out on the epoxy coated pipe at test temperature of 0°C. Test method, no. of test specimen and acceptance criteria shall comply CSA Z.245.20-98, Table 4.

g. Cross-section & Interface Porosity Test

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Cross section porosity and interface porosity tests shall be carried out on the epoxy coated pipe. Test method, no. of test specimen and acceptance criteria shall comply CSA Z.245.20-98, Table 4.

#### 7.5.2 Tests on pipes coated with all three layers

##### a. Bond Strength:

Three test pipes shall be selected for bond strength tests. On each of the selected pipes, three bond strength test shall be performed for each specified temperature i.e. one at each end and one in the middle of the pipe and specified requirements shall be complied with, i.e. bond strength as well as mode of separation. Length of peel shall be minimum 65 mm. None of these samples shall fail.

##### b. Impact Strength:

Three test pipes shall be selected for impact strength test and the test shall meet the specified requirements.

##### c. Indentation Hardness:

Two samples for both temperatures from all pipes shall be taken. If any one of these samples fails to satisfy the specified requirements, then the test shall be repeated on four more samples. In this case, none of the samples shall fail.

##### d. Elongation at failure:

Six samples each from three coated pipes i.e. 18 samples in all shall be tested and the test shall comply the specified requirement. Only one sample per pipe may fail.


##### e. Cathodic Disbondment Test:

Two CD tests shall be carried out for the total lot of test pipes having all three layers. One test shall be carried out for 30 days duration and another test for 48 hours duration. The tests shall comply the specified requirement. Whenever Procedure Qualification is necessitated for different pipe size with same coating material combination, 48 hours test only be conducted. 30 days CD test is not mandatory in this case.

##### f. Holiday Inspection

All the pipes shall be subject to holiday inspection. The test voltage shall be as specified in para 10.4.

##### g. Coating Thickness Measurement

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All pipes shall be subject to coating thickness measurements. Acceptance criteria shall be as per para 10.3.

h. Air Entrapment

One sample each from pipe body and on weld (if applicable) shall be taken from all four coated pipes and the specified requirements shall be complied with.

i. Degree of Cure

Epoxy film samples (minimum 4 no., equally spaced) shall be scrapped from one coated pipe and the samples shall be taken for cure test using Differential Scanning Calorimetry (DSC) procedure. Care shall be taken to remove the samples of full film thickness avoiding inclusion of steel debris. Glass transition temperature differential ( $\Delta T_g$ ) and % cure ( $\Delta H$ ) shall comply with the specified requirements.

7.5.3 Inspection of all test pipes


All pipes shall be subject to the following inspections:

- a. surface cleanliness, surface roughness measurements and dust control immediately after second abrasive blast cleaning and salt test immediately after De-ionised water wash.
- b. pH of pipe surface before and after phosphoric acid wash.
- c. visual inspection of chromate coating.
- d. visual inspection of finished coating, cut back dimension, internal/ external cleanliness, end sealing and bevel inspection.

Acceptance criteria for all inspection and testing shall be as specified in this specification.

7.6 After completion of the qualification tests and inspection as per para 7.4 and 7.5 above, the CONTRACTOR shall prepare and issue to COMPANY for approval a detailed report of the above tests and inspection including test reports/certificates of all materials and coatings tested. Only upon written approval from COMPANY, CONTRACTOR shall commence production coating.


7.7 On successful completion of PQT, coating of all five (5) test pipes shall be removed and completely recycled as per the approved coating procedure specification, at CONTRACTOR's expense. Remaining pipes will be accepted by COMPANY provided they meet the requirements of this specification and need not be stripped and re-cycled.

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- 7.8 The CONTRACTOR shall re-establish the requirements of qualification and in a manner as stated before or to the extent considered necessary by COMPANY, in the event of, but not limited to, the following:
- Every time there is a change in the previously qualified procedure.
  - Every time there is a change in the manufacturer and change in formulation of any of the raw materials and change in location of raw material manufacture.
  - Every time the coating yard is shifted from one location to the other or every time the critical coating equipments (induction heater, epoxy spray system, extruder, etc) are shifted.
  - Any change in line speed during coating application
  - Any time when in COMPANY's opinion the properties are deemed to be suspect during regular production tests.
- 7.9 COMPANY reserves the right to conduct any or all the test required for qualification through an independent laboratory or agency at the cost of CONTRACTOR when in COMPANY's opinion, the results are deemed suspect. COMPANY's decision shall be final.

## **8.0 PIPE SURFACE PREPARATION**

- 8.1 Unless specified otherwise, the pipes shall be supplied free from mill applied oils but may be subject to contamination occurring during transit.
- 8.2 Prior to cleaning operation, CONTRACTOR shall visually examine the pipes and shall ensure that all defects, flats and other damages have been repaired or removed. The CONTRACTOR shall also remove marking stickers, if any, present within the pipe. Record shall be kept of such marking on the stickers to ensure traceability of pipe after coating.
- 8.3 Any oil, grease, salt or other contaminants detrimental to the formation of a good coating bond or coating quality shall be removed prior to coating application. Contaminants may be removed by the use of non-oily solvents. Gasoline or kerosene shall not be used for this purpose. Visible oil and grease spots shall be removed by solvent wiping. Solvent cleaning shall be in accordance with SSPC-SP1. Steel surface shall be allowed to dry before abrasive cleaning.

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- 8.4 All pipes shall be preheated to a temperature of 65°C to 85°C prior to abrasive blast cleaning. The external surface of the pipe shall be cleaned using 2 no. dry abrasive blast cleaning units to achieve the specified surface cleanliness and profile. After first abrasive blast cleaning, chemical pre-treatment with phosphoric acid solution as per para 8.6 shall be carried out prior to second abrasive blast cleaning. However at the option of CONTRACTOR, chemical pre-treatment with phosphoric acid solution as per para 8.6 may be carried out after the second abrasive blaster.

The abrasive blast cleaning units shall have an effective dust collection system to ensure total removal of dust generated during blast cleaning from the pipe surface. The equipment used for abrasive blast cleaning shall meet the specified requirements and shall be free from oil, water soluble salts and other forms of contamination to ensure that the cleaning process is not impaired. Traps, separators and filters shall be checked for condensed water and oil at the start of each shift and emptied and cleaned regularly. During abrasive blast cleaning, the metallic abrasive shall be continuously sieved to remove “fines” and “contaminants” and the quality checked at every four hours. Abrasives used for blast cleaning shall comply ISO-11124

- 8.5 Suitable plugs shall be provided at both pipe ends to prevent entry of any shot/grit into the pipe during blast cleaning operations. These plugs shall be removed after blast cleaning. Alternatively the CONTRACTOR may link the pipes suitably together to prevent the entry of any short/grit into the pipe.

8.6 Chemical Pre-treatment with Phosphoric Acid Solution

- 8.6.1 All pipes shall be provided chemical pre-treatment with phosphoric acid solution. 10% solution of phosphoric acid, Oakite 31 / 33 or equivalent, shall be used to remove all soluble salts and other soluble contaminants.

The CONTRACTOR shall provide data sheets and supporting documentation for the phosphoric acid to be used. The documentation shall verify that the phosphoric acid is suitable for the treatment of line pipe prior to the application of the specific fusion bonded epoxy powder being applied and the final coating will meet fully the requirements of this specification.

- 8.6.2 The pipe temperature immediately prior to the phosphoric acid treatment shall be in the range of 45 to 75 °C. Phosphoric acid treatment shall be followed immediately by washing with de-ionised water. Deionised water used shall conform to the following requirements:

S.NO.	PROPERTIES	UNIT	REQUIREMENT
1	Turbidity	NTU	1 max
2	Conductivity	µmho/cm	5 max
3	Hardness	-	Nil
4	Total Alkalinity as CaCO <sub>3</sub>	Mg/l	2 to 3
5	Chloride as Cl <sup>-</sup>	Mg/l	1 max
6	Sulphate as SO <sub>4</sub> <sup>=</sup>	Mg/l	1 max
7	PH	-	6.5 to 7.5

Tests to determine the above properties shall be carried out in accordance with “Standard Methods for the Examination of Water and Wastewater” published jointly by American Public Health Association, American Water Works Association and Water Pollution Control Federation.

Quality of the deionised water shall be monitored at the start of each shift and at every four hours interval. Non-compliance of deionised water with respect to the above requirements shall cause for stoppage of the operations.


8.6.3 The pH of the pipe surface shall be determined both before and after the de-ionised water rinse initially on each pipe and in case of consistent results, the frequency may be relaxed to once per hour at the discretion of COMPANY Representative. The measured pH shall be as follows:

Before de-ionised water wash : 1 to 2


After de-ionised water wash : 6 to 7

8.6.4 After the deionised water wash, the pipe shall be dried with dry air and preheated to a temperature of 65°C to 85°C.

8.6.5 The salt tests shall be carried out after deionised water rinse. One test shall be carried out at one end of each pipe. The acceptance criteria shall be 2µg/cm<sup>2</sup>. An approved salt meter (SCM 400 or equivalent) shall be used to carry out salt tests and shall be calibrated in accordance with the equipment manufacturer’s recommendations.

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- 8.7 Abrasive cleaning carried out shall be such that the resultant surface profile is not dished and rounded when viewed with 30X magnification. The standard of finish for cleaned pipe shall conform to near white metal finish to SA 2 ½ of Swedish Standard SIS 055900 latest edition. Surface of pipe after abrasive blast cleaning shall have an anchor pattern of 50 to 70 microns (R<sub>Z</sub>). This shall be measured for each pipe by a suitable instrument such as surface profile depth gauge. In addition the pipe surface after blast cleaning shall be checked for the degree of cleanliness (Sa 2½), degree of dust and shape of profile. Degree of dust shall comply the requirements of ISO 8502 - 3. Acceptance limit shall be either quality rating 2 or Class 2.
- 8.8 All pipes shall be visually examined for presence of any shot/grit/loose material left inside the pipe during blast cleaning. Suitable mechanical means (stiff brush) shall be employed to remove the same before the pipes are processed further. In addition, inside surface of the pipe shall also be visually inspected for presence of any foreign material or shots and grit (free or embedded/sticking to pipe inside surface). The pipe inside surface shall be examined using sharp floodlight focused at the middle of the pipe at one end while inspection is carried out visually from other end. Any foreign material or shots/grit present in the pipe shall be completely removed by mechanical brush, high pressure air jets, by tilting of pipe, etc.
- 8.9 At no time shall the blast cleaning be performed when the relative humidity exceeds 85%. The CONTRACTOR shall measure the ambient conditions at regular intervals during blast cleaning and coating operations and keep records of prevailing temperature, humidity and dew point.
- 8.10 The blast cleaned surface shall not be contaminated with dirt, dust, metal particles, oil, water or any other foreign material, nor shall the surface or its anchor pattern be scarred or burnished. All blast cleaned pipe surface shall be kept in dust free enclosure prior to coating. After blast cleaning, all surfaces shall be thoroughly inspected under adequate lighting to determine anchor pattern, quality of blasting and identify any surface defects prior to coating application. All surface defects such as slivers, scab, burns, laminations, welds spatters, gouges, scores, indentations, slugs or any other defects considered injurious to the coating integrity made visible during blast cleaning shall be reported to the COMPANY Representative and on permission from COMPANY Representative, such defects shall be removed by filing or grinding. After any grinding or mechanical repairs, the remaining wall thickness shall be checked and compared with specified thickness. Any pipes having thickness less than 95% of specified thickness shall be kept aside and disposed off as per the instructions of COMPANY Representative. The method employed to remove surface defects shall not burnish or destroy the anchor pattern or contaminate the surface. Pneumatic tools shall not be used unless they are fitted with effective air/oil and water traps. Where burnishing results in destruction of anchor pattern, the anchor pattern shall be restored by

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suitable means. Pipes which have damages repaired by grinding and have ground areas more than 50mm in diameter shall be re-blasted.

Any dust or loose residues that have been accumulated during blasting and/or during filing/grinding operations shall be removed by vacuum cleaning.

If contamination of surface occurs, the quality of blast cleaning method and process shall be examined. If the surface roughness is outside the specified limit, the blast cleaning material shall be checked and replaced.

- 8.11 Upon Completion of the blasting operations, the quality control supervisor shall accept the pipe for further processing or return for re-blasting after removal of defects/imperfections. In case imperfections are considered detrimental to the coating quality, the same shall be reported to COMPANY's Representative for final decision on rejection or re-blasting / removal of defects. Re-blasting / removal of defects or returning pipe to the yard shall be at the CONTRACTOR's cost.

COMPANY's Representative, in additions, reserves the right to initiate any of the above actions during periodic inspections for oil, dust, salt, imperfections, surface defects, lack of white metal finish, etc.

- 8.12 In order to ensure that pipe with defects are not processed further, provisions shall be available to lift the pipes from inspection stand.

8.13 Chemical Pre-treatment with Chromate Solution


- 8.13.1 Following completion of abrasive blast cleaning, all pipe surfaces shall be chemically pre-treated with a 10% strength chromate solution.

- 8.13.2 The CONTRACTOR shall provide data sheets and supporting documentation for the chemical to be used. The documentation shall verify that the chemical is suitable for the treatment of line pipe prior to the application of the specific fusion bonded epoxy powder being applied and the final coating will meet fully the requirements of this specification.

- 8.13.3 The chemical pre-treatment shall be applied fully in accordance with the chemical suppliers' instructions and in a manner that ensures 100% uniform coverage of the pipe surface without introducing surface contamination.

- 8.13.4 The CONTRACTOR shall check that the concentration of the chemical pre-treatment solution remains within the range recommended by the chemical manufacturer for the pipe coating process. The concentration shall be checked at the make up of each fresh solution and once per hour, using a method approved by the chemical manufacturer. The CONTRACTOR shall



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also ensure that the chemical pre-treatment solution remains free from contamination at all times. Recycling of chemical pre-treatment solution is not permitted.


- 8.13.5 The CONTRACTOR shall ensure that the temperature of the substrate is maintained between 40°C and 80°C and the chromate solution temperature does not exceed 60° or as recommended by the manufacturer.
- 8.13.6 The chromate coating shall be smooth, even, free from runs, drips or excessive application and lightly adherent with no flaking of the coating. The chromate coated steel must be thoroughly dried immediately after application and shall be achieved by boiling off any residual solution on the surface.
- 8.14 The total allowable elapsed time between completion of the blasting operations and commencement of the pre-coating and heating operations shall be such that no detectable oxidation of the surface occurs. Relative humidity readings shall be recorded every half an hour during the blasting operations in the immediate vicinity of the operations. The maximum elapsed time shall not exceed the duration given below:

RELATIVE HUMIDITY %	MAXIMUM ELAPSED TIME
> 80	2 hours
70 to 80	3 hours
< 70	4 hours

Any pipe not processed within the above time-humidity requirement shall be completely re-blasted. Any pipe showing flash rusting shall be re-blasted even if the above conditions have not been exceeded.

- 8.15 Pipe handling between abrasive blasting and pipe coating shall not damage the surface profile achieved during blasting. Any pipe affected by the damage to the surface exceeding 200mm<sup>2</sup> in area and/or having contamination of steel surface shall be rejected and sent for re-blasting.


## **9.0 COATING APPLICATION**

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The external surface of the cleaned pipe conforming to clause 8.0 of this specification shall be immediately coated with 3-layer extruded polyethylene coating in accordance with the procedures approved by COMPANY, relevant standards and this specification. In general the procedure shall be as follows:

## 9.1 Pipe Heating

- 9.1.1 Immediately prior to heating of pipe, all dust and grit shall be removed from inside of the pipe by a combination of air blast, brushing and vacuum cleaning. Suitable arrangement shall be made to protect the bevel ends from getting damaged during the coating operation.
- 9.1.2 Induction heater or gas fired heating shall be used for heating the pipe. The method shall be capable of maintaining uniform temperature along the total length of the pipe, and shall be such that it shall not contaminate the surface to be coated. In case of induction heating, appropriate frequency shall be used to ensure 'deep heating' and intense skin heating is avoided. Gas fired heating system shall be well adjusted so that no combustion products are deposited on the steel surface. This shall be demonstrated on bare pipes prior to start of PQT. Oxidation of the cleaned pipe surfaces prior to coating (in the form of blueing or other apparent oxide formation) is not acceptable.
- 9.1.3 External surface of the pipe shall be heated to about 190 °C or within a temperature range (min. to max.) as recommended by the powder manufacturer. Required pipe temperature shall be maintained as it enters the coating chamber.
- 9.1.4 Temperature of the pipe surface shall be continuously monitored & recorded by using suitable instruments such as infrared sensors, contact thermometers, thermocouples etc. The recording method shall allow correlating each line pipe. The monitoring instrument shall be able to raise an alarm / activate audio system (hooter) in the event of tripping of induction heater / gas fired heater or in the event of pipe temperature being outside the range recommended by the manufacturer. Any deviation from the application temperature range recommended by manufacturer shall be rectified. If immediate rectification is not feasible, the production shall be stopped until cause of deviation has been removed. Any pipe coated during the duration of temperature deviation shall be identified by marking and rejected. Such rejected pipes shall be stripped, re-cleaned and recoated.
- 9.1.5 Temperature measuring & monitoring equipment shall be calibrated twice every shift and/or as per COMPANY Representative's instruction.
- 9.1.6 CONTRACTOR shall ensure that pipe surface emissivity variations are minimised during pipe heating. To avoid significant variance, more than once

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blasted joints should be coated at the same time and not mixed with joints blasted only once.

## 9.2 Pipe Coating

9.2.1 Subsequent to pipe heating, coating consisting of following layers shall be applied onto the pipe.

- i. Electrostatic application of epoxy powder of minimum dry film thickness 0.150 mm, unless otherwise specified. The maximum thickness shall not exceed the epoxy thickness specified by epoxy powder manufacturer.
- ii. Grafted co-polymer adhesive application by extrusion, minimum thickness 0.200 mm.
- iii. Polyethylene application by extrusion.


The coated pipe shall be subsequently quenched and cooled in water for a period that shall sufficiently lower the temperature of pipe coating to permit handling and inspection.

9.2.2 Minimum total thickness of finished coating shall be as under:

Pipe size (specified outside diameter)	Minimum Coating thickness (mm) (*)	
	Normal Type (n)	Reinforced Type (v)
Upto 10 <sup>3</sup> / <sub>4</sub> " (273.1 mm)	2.0	2.7
Over 10 <sup>3</sup> / <sub>4</sub> "(273.1 mm) to below 20"(508.0 mm)	2.2	2.9
From 20"(508.0 mm) to below 32" (813.0 mm)	2.5	3.2
From 32" (813.0 mm) and above	3.0	3.7


(\*) In case HDPE material is used as top coat, 10% reduction in minimum coating thickness specified is permissible.

9.2.3 Coating materials shall be inspected in accordance with the manufacturer's recommendation prior to coating application and it shall be ensured that the materials are moisture free. In case the relative humidity exceeds 80%, the

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adhesive and polyethylene material shall be dried using hot dry air as per the directions of COMPANY Representative.

- 9.2.4 Prior to starting the application of fusion bonded epoxy powder, the recovery system shall be thoroughly cleaned to remove any unused powder remaining from a previous line pipe coating application. The use of recycled powder shall be permitted subject to:
- a) Satisfactory qualification of the reclaimed system during PQT stage
  - b) The proportion of the reclaimed powder in the working mix does not exceed 20% at any one time.
  - c) The quality of the recycled powder being routinely checked during production, at a minimum frequency of once per shift and consistently meets the requirements stated at para 5.3.1
- 9.2.5 Dry air, free of oil and moisture shall be used in the coating chamber and spraying system and filters, dehumidifier/dryer as required along with control & monitoring system shall be provided for this purpose. Dew point of air used to supply the fluidised bed, epoxy spray system and epoxy recycling system shall be at least (-) 40°C and this shall be monitored during the regular production.
- 9.2.6 Air pressure in the epoxy spray guns shall be controlled, continuously monitored and recorded by using suitable instruments. The air pressure shall be controlled within the limits established during coating procedure qualification. The monitoring system shall be capable of raising an alarm / activate audio system (hooter) in the event of change in air pressure beyond the set limits. Any deviation from the pre-set limits shall be rectified. If immediate rectification is not feasible, the production shall be stopped until cause of deviation has been removed. Any pipe coated during the duration of air pressure deviation shall be identified by suitable marking and rejected. Such rejected pipes shall be stripped and recoated.
- 9.2.7 Extruded adhesive layer shall be applied before gel time of the epoxy coating has elapsed and within the window recommended by the manufacturer. The CONTRACTOR shall establish, to the satisfaction of the COMPANY Representative, that the adhesive is applied within the gel time window of epoxy and at the temperature recommended by the adhesive manufacturer. The CONTRACTOR shall state the minimum and maximum time interval between epoxy and adhesive application at the proposed pre-heat temperature and line speed.
- 9.2.8 Extruded polyethylene layer shall be applied over the adhesive layer within the time limit established during PQT stage and within the time/temperature range recommended by the manufacturer. The extrusion temperatures of the adhesive and polyethylene shall be continuously recorded. The monitoring

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instruments shall be independent of the temperature control equipment. The instruments shall be calibrated prior to start of each shift.

9.2.9 CONTRACTOR shall ensure that there is no entrapment of air or void formation along the seam weld (where applicable) during application of coating. Air entrapment below the coating and also along the coating overlap shall be prevented by forcing the coating on to the pipe using high pressure roller of suitable design during coating application. In case it is not adequately achieved, CONTRACTOR shall supplement by other methods to avoid air entrapment. The methods used shall be witnessed and approved by COMPANY.

9.2.10 Resultant coating shall have a uniform gloss and appearance and shall be free from air bubbles, wrinkles, holidays, irregularities, discontinuities, separation between layers of polyethylene & adhesive, etc.

9.2.11 Coating and/or adhesive shall terminate 150 mm (+) 20 / (-) 0 mm from pipe ends. The adhesive shall seal the end of applied coating. CONTRACTOR shall adopt mechanical brushing for termination of the coating at pipe ends. Edge of the coating shall be shaped to form a bevel angle of 30° to 45°.

9.2.12 Failure to comply with any of the above applicable requirement and of the approved procedure shall be cause for the rejection of the coating and such coating shall be removed in a manner approved by COMPANY at CONTRACTOR's expense.


## **10.0 INSPECTION AND TESTING**

### 10.1 General

The CONTRACTOR shall establish and maintain such quality assurance system as are necessary to ensure that goods or services supplied comply in all respects with the requirements of this specification. The minimum inspection and testing to be performed shall be as indicated subsequently herein.

### 10.2 Visual Inspection

Immediately following the coating, each coated pipe shall be visually checked for imperfections and irregularities of the coating. The coating shall be of natural colour and gloss, smooth and uniform and shall be blemish free with no dust or other particulate inclusions. The coating shall not show any defects such as blisters, pinholes, scratches, wrinkles, engravings, cuts, swellings, disbanded zones, air inclusions, tears, voids or any other irregularities. Special attention shall be paid to

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the areas adjacent to the longitudinal weld (if applicable), adjacent to the cut-back at each end of pipe and within the body of the pipe.

In addition inside surface of the pipe shall also be visually inspected for presence of any foreign material or shots and grit (free or embedded/sticking to pipe inside surface). The pipe inside surface shall be examined using sharp floodlight focussed at the middle of the pipe at one end while inspection is carried out visually from other end.

### 10.3 Coating Thickness

The coating thickness shall be measured at points uniformly distributed along the length and about the circumference of the pipe, using a non-destructive (e.g. magnetic) method which permits, measurements to be made to an accuracy of 10%.


### 10.4 Holiday Detection

The coating shall be tested for continuity by means of spark testing, using commercially available high voltage equipment complying with DIN VDE 0433 Part 2, the voltage of which is discharged via a sphere spark gap. The test voltage shall be 25 Kv. The electrode (e.g. metal brush) shall be in contact with the coating surface, since any air gap would falsify results.

When a fault is present, a spark will be seen, or the test equipment will emit a signal.

### 10.5 Bond Strength Test

- a. CONTRACTOR shall conduct bond strength test for composite coating as per Clause 5.3.3(a) of this specification. A minimum of 65 mm length shall be peeled. First 20 mm and last 20 mm shall not be counted for assessment of bond strength.
- b. The frequency of test for cut back portions shall be one pipe in every fifteen (15) pipes coated and for middle of pipe shall be one pipe in every sixty (60) pipes coated or one pipe per shift whichever is higher. On each selected pipe, bond strength shall be performed for each specified temperature. Test shall be performed at each cut back portion and one in the middle of pipe. The system shall disbond/separate cohesively either in adhesive layer or in polyethylene layer. Majority of the peeled off area on the pipe shall show presence of adhesive. Disbondment/separation at epoxy to steel interface or epoxy / adhesive interface or adhesive / polyethylene interface shall not be permitted. The failure mode shall be recorded for each test.
- c. In case the test fails to comply the specified requirement, the CONTRACTOR shall test the preceding and succeeding coated pipe. If both pipes pass the test, then

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the remainder of the pipe joints in that shift shall be deemed satisfactory. If either pipe fails to meet the specified requirements, all pipes coated during that shift shall be tested

until the coating is proved acceptable. Rejected coated pipes shall be stripped and re-coated in accordance with approved procedure, at CONTRACTOR's expense.

- d. The frequency of bond strength test as per para 10.5 (b) for cut back portion may be reduced depending upon the consistency of result to one pipe in every twenty five (25) instead of every fifteen pipes, at the sole discretion of the COMPANY Representative.


#### 10.6 Impact Strength

- a. Impact strength test shall be conducted as per clause 5.3.3(b) of this specification. Initially the frequency of test shall be two (2) coated pipes per shift that may be further reduced to one coated pipe per 2 weeks depending upon consistently acceptable results at the sole discretion of COMPANY's Representative.
- b. Minimum thirty (30) impacts located equidistant along the length of coated pipe shall be performed.
- c. Immediately after testing, the test area shall be subjected to holiday detection at the same voltage as used prior to impact strength test. The pipe shall be rejected if any holiday is noted in the test area.
- d. In case of test failure, retesting and disposal of coated pipe shall be as per para 10.5 (c) above.

#### 10.7 Indentation Hardness

- a. Indentation hardness test shall be as per clause 5.3.3 (c) of this specification. The frequency of test shall be initially 2 (two) coated pipes per shift which shall be further reduced to one test each on 2 coated pipes per week at random after 1 week of consistently acceptable results. Two samples for each temperature shall be taken from the cut back portion of coated pipe and one in the middle of the pipe for this test.
- b. In case of test failure, retesting and disposal of coated pipe shall be as per para 10.5 (c) above.

#### 10.8 Air Entrapment Test

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- a. Strips from bond strength tests or coated pipe may be used to help determine the porosity of the finished coating. Strip shall be also cut from longitudinal weld (if applicable) at cut back portion and examined for the presence of voids.
- b. Bond strength strip shall be viewed from the side and at the failure interface. At the pipe bond strength test location, utility knife shall be used to cut the edge of the coating to a 45° angle and view with a microscope. Similar examination shall be done in the coating cut back area.
- c. One sample each either on the bond strength strip or coated pipe and strip cut from the longitudinal weld (if applicable) shall be examined for air entrapment per shift. Strips shall be viewed from the side.
- d. All examination shall done using a 30X magnification hand-held microscope. The polyethylene and adhesive layers shall have no more than 10% of the observed area taken up with air entrapment (porosity or bubbles). Air entrapment shall not occupy more than 10% of the thickness in each case. Bubbles shall not link together to provide a moisture path to the epoxy layer.
- e. In case of test failure, retesting and disposal of coated pipe shall be as per para 10.5 (c) above.

#### 10.9 Degree of Cure

- a. Epoxy film samples shall be removed from cut back portion of the coated pipe using hammer and cold chisel and the samples shall be taken for cure test using DSC procedure. Care shall be taken to remove the samples of full film thickness avoiding inclusion of steel debris. Glass transition temperature differential ( $\Delta T_g$ ) and % cure ( $\Delta H$ ) shall comply the specified requirements.
- b. Frequency of this test shall be once per shift. Pipe shall be selected randomly by COMPANY Representative during the middle of a shift. Suitable provisions / arrangements as per the instructions of COMPANY Representative shall be made by the CONTRACTOR for this purpose.
- c. In case of test failure, production carried out during the entire shift shall be rejected, unless the CONTRACTOR proposes a method to establish the compliance with the degree of cure requirements of all pipes coated during that shift.

#### 10.10 Epoxy Layer Adhesion Test



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- a. Adhesion of epoxy layer shall be determined at ambient temperature by the “St Andrews Cross” method i.e. by cutting two straight lines through the epoxy layer with a sharp knife. The incisions shall intersect at an angle of 30°/150°. The epoxy coating shall resist disbondment from the steel when attempts are made to flick/lift the coating from the 30° angle with a sharp knife.
- b. Frequency of this test shall be once per shift. The test shall be carried out at the cut back portion on the pipe from which the Degree of Cure test has been carried out as per para 10.9 above.
- c. In case of test failure, retesting and disposal of coated pipe shall be as per para 10.9 (c) above.

#### 10.11 Cathodic Disbondment Test

- a. 48 hours CD test shall be conducted as per clause 5.3.3 (h) of this specification.
- b. The frequency of this test shall be once in every two weeks or one test representing each batch of epoxy powder used, whichever is more frequent.
- c. In case the test fails to conform to the specified requirement, at the option of the CONTRACTOR, all pipes coated after the previous acceptable test and prior to next acceptable test shall be rejected or the test shall be repeated using two additional samples taken from the same end of the affected pipe.

When both retests conform to the specified requirement, the lot of pipes shall be accepted. When one or both the retests fail to conform to the specified requirement, all coated pipes after previous acceptable test and prior to next acceptable shall be rejected. All rejected pipes shall be stripped, re-cleaned and re-coated. COMPANY may consider a further retest program to determine whether any of the affected pipes meet the criteria for acceptance upon written request by the CONTRACTOR.

- 10.12. Damages occurring to pipe coating during above tests shall be repaired in accordance with approved coating repair procedure.
- 10.13 Repairs occurring on account of the production tests are however excluded from above mentioned limitations at para 10.4 (d) above.
- 10.14 COMPANY reserves the right to perform inspection and witness tests on all activities concerning the pipe coating operations starting from bare pipe to finished coated pipe ready for despatch and also testing of raw materials. CONTRACTOR shall give reasonable notice of time and shall provide without charge reasonable access and facilities required for inspection to the COMPANY's representative. Inspection and tests performed or witnessed by

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COMPANY's representative shall in no way relieve the contractor's obligation to perform the required inspection and tests.

- 10.15 In case rate of defective or rejected pipes and/or samples tests are 10% or more for a single shift (typically 8 hours), CONTRACTOR shall be required to stop production and carry out a full and detailed investigation and shall submit findings to COMPANY for approval. CONTRACTOR shall recommence the production only after getting the written permission from COMPANY.

Under no circumstances any action or omission of the COMPANY's Representative shall relieve the CONTRACTOR of his responsibility for material and quality of coating produced. No pipes shall be transported from the coating plant unless authorised by COMPANY in writing.


## **11.0 HANDLING, TRANSPORTATION AND STORAGE**

- 11.1 The CONTRACTOR shall be fully responsible for the pipe and for the pipe identification marking from the time of "taking over" of bare pipe from COMPANY until such time that the coated line pipes are 'handed over' and/or installed in the permanent installation as the case may be according to the provisions of the CONTRACT.

At the time of "taking over" of bare pipes CONTRACTOR shall inspect and record all the relevant details referred above including pipe defects in the presence of COMPANY. All pipes shall be checked for bevel damages, weld seam height, dents, gouges, corrosion and other damages. COMPANY Representative shall decide whether pipe defects / damages are suitable for repair. Damage to the pipes that occur after the CONTRACTOR has taken delivery such as dents, flats, or damage to the weld ends shall be cut off or removed and pipes rebevelled and repaired again as necessary. The cost of this work, as well as that of the pipe lost in cutting and repair shall be to the CONTRACTOR's account. All such works shall be carried out after written approval of the COMPANY. Any reduction in length shall be indicated in the CONTRACTOR's pipe tracking system.

- 11.2 The CONTRACTOR shall unload, load, stockpile and transport the bare pipes within the coating plant(s) using suitable means and in a manner to avoid damage to pipes.

The CONTRACTOR shall stockpile the bare pipes at the storage area of the coating plant. The CONTRACTOR shall prepare and furnish to COMPANY a procedure/calculation generally in compliance with API RP-5L1 for stacking of pipes of individual sizes, which shall be approved by COMPANY prior to commencement.

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- 11.3 The CONTRACTOR shall load, unload, transport and stockpile the coated pipes within the coating plant using approved suitable means and in a manner to avoid damage to the pipe and coating. The COMPANY shall approve such procedure prior to commencement of work.
- 11.4 Coated pipes may be handled by means of slings and belts of proper width (minimum 60 mm) made of non- abrasive/non-metallic materials. In this case, pipes to be stacked shall be separated row by row to avoid damages by rubbing the coated surface in the process of taking off the slings. Use of round sectional slings is prohibited. Fork lifts may be used provided that the arms of the forklift are covered with suitable pads, preferably rubber.
- 11.5 Bare / coated pipes at all times shall be stacked completely clear from the ground, at least 300 mm, so that the bottom row of pipes remains free from any surface water. The pipes shall be stacked at a slope so that driving rain does not collect inside the pipe. Bare / coated pipes may be stacked by placing them on ridges of sand free from stones and covered with a plastic film or on wooden supports provided with suitable cover. This cover can be of dry, germ free straw covered with plastic film, otherwise foam rubber may be used. The supports shall be spaced in such a manner as to avoid permanent bending of the pipes.

Stacks shall consist of limited number of layers such that the pressure exercised by the pipe's own weight does not cause damages to the coating. CONTRACTOR shall submit calculations for COMPANY approval in this regard. Each pipe section shall be separated by means of spacers suitably spaced for this purpose. Stacks shall be suitably secured against falling down and shall consist of pipe sections having the same diameter and wall thickness. The weld seam of pipes shall be positioned always in a manner so as not to touch the adjacent pipes.

The ends of the pipes during handling and stacking shall always be protected with bevel protectors.

- 11.6 The lorries used for transportation shall be equipped with adequate pipe supports having as many round hollow beds as there are pipes to be placed on the bottom of the lorry bed. Total width of the supports shall be at least 5% of the pipe length and min. 3 no. support shall be provided. These supports shall be lined with a rubber protection and shall be spaced in a manner as to support equal load from the pipes. The rubber protection must be free from all nails and staples where pipes are in contact. The second layer and all following layers shall be separated from the other with adequate number of separating layers of protective material such as straw in plastic covers or mineral wool strips or equivalent, to avoid direct touch between the coated pipes.

All stanchions of lorries used for transportation shall be covered by non-abrasive material like rubber belts or equivalent. Care shall be exercised to properly cover the top of the stanchions and other positions such as reinforcement of the truck

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body, rivets, etc. to prevent damage to the coated surface. Slings or non-metallic straps shall be used for securing loads during transportation. They shall be suitably padded at the contact points with the pipe.


- 11.7 Materials other than pipes and which are susceptible of deteriorating or suffering from damages especially due to humidity, exposure to high thermal excursions or other adverse weather conditions, shall be suitably stored and protected. Deteriorated materials shall not be used and shall be replaced at CONTRACTOR's expenses. These materials shall always be handled during loading, unloading and storage in a manner so as to prevent any damage, alteration and dispersion. When supplied in containers and envelopes, they shall not be dropped or thrown, or removed by means of hooks, both during the handling operations till their complete use. During unloading, transport and utilization, any contact with water, earth, crushed stone and any other foreign material shall be carefully avoided.

CONTRACTOR shall strictly follow Manufacturer's instructions regarding storage temperature and methods for volatile materials that are susceptible to change in properties and characteristics due to unsuitable storage. If necessary the CONTRACTOR shall provide for a proper conditioning.

- 11.8 In case of any marine transportation of bare/coated line pipes involved, the same shall be carried out in compliance with API RP 5LW. CONTRACTOR shall furnish all details pertaining to marine transportation including drawings of cargo barges, storing/stacking, sea fastening of pipes on the barges/marine vessels to the company for approval prior to undertaking such transportation works. In addition contractor shall also carry out requisite analyses considering the proposed transportation scheme and establish the same is safe and stable. On-deck overseas shipment shall not be allowed.

## **12.0 REPAIR OF COATING**

CONTRACTOR shall submit to COMPANY, its methods and materials proposed to be used for executing a coating repair and shall receive approval from COMPANY prior to use. In open storage the repair coating materials must be able to withstand a temperature of at least (+) 80°C without impairing its serviceability and properties. CONTRACTOR shall furnish manufacturer's test certificates for the repair materials clearly establishing the compliance of the repair materials with the applicable coating requirements indicated in this specification.

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All pipe leaving coating plant, shall have sound external coating with no holiday or porosity on 100% of the surface.

Defects, repairs and acceptability criteria shall be as follows:

- Pipes showing porosities or very small damage not picked up during holiday test and having a surface less than 0.5 cm<sup>2</sup> or linear damage (cut) of less than 3 cm shall be repaired by stick using material of same quality.
- Damages caused to coating by handling such as scratches, cuts, dents, gouges, not picked up during holiday test, having a total reduced thickness on damaged portion not less than 2 mm and an area not exceeding 20 cm<sup>2</sup> shall be rebuilt by heat shrink patch only and without exposing to bare metal.
- Defects of size exceeding above mentioned area or holidays of width less than 300 mm shall be repaired with heat shrink repair patch by exposing the bare metal surface.
- Defects exceeding the above and in number not exceeding 2 per pipe and linear length not exceeding 500 mm shall be repaired using heat shrinkable sleeves of HTLP 80 or equivalent.
- Pipes with bigger damage shall be stripped and recoated.
- In case of coating defect close to coating cut back, CONTRACTOR shall remove the coating throughout the entire circumference of the pipe down to the steel surface and increase the coating cut back length. Now if the coating cut back exceeds 170 mm of linear length of pipe then the coating shall be repaired by the use of heat shrink sleeves thereby making up the coating cut back length of 150 mm.

Notwithstanding the above, under no circumstances, if the defect exceeds 70 mm from the original coating cut back length, the entire coating shall be removed and the pipe shall be recycled through the entire coating procedure.

Irrespective of type of repair, the maximum numbers of repair of coating shall be as follows:

- Holiday repair of size  $\square \leq 100$  cm<sup>2</sup> attributable to process of coating application shall be maximum one number per pipe.
- In addition to the above, defects to be repaired by heat shrink patch/sleeve shall be maximum 2 (two) per pipe.

Defects exceeding the above limits shall cause pipe coating rejection, stripping and recoating. The above is exclusive of the repairs warranted due to testing as per this specification.

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All repairs carried out to coating for whatever reason shall be to the account of CONTRACTOR.

Cosmetic damages occurring in the polyethylene layer only need not be repaired by exposing up to steel surface, as deemed fit by the COMPANY Representative. In any case the CONTRACTOR shall establish his material, methods and procedure of repair that result in an acceptable quality of product by testing and shall receive approval from COMPANY prior to use.

Testing of repairs shall be in the same form as testing coating. All repairs shall result in a coating thickness no less than the parent coating thickness. CONTRACTOR shall test repairs to coating as and when required by COMPANY.

### **13.0 MARKING**


CONTRACTOR shall place marking on the outside surface of the coating at one end of the coated pipe, and marking shall indicate, but not limited to the following information:

- a. Pipe number, Heat number
- b. Diameter & Wall thickness
- c. Coated pipe number
- d. Colour band
- e. Any other information considered relevant by COMPANY.
- f. Pipe Manufacturer Name
- g. Inspection Mark/Punch

CONTRACTOR shall obtain prior approval on marking procedure to be adopted from the COMPANY.

### **14.0 QUALITY ASSURANCE**

- 14.1 The CONTRACTOR shall have established within his organisation and, shall operate for the contract, a documented Quality System that ensures that the requirements

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of this specification are met in all aspects. The Quality System shall be based upon ISO 9001/2 or equivalent.

- 14.2 The CONTRACTOR shall have established a Quality Assurance Group within its organisation that shall be responsible for reviewing the Quality System and ensuring that it is implemented.
- 14.3 The CONTRACTOR shall submit the procedures that comprise the Quality System to the COMPANY for agreement.
- 14.4 The CONTRACTOR's Quality System shall pay particular attention to the control of Suppliers and Sub-contractors and shall ensure that the requirements of this specification are satisfied by the Suppliers and Sub-contractors operating Quality system in their organisation.
- 14.5 The CONTRACTOR shall, prior to the commencement of work, prepare and issue a Quality Plan for all of the activities required to satisfy the requirements of this specification. The plan shall include any sub-contracted work, for which the sub-contractors Quality Plans shall be submitted. The plan shall be sufficiently detailed to indicate sequentially for each discipline the requisite quality control, inspection, testing and certification activities with reference to the relevant procedures and the acceptance standards.
- 14.6 The CONTRACTOR's Quality system and associated procedures may, with due notice, be subject to formal audits. The application of quality control by the CONTRACTOR will be monitored by the COMPANY Representatives who will witness and accept the inspection, testing and associated work required by this specification.

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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.  
Equipments assembled at site shall only receive primer coat in the shop and finish coatings will be applied at site.

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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.

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.

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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.

#### 4.2.5 Roller Application

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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

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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.

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

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- 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;
- 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.

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#### 4.6 Wash-Up

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 <b>– High Durability</b>	Total dry film thickness of paint system: 320 microns <b>as per C5 – High Durability</b>
b)	Surfaces (CS) with operating temperature upto 91 <sup>0</sup> C TO 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>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-	<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
		05-5900 (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</b>	:	<b>(SSPC SP 20 Level 1) &gt;85% by wt.</b>

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<b>(As per the ASTM D520 – Spherical 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. ±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. ±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. ±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

### **TWO PACK ALIPHATIC ACRYLIC POLYURETHANE FINISH PAINT – F5**

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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
<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

## **6.0 MACHINERY, ELECTRICAL AND INSTRUMENT EQUIPMENT:**



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## 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	Ra1	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 upto 2 MT	BLACK	9005	"
- Structures above 2 MT	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) with operating temperature less than	GREY	7035	"

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Description	Colour	Ra1	Correspond. Asian Paint colors to be defined – See Note-2
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	
-			“
- T-303	WHITE	9010	“

NOTE-1: The colours shall be according to IS2379:1990/International STD. RAL or BS, proposed by Contractor or Manufacturer

## 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
- b. Material safety data sheet

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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 SPECIFICATION FOR INSULATING JOINTS

REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD
00			Issued			

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## 1. SCOPE

This specification covers the basic requirements for design manufacture, testing and supply of carbon steel insulating joints to be installed in onshore pipeline systems handling natural gas.

## 2. REFERENCE DOCUMENTS

2.1 Reference has been made in this specification to the latest edition of the following codes, standards and specifications :

- i. ASME B31.8 : Gas transmission & Distribution piping System.
- ii. ASME B31.4 : Liquid transportation systems for hydrocarbon & other liquids
- iii. ASME B31.8 : Gas transmission and distribution piping systems
- iv. ASME Sec.viii/ix : Boiler and pressure vessel code
- v. ASTM A 370 : Standard test methods & definitions for mechanical testing for steel products
- vi. ASME B 16.25 : Butt welding ends.
- vii. MSS –SP- 75 : Specification for High test wrought welding fittings.
- viii. MSS-SP-53 : Quality standard for steel castings and forging for valves flange and fittings and other piping components – magnetic particle examination method
- ix. API 1104 : Standard for welding pipelines and Related facilities.
- x. SSPC-VIS-1 : Steel Structures painting Council Visual Standard.
- xi. NACE RP 0286 : The electrical isolation of cathodically protected pipelines.

2.2 In case of conflict between the requirements of this specification and the Codes, Standards and Specifications referred in clause 2.1 above, the requirements of this

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specification shall govern.

### 3. **MATERIAL**

- 3.1 Carbon steel used for the manufacture shall be fully killed.
- 3.2 Insulating joints which are subject to field welding by purchaser shall have carbon equivalent (CE) not exceeding 0.45% based on check analysis for each heat of steel calculation according to the following formula:

$$CE = C + \frac{Mn}{6} + \frac{(Cr+Mo+V)}{5} + \frac{(Ni + Cu)}{15}$$

- 3.3 For insulating joints specified to be used for natural gas service, Charpy V-notch test shall be conducted on each heat of base material, weld metal and heat affected zone of all pressure containing parts of insulating joints in accordance with the impact test provisions of ASTM A 370 at a temperature of 0<sup>0</sup> C. The Charpy impact test specimens shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of the plate of forging.

Average impact energy value of three full sized specimens shall be 27 joules.

Minimum impact energy value of any one specimen shall not be less than 80% of the average impact energy specified. No specimen shall exhibit less than 80% shear area.

- 3.4 For insulating joints specified to be used for natural gas service, hardness test shall be carried out as per ASTM A370 for each heat of steel used. The maximum hardness of base metal, weld metal and heat affected zone (HAZ) of all pressure parts shall be 248 HV<sub>10</sub>, unless specified otherwise.
- 3.5 Insulation material shall be minimum 20 mm thick and shall comply section 5, NACE RP 0286.

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#### 4. DESIGN AND FABRICATION

##### 4.1 **Mechanical**

4.1.1 Insulating joints shall be of integral type fabricated by welding and with pups on either side. A corrosion allowance shall be considered in design. Bolted and threaded joints are not acceptable.

4.1.2 Insulating joints shall be designed using the design principles of ASME Section-VIII Div.1.

The design shall be checked for the following two cases:

**Case-I:** Design Pressure + Axial Force (F)

The Axial Force shall be calculated as under:

$$F = 0.1 \times S \times A$$

Where

S = SMYS of connected pipe

A = Metal cross-sectional area of connected pipes.

The allowable stress in this case shall be less than or equal to 0.5 x SMYS of insulating joint material.

**Case-II:** Hydrostatic Test Pressure

The allowable stress in this case shall be less than or equal to 90% of SMYS of insulating joint material.

Detailed calculations shall be submitted for Purchaser approval.

4.1.4 Insulating joint shall be designed to withstand a sustained internal vacuum of at least 1 mill bar.

4.1.5 The joint between pipe pup pieces and main forging shall be full penetration butt weld type. Weld design shall be such as resulting in a weld joint factor of 1.0.

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- 4.1.6 Butt weld ends shall have ends as per ASME B16.25. However, end preparation for butt welding ends having unequal thickness with respect to connecting pipe, shall be as per ASME B31.4/ B31.8 as applicable.
- 4.1.8 Insulating joints shall allow free passage of scraper / instrumented pigs.  
The internal bore shall be same as that of connecting pipe including its tolerances.
- 4.1.10 Insulating joints shall be suitable for aboveground or underground installations.
- 4.1.11 All welds shall be made by welders and welding procedures qualified in accordance with the provisions ASME section IX. The procedure qualification shall include impact test and hardness test and shall meet the requirements of clause 3.3 & 3.4 of this specification.
- 4.1.12 Repair welding on parent metal is not allowed. Repair of weld shall be carried out only after specific approval by purchaser's representative for each repair. The repair welding shall be carried out by welders and welding procedures duly qualified as per ASME section IX and records for each repair shall be maintained.
- 4.1.13 The tolerance on internal diameter and out of roundness at the ends for insulating joints shall be as per applicable connected pipe specification.

## 4.2 **Electrical**

- 4.2.1 The average dielectric strength of the insulating joint shall be minimum 15 kilo volts.
- 4.2.2 Two cleats shall be provided on the pups on either side of the insulating joint for connecting 10 mm<sup>2</sup> and 50 mm<sup>2</sup> cables for measurement/ shorting purposes. Cleats shall be attached to the insulating joint by welding.

## 5. **INSPECTION AND TESTS**

- 5.1 The Manufacturer shall perform all inspections and tests as per the requirement of this specification and the relevant codes, prior to shipment at his works. Such inspections and tests shall be, not but limited to the following:
- 5.1.1 Visual inspection.
- 5.1.2 Dimensional checks shall be carried out on finished products as per the purchaser's approved drawings.

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5.1.3 Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.

5.1.4 The non-destructive inspection shall be carried out as given below:

- a. All butt and repair welds for welded fittings shall be examined 100% by radiography. Acceptance criteria shall be as per API 1104.
- b. All finished weld ends shall be 100% tested for lamination type defects by ultrasonic test. Any lamination larger than 6.35 mm shall not be acceptable.
- c. Welds, which cannot be inspected by radiographic methods, shall be checked by ultrasonic or magnetic particle methods. Acceptance criteria shall be as per ASME Section VIII Appendix 12 and Appendix 6 respectively.

5.2 Insulating joints shall be hydrostatically tested to a specified pressure. The test duration shall be 15 minutes.

5.3 After hydrostatic test, insulating joints shall be tested with air at 5 kg/cm<sup>2</sup> for 10 minutes. No leakage will be accepted.


5.4 Purchaser's Inspector reserves the right to perform stage wise inspection and witness tests, at Manufacturer's Works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide, without charge, reasonable access and facilities required for inspection, to the purchaser's inspector.

Inspection and tests performed/witnessed by Purchaser's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

#### 5.5 Dielectric Test

- a) Insulating resistance of each insulating joint shall be at least 25 mega-ohms when checked with 500-1000 V DC.
- b) Insulating joint before and after the hydrostatic test, shall be tested for dielectric integrity for one minute at 5000 V A.C., 50 cycles and the leakage current before and after hydrostatic test shall be equal. Testing time, voltage and leakage shall be recorded and certified.

No repair shall be permitted to the insulating joints failed in the above mentioned tests.

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## 6. TEST CERTIFICATES

Manufacturer shall furnish the following certificates:


- a) Test certificates relevant to the chemical analysis and mechanical properties of the Materials used for manufacture of insulating joints as per relevant standards and this specification.
- b) Test Reports on non destructive testing.
- c) Test reports for hydrostatic and air tests.
- d) Test certificates for electric tests.

## 7. PAINING, MARKING AND SHIPMENT

7.1 Insulating joint surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SP-6 in accordance with "Steel Structures Painting Council – Visual standard SSPC-VIS-I". External surfaces of buried insulating joints shall be painted with three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns

7.2 Insulating joints shall be marked with indelible paint with the following data:-

- a) Manufacturer's name
- b) Suitable for \_\_\_ inch nominal diameter pipeline
- c) End thickness in mm
- d) Material
- e) Design pressure/Hydrostatic test pressure
- f) ANSI Class rating
- g) Tag No.
- h) Year of manufacture

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- 7.3 Insulating joints shall be suitably protected to avoid any damage during transit. Metallic bevel protectors shall be provided for weld ends.

## 8. **DOCUMENTATION**


- 8.1 All documents shall be in English Language.
- 8.2 At the time of bidding, Bidder shall submit the following documents:-
- a) General arrangements drawing along with cross sectional view, overall dimensions and details of insulating materials recommended.
  - b) Reference lists of previous supplies of insulating joint of similar specification.
  - c) Clause wise list of deviation from this specification, if any.
- 8.3 Within three weeks of placement of order, the manufacturer shall submit four copies of but not limited to the following drawings, documents and specifications for approval.
- a) Fabrication drawings and relevant calculations for pressure containing parts.
  - b) Welding procedure and method of manufacture for all phases of manufacture.
  - c) Quality Assurance Plan (QAP).

Once the approval has been given by purchaser any changes in design, material and method of manufacture shall be notified to the Purchaser whose approval in writing of all changes shall be obtained before the insulating joint are manufactured.

- 8.4 Within four weeks from the approval date Manufacturer shall submit one reproducible and six copies of the approved drawings, documents and specifications as listed in 8.3 of this specification.
- 8.5 Prior to shipment, the manufacturer shall submit one reproducible and six copies of the test certificates as listed in Clause 6 of this specification.

## 9. **GUARANTEE**

- 9.1 The manufacturer shall guarantee that the materials used comply with the requirements of this specification.
- 9.2 Manufacturer shall replace or repair insulating joints found defective due to inadequate engineering or quality of material.

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- 8.3 Manufacturer shall replace the insulating joint without delay if the defect or malfunctioning cannot be eliminated.
- 8.4 Any defects occurring within 12 months from the date of installation or within 30 months from the date of despatch, whichever is earlier, shall be repaired making all necessary modifications and repair of defective parts free of charge to the purchaser.
-



**TECHNICAL SPECIFICATION OF INSULATION JOINT**

PC150-PDS-600-IJ	0
DOCUMENT NO	REV
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SL.NO	DETAILS	DATA	
a	Type	Insulating Joint, Monolithic Type	
B	Design Code	ASME B 31.3/ASME B 31.4/ ASME SEC VIII DIV-1 Appx.2	
C	Design Pressure	As per Line Design Condition	
D	Design Temperature	As per Line Design Condition	
E	Corrosion Allowance	1.5 mm	
F	Design Factor	0.5	
G	ANSI Rating	150#	
H	Service	Water	
I	Joint Overall Length	12 *IJ+ Extension pipe	
J	Material	Pipeline	API 5L Gr. B, PSL-1, 3LPE Coated
		"S-L-G" Body parts	ASTM/ ASME Material
		"F"- Isolating Element	NEMA G10- ASTM D709
		"OR" -Gasket	Viton/ Graphoil
		"Si" -Black Seal	Silicon Neutral Low Module
		"R" Filler Isolator	Epoxy Resin Cold Cured
		"P" Cable Lugs, M10	EN 10025 235 JR( Carbon Steel)
		"DFT1" Internal Coating	Amine Cure Epoxy Resin 200-300 microns
		"DFT2" External Coating	Amine Cure Epoxy Resin 200-300 microns
K	Installation	Aboveground & Underground	
L	Di-Electric Test	1.5-5 KV @ 1 Minute AC 50-60 Hz	
M	Electrical Insulation Test	>200 MΩ @ 1000 V DC	
N	End Connection	Butt-Welded (To Suit Connecting Pipe)	
P	Post Weld Heat Treatment	Yes	
Q	Non Destructive Testing	W1-W2-W3: MT & UT, BE MT -According to ASME V	
R	Welds	W1-W2-W3: According to ASME IX- API 1104	
S	Hydrotest Pressure (At Factory)	1.5 Times the Design Pressure	
T	Certification	EN 10204- 3.1	



**NOTES:**

1. A length of 50 mm at each end shall be left uncoated to allow welding
2. All pressure containing material including steel parts, insulating material, seal gasket and internal coating are suitable for Resistance to H<sub>2</sub>S environment.
3. All Pressure containing steel parts shall be in strict accordance with NACE-MR-0175/ ISO 15156.
4. This calculation is approx.
5. Material is not in contact with the fluid
6. Cables lugs shall be installed on the Insulating Joints, only if there is a provision for Cathodic Protection.

	PROJECTS & DEVELOPMENT INDIA LTD.	PNPM/PC-150/E/121/NCB/VI-7.0	0	
		Document No	Rev	
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## SECTION: VI (CIVIL)

### VENDOR LIST



	BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES	PNPM/PC-150/E/121/NCB/VI-7.0	0	
		DOCUMENT NO	REV	
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## 1.0 CIVIL



### GENERAL NOTES:

- i. Only 'First' Quality materials shall be used
- ii. 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.
- iii. 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.
- iv. In case of non-availability of any material among approved vendor list / makes in a particular site / region, alternate vendor / make conforming to IS / BS etc. shall be used subject to approval by OWNER / CONSULTANT.



SL. NO.	ITEM	NAME
1.0	<b><u>FLOOR FINISHING</u></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
1.4	HEAVY DUTY FLOOR TILES	A) BHARAT TILES B) RESTILE CERAMICS C) PELICAN CERAMIC INDUS. D) PAVIT E) SONA TILES
1.5	INDUSTRIAL FLOOR HARDENER ADMIXTURE	A) PIDILITE INDUSTRIES B) SIKA C) CICO.
1.6	PVC ROLLS	A) PREMIER VINYL B) ARMSRONG INARCO C) RMG POLYVINYL
1.7	PVC TILES	A) ARMSTRONG

	BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES	PNPM/PC-150/E/121/NCB/VI-7.0	0	
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1.8	PVC TILES/ROLL ANTISTATIC	A) PREMIER VINYL B) RMG POLYVINYL C) ARMSTRONG
1.9	ACID RESISTANT TILES(BATTERY ROOM)	A) H&R JOHNSON OR APVD. EQUIV.
1.10	MOSSAIC TILE	A) ITALIS 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
2.2	PLY WOOD/BLOCK BOARD	A) CENTURY B) KITPLY PRODUCTS C) GREEN PLY
2.3	PARTICLE BOARD (EXTRA GRADE)	A) BHUTAN BOARD B) NOVAPAN INDIA LTD.
2.4	MDF BOARD/MD PARTICLE BOARD (EXTRA GRADE)	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
2.6	MARINE PLYWOOD	A) CENTURY B) GREENPLY INDUS. LTD. C) MERINO D) ARCHID
<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
2.7.2	CYLINDRICAL PIN TUMBLER LOCK WITH KNOBS	A) GODREJ & BOYCE B) EVERITE AGENCIES (P) LTD. C) DOORSET
2.7.3	HYDRAULIC DOOR CLOSER (OVER HEAD/ FLOOR)	A) OZONE B) EVERRITE AGENCIES (P) LTD. C) HARDWYN
2.7.4	MISC. DOOR FITTINGS HINGLE, TOWER BOLTS, LATCHES, SOPPER, STAYS, ALDROPS ETC.	A) EVERITE AGENCIES (P) LTD. B) EBCO DINSUTRIES D) OZONE

	BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES	PNPM/PC-150/E/121/NCB/VI-7.0	0	
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		E) HARDWYN
2.7.5	THREE WAY BOLTING LOCKING DEVICE HANDLE	A) SRIMA SALES & SERVICES B) DHIMAN INDUSTRIES
2.7.6	PANIC BAR LATCH (FOR EMERGENCY DOOR)	A) SRIMA SALES & SERVICE
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
<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	CRYLIC BASED CEMENTATIOUS PRIMER COATING FOR ROOF WATERPROOFING	A) STRUCTURAL WATER PROOFING CO. (P) LTD. B) SIKA QUALCRETE LTD. C) PIDILITE INDUSTRIES
5.3	APP MODIFIED POLYMERIC WASTER PROOFING MEMBRANE	A) PIDILITE INDUSTRIES LTD. B) SIKA
<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.

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		D) SHALIMAR PAINTS E) KANSAI NEROLAC PAINTS LTD.
6.2	DRY OILBOUND DISTEMPER	A) ASIAN PAINTS LTD. B) KANSAI NEROLAC PAINTS LTD.
6.3	INDUSTRIAL / EXPOXY/ 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
6.4	WATERPROOFING CEMENT PAINT	A) KILLICK NIXON LTD. B) RAJDOOT PAINTS
6.5	WOOD MELAMINE POLISH	A) ASIAN PAINTS B) SHALIMAR PAINTS C) WEMBLI PAINTS
6.6	WATERPROOFING TRANSPARENT EXTERIOR WALL COATING (OVER PAINTED SURFACE)	A) PIDILITE INDUSTRIES B) SIKA
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. 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
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



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		C) DUROPLAST
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
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 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
9.4	OVERDECK HEAT INSULATION	A) LLOYD INSULATION (I) LTD. B) BEST PLASTRONICS LTD.
9.5	GYPNUM BOARD TILES (FIBRE GLASS REINFORCED)/ PRIMA BOARD ARMSTRONG FALSE CEILING	A) SAINT GOBAIN
10.0	<b>SPECIALITY PRODUCTS</b>	A) PIDILITE INDUSTRIES

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	<b>(CEMENT ADDITIVES/ ADMIXTURES/CORROSION INHIBITORS/ SURFACE TREATMENT/ GROUT &amp; ANCHORS/SEALING/ COASTING</b>	B) SIKA
10.1	EPOXY FLOOR COATING (BATTERY ROOM)	A) SIKA B) FAIRMATE
<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
11.3	PVC PLUMBING FITTINGS	A) SUPREME B) POLYPAC C) ASTROL
11.4	REINFORCED FIBRE GLASS WATERPROOFING FELT	A) SIKA B) U.P. TWIGA F.G. LTD.
11.5	ANTI TERMITE TREATMENT	A) PCI OR APPRVD EQUIV.
11.6	MATERIAL TEST HOUSE	A) IIT MADRAS B) GOVT APPROVED AGENCY
12.0	CEMENT	A) ACC B) J K CEMENT C) BINANI CEMENT D) JP CEMENT E) 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	AP GOVT APPROVED AGENCY
14.0	WRAPPING COATING (I/C TAPE & PRIMER) IWL OR APPROVED EQUIPMENT	A) IWL OR APPROVED EQUIVALENT
15.0	FIRE PROOFING MATERIAL	A) CAFCO B) CARBOLINE
16.0	STRUCTURAL STEEL / CS PLATE	A) SAIL B) TATA STEEL C) RINL D) JINDAL STEEL & POWER LTD



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		E) ESSAR F) ISPAT INDUSTRIES
16.1	MS PIPES (HAND RAIL APPLICATION)	A) SURYA B) PRAKASH C) JINDAL
17.0	TIMT BAR / REBAR	A) SAIL B) TATA STEEL C) RINL D) SHYAM STEEL INDUSTRIES LIMITED
18.0	GRATINGS/HANDRAILS	A) INDIANA GRATINGS B) WESTCOAST ENGINEERING C) GREATWELD GRATING D) KANADE ANAND UDYOG
19.0	WELDING ELECTRODE	A) ADOR B) ESAB C) D & H D) HANOVAR

 <b>पी डी आई एल</b> <b>PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LTD</b>	PNPM/PC150/E/121 /SEC-7.0	0	
		DOCUMENT NO	REV	
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## PART – II : TECHNICAL



### SECTION – 7.0

#### VENDOR LIST (ROTATING EQUIPMENT)

**FOR BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES**

**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

0	18.07.23	18.07.23	ISSUED FOR ENQUIRY	AIN	YKG	RRK
P1	07.03.2019	07.03.2019	ISSUED FOR ENQUIRY	NY	ASR	GC
P	08.02.2019	08.02.2019	ISSUED FOR ENQUIRY	NY	ASR	GC
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

	<b>BALANCE JOB OF SUPPLY, ERECTION, TESTING &amp; COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES TFL, TALCHER</b> <b>VENDOR LIST (ROTATING EQUIPMENT)</b>	PNPM/PC150/E/121/ SEC-7.0	0	
		DOCUMENT NO	RE	
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## 1.0 ROTATING EQUIPMENT :

Sl.No	Vendor's Name	Country
<b>Pumps for water service (Vertical)</b>		
1.	Flowmore Pvt. Ltd	India
2.	Jyoti Limited	India
3.	Kirloskar Brothers Ltd.	India
4.	Mather & Platt (India) Ltd.	India
5.	KSB Pumps Limited	India
6.	AKAY Industries Pvt Ltd	India
7.	Kishore Pumps Pvt Ltd	India
8.	SAM TURBO Industries Pvt Ltd	India
<b>EOT Cranes</b>		
1.	W.H. Brady & Co. Ltd	India
2.	Avon Cranes Pvt. Ltd.	India
3.	The ACME manufacturing Co. Ltd	India
4.	WMI Cranes	India
5.	Samco Engineering Pvt. Ltd	India

	<b>VENDOR LIST</b>	PNMP/PC150/E/121/SEC-VI-7.0	0	
		DOCUMENT NO	REV	
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**VENDOR LIST**  
**FOR**  
**SUPPLY OF PIPING ITEMS FOR BALANCE JOB OF**  
**SUPPLY, ERECTION, TESTING & COMMISSIONING OF**  
**PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED**  
**FACILITIES**

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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
8	INDUS TUBES LIMITED (6" to 12")	INDIA
9	JAY LAKSHMI STEEL & ENGINEERING CO.	INDIA

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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
14	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
15	WELSPUN GUJARAT STAHL ROHREN LIMITED (DAHEJ) (upto 72" (50	INDIA



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	MM THK))	
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
11	P.K.FORGE & FITTING INDUSTRIES	INDIA
12	RATNADEEP METAL & TUBES PVT. LTD. (<=168.3MM OD)	INDIA

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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	PHOCEEENNE	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
9	JINDAL SAW LTD.	INDIA
10	KRYSTAL STEEL MANUFACTURING PVT. LTD. (upto 2" (MATERIAL	INDIA



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	UPTO GRADE SS 321))	
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
39	MITSUBISHI CORPORATION	JAPAN

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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>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>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

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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
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	PHOCEENNE	FRANCE
39	VALLOUREC	FRANCE
40	SEIKMANN ANLAGEN-TECHNIK GMBH.	GERMANY
41	TPS-TECHNITUBE ROHRENWERKE GMBH	GERMANY
42	HORST KURVERS GMBH	GERMANY

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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
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>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	INDIA

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	2500#))	
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# ; 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 : 1/2" TO 42" (UPTO 600#), 1/2" TO 24" (UPTO 900#), 1/2" TO 16" ( UPTO 1500#), 1/2" 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#), 1/2" to 40"-300#, 1/2" to 42"- 600#,1/2" to 20"-900#, 1/2" to 20"-1500#, 1/2" 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>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

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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 & Check))	INDIA
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

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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 1 ½" (800#))	INDIA
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"	INDIA

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	(150#); 24" (300#); 12" (600#) & Forged: Upto 2" (800#))	
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
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



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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
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

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3	AQUA VALVES PVT. LTD.	INDIA
4	BRIGHTCH 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
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

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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
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

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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 (<300#,<30"(TEFLON/RUBBER) ,<72"(METAL))	INDIA
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

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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 (COPEX-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
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 1 1/2", 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

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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
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

	<b>VENDOR LIST</b>	PNMP/PC150/E/121/SEC-VI-7.0	0	
		DOCUMENT NO	REV	
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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>FLAT GASKETS/ RUBBER GASKET</b>	
1	FERROLITE JOININGS (P) LTD.	INDIA
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

	<b>VENDOR LIST</b>	PNMP/PC150/E/121/SEC-VI-7.0	0	
		DOCUMENT NO	REV	
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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>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 ELLETOFT 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
10	MULTITEX FILTERATION ENGINEERS LTD	INDIA



	<b>VENDOR LIST</b>	PNMP/PC150/E/121/SEC-VI-7.0	0	
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11	ZOLOTO INDUSTRIES (15MM TO 100MM)	INDIA
12	BOTELI VALVE GROUP CO. LTD. (Y - TYPE ONLY: 14" (150#) & 3" (300# & 600#))	CHINA
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>FASTENERS</b>		
1	AEP COMPANY	INDIA
2	CAPITAL INDUSTRIES	INDIA
3	CONSOLE ENGG. & FASTNERS INDUSTRIES	INDIA
4	EBY FASTNERS	INDIA
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 (½" 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

NOTE(Piping vendor list):

1. Make of the items not indicated and any other make for the specified item shall be subject to

	<b>VENDOR LIST</b>	PNMP/PC150/E/121/SEC-VI-7.0	0	
		DOCUMENT NO	REV	
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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 PDIL</b>	<b>PROJECTS &amp; DEVELOPMENT INDIA LIMITED</b>	<b>PNPM/PC150/E/121/SEC- 8.0</b>	<b>0</b>	
		Document No.	Rev	
		Sheet 1 of 3		

## **PART II: TECHNICAL**

### **SECTION – 8.0**

#### **SPARE PARTS**

#### **BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES**



**PROJECT: INTEGRATED COAL BASED FERTILISER  
COMPLEX AT TALCHER, ANGUL DISTRICT,  
ODISHA (INDIA)**

<b>0</b>	<b>18.07.23</b>	<b>18.07.23</b>	<b>ISSUED FOR ENQUIRY</b>	<b>AIN</b>	<b>YKG</b>	<b>RRK</b>
<b>P1</b>	<b>07.03.2019</b>	<b>07.03.2019</b>	<b>ISSUED FOR ENQUIRY</b>	<b>NY</b>	<b>ASR</b>	<b>GC</b>
<b>P</b>	<b>08.02.2019</b>	<b>08.02.2019</b>	<b>ISSUED FOR ENQUIRY</b>	<b>NY</b>	<b>ASR</b>	<b>GC</b>
<b>REV</b>	<b>REV DATE</b>	<b>EFF DATE</b>	<b>PURPOSE</b>	<b>PREPD</b>	<b>REVWD</b>	<b>APPD</b>

	<b>RAW WATER &amp; FIRE WATER RESERVOIR, PUMP HOUSE AND SERVICES</b> TFL, TALCHER <b><u>SPARE PARTS</u></b>	PNPM/PC150/E/112/SEC-8.0	0	
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### 1.1 Centrifugal Pump

S. 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	2 set	2 sets	3 sets	4 sets
4.	Shaft with keys	1 set	1 set	1 set	1 set
5.	Shaft Sleeve	1 set	2 sets	3 sets	4 sets
6.	Interstage sleeves	1 set	2 sets	3 sets	4 sets
7.	Interstage Bushes	1 set	2 sets	3 sets	4 sets
8.	Mech. Seal where applicable	1 no.	1 no.	2 nos.	2 nos.
9.	'O' Rings / Springs for Mech. Seal	2 set	2 sets	3 sets	4 sets
10.	Mechanical Seal Faces	1 set	2 sets	3 sets	4 sets
11.	Constant level Oiler	2 sets	2 sets	2 sets	2 sets
12.	Deflectors	2 sets	2 sets	3 sets	3 sets
13.	Complete coupling	1 No.	1 No.	1 No.	1 No.
14.	Flexible elements, Bushes, Pins for Coupling	1 set	1 set	2 sets	2 sets
15.	Bearings ( DE + NDE )	1 set	2 sets	2 sets	2 sets
16.	Gaskets & 'O' Rings	2 sets	3 sets	4 sets	6 sets
17.	Labyrinths	2 sets	3 sets	4 sets	5 sets
18.	Throat Bushing	1 No.	2 Nos.	3 Nos.	4 Nos.
19.	Throttle Bushing	1 No.	2 Nos.	3 Nos.	4 Nos.
20.	Oil Seals	2 sets	3 sets	4 sets	6 sets
21.	Balancing drum & sleeves	1 set	1 set	2 sets	2 sets
22.	Leak-off valve-gaskets, 'O' Rings and springs	2 sets	3 sets	4 sets	5 sets
23.	Spares for gear box (bearings, gears and seals)	1 set	1 set	1 set	1 set
24.	All type of Fasteners	200%	200%	200%	200%

	<b>RAW WATER &amp; FIRE WATER RESERVOIR, PUMP HOUSE AND SERVICES</b> TFL, TALCHER  <b><u>SPARE PARTS</u></b>	PNPM/PC150/E/112/SEC-8.0	0	
		Document No.	Rev	
		Sheet 3 of 3		

## 1.2 **EOT CRANE**

S. No.	DESCRIPTION	QUANTITY
1.	Wire rope for main hoist	1 set
2.	Wire rope for Auxiliary hoist (if applicable)	1 set
3.	Rope guide for main Hoist	1 set
4.	Rope guide for Auxiliary Hoist (if applicable)	1 set
5.	All type of Bearings	1 set
6.	All type of Oil seals, Gaskets , O-Rings	1 set

### **NOTE:**

1. 'Set' means complete replacement of particular part in one machine.
2. Item wise price against each item shall be furnished in the Performa enclosed with the enquiry
3. The quotation should contain sectional drawing showing location & part no. (For exact identification) & material specification

	<b>PROJECTS &amp; DEVELOPMENT INDIA LIMITED</b>	PNPM/PC150/E/121/SEC-9.0	0	
		Document No.	Rev	
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## PART II: TECHNICAL

### SECTION – 9.0

#### DRAWINGS AND DOCUMENTS


#### BALANCE JOB OF SUPPLY, ERECTION, TESTING & COMMISSIONING OF PERMANENT RAW WATER SUPPLY SYSTEM AND ALLIED FACILITIES

**PROJECT: INTEGRATED COAL BASED FERTILISER COMPLEX AT TALCHER, ANGUL DISTRICT, ODISHA (INDIA)**

0	18.07.23	18.07.23	ISSUED FOR ENQUIRY	AIN	YKG	RRK
P1	07.03.2019	07.03.2019	ISSUED FOR ENQUIRY	NY	ASR	GC
P	08.02.2019	08.02.2019	ISSUED FOR ENQUIRY	NY	ASR	GC
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



	<b>RAW WATER &amp; FIRE WATER RESERVOIR, PUMP HOUSE AND SERVICES TFL, TALCHER</b>  <u><b>DRAWINGS AND DOCUMENTS</b></u>	PNPM/PC150/E/112/SEC-12.0	0	
		Document No.	Rev	
		Sheet 2 of 5		

A	Pumps	With Bid (Y/N)	For Review/ Approval	For Information	Final/ Approved/ As-built
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	Y	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



	<b>RAW WATER &amp; FIRE WATER RESERVOIR, PUMP HOUSE AND SERVICES TFL, TALCHER</b>  <u><b>DRAWINGS AND DOCUMENTS</b></u>	PNPM/PC150/E/112/SEC-12.0	0	
		Document No.	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	Y	-	-	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	Y	-	-	Y
25.0	Parts catalogue complete with reference drawing nos. and sketches etc.	N	-	-	Y

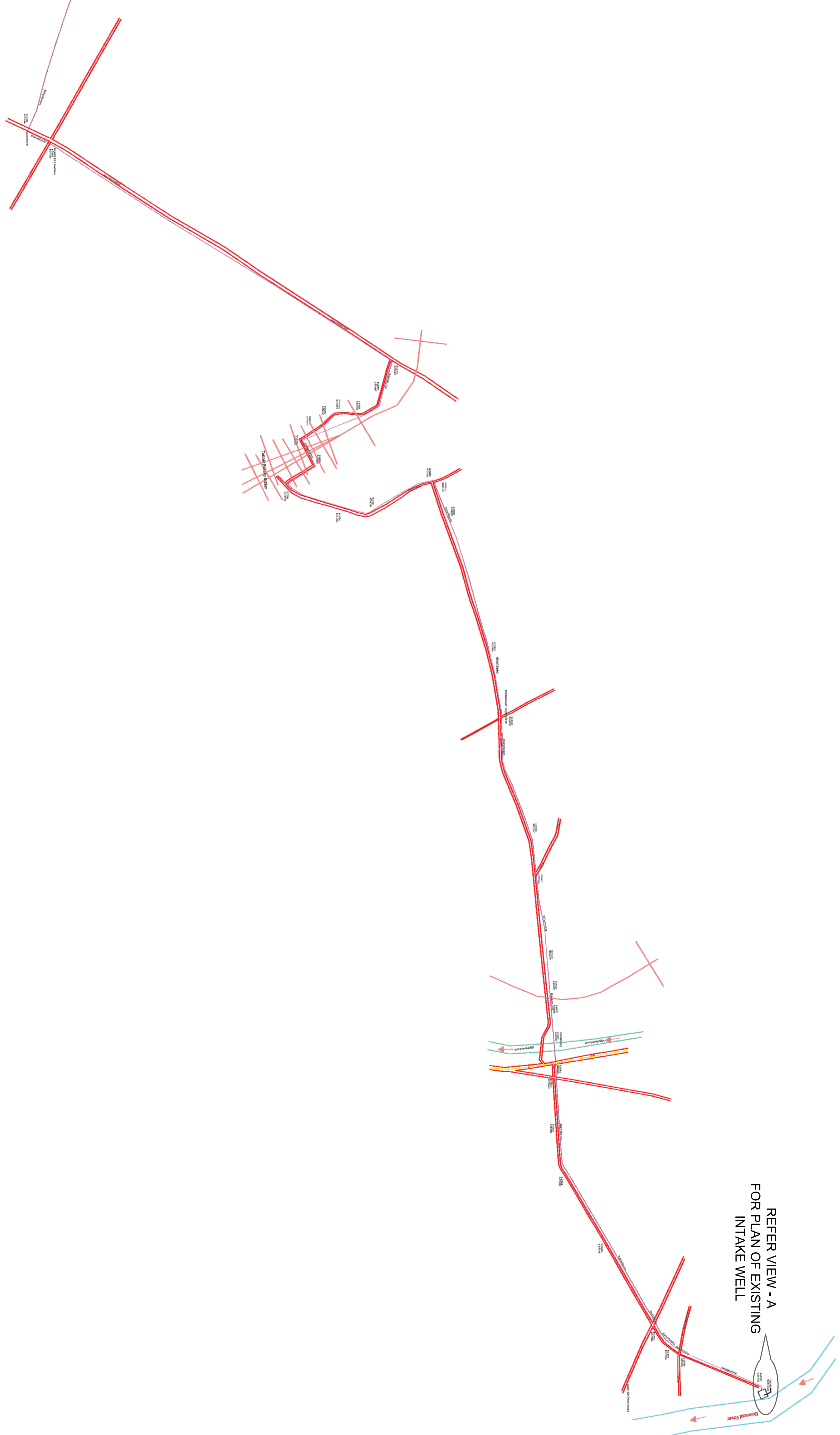
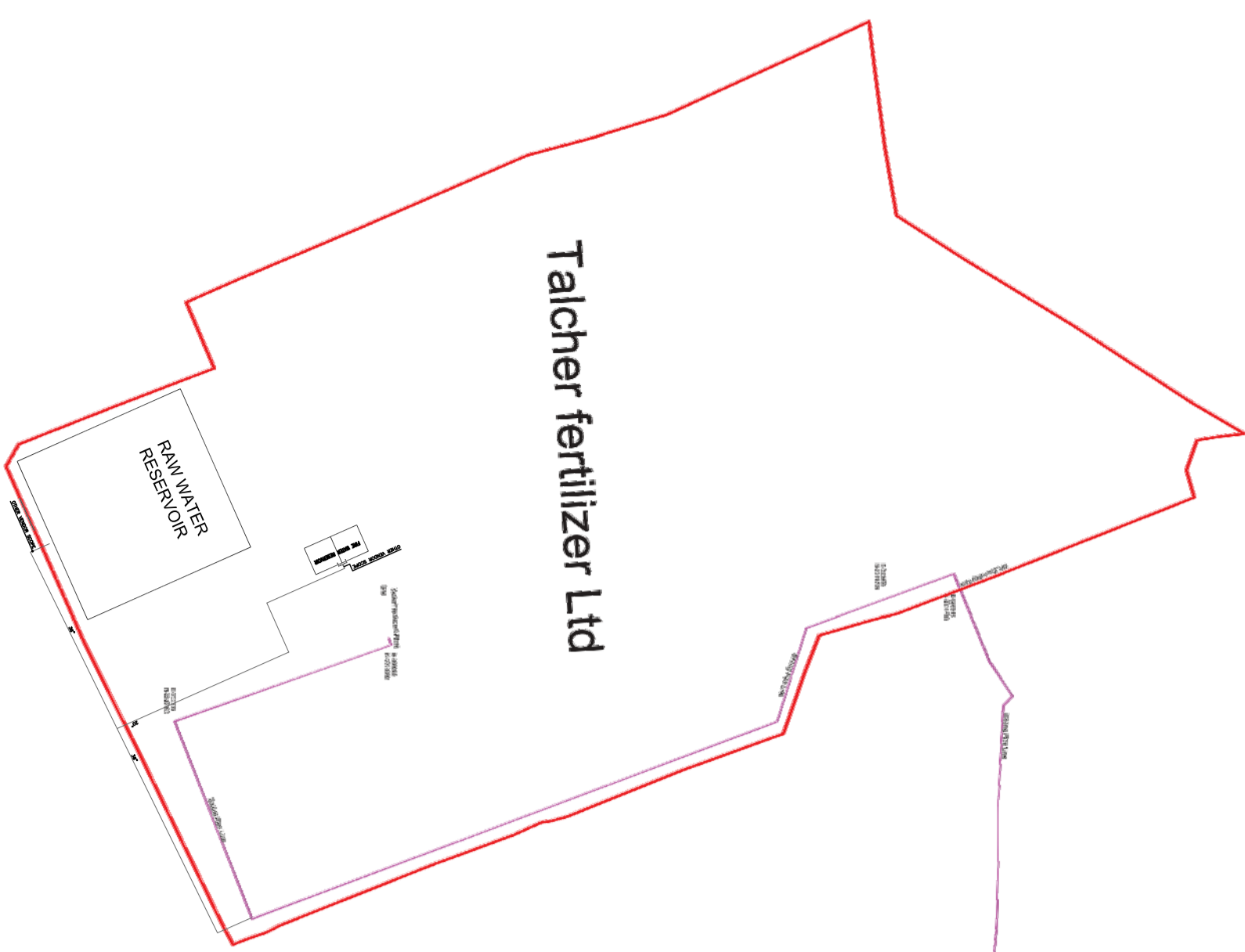
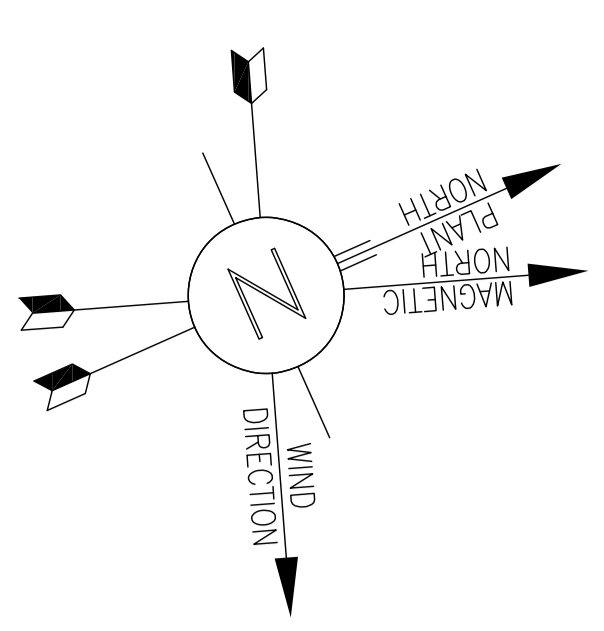


	<b>RAW WATER &amp; FIRE WATER RESERVOIR, PUMP HOUSE AND SERVICES TFL, TALCHER</b>  <u><b>DRAWINGS AND DOCUMENTS</b></u>	PNPM/PC150/E/112/SEC-12.0	0	
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B	EOT Crane / Hoist	With Bid (Y/N)	For Review/ Approval	For Information	Final/ Approved/ As- built
1	Data sheets – completely filled		Y		Y
2	Information to be supplied by manufacturer / Vendor		Y		Y
3	General arrangement Drg. showing various details & all principal dimensions of the assembled unit, horizontals and vertical clearances and approaches.		Y		Y
4	List of spare parts with individual part Nos. and prices.		Y		Y
5	Descriptive literature / catalogue		Y		Y
6	Detailed manufacturing programme Time-Bar Chart.		Y		Y
7	Individual structural drgs. For main girders and End-carriages.		Y		Y
8	Mechanical calculations (Brakes, Gear boxes, gears, pinions coupling, Bearing, Rope-drum, Wire-rope etc.		Y		Y
9	Civil load data drawing, Cross-sectional detailed drawings of sub-assemblies part nos., materials of construction and heat treatment details wherever applicable :		Y		Y
10	a) General Assembly Drg. Showing the complete mechanical details.		Y		Y
11	Crane rail & end stops fixing arrangement.		Y		Y
12	Material test certificates (including the originals) of load bearing parts e.g.		Y		Y
13	Crane rail & end stops fixing arrangement.		Y		Y
14	Material test certificates (including the originals) of load bearing parts e.g.		Y		Y
15	Test certificates of motors (including the originals)		Y		Y
16	Certificates of No load, load, over load deflection Test duly witnessed by the Inspector		Y		Y
17	Operation & Maintenance Manual (including the lubrication schedule also.)		Y		Y

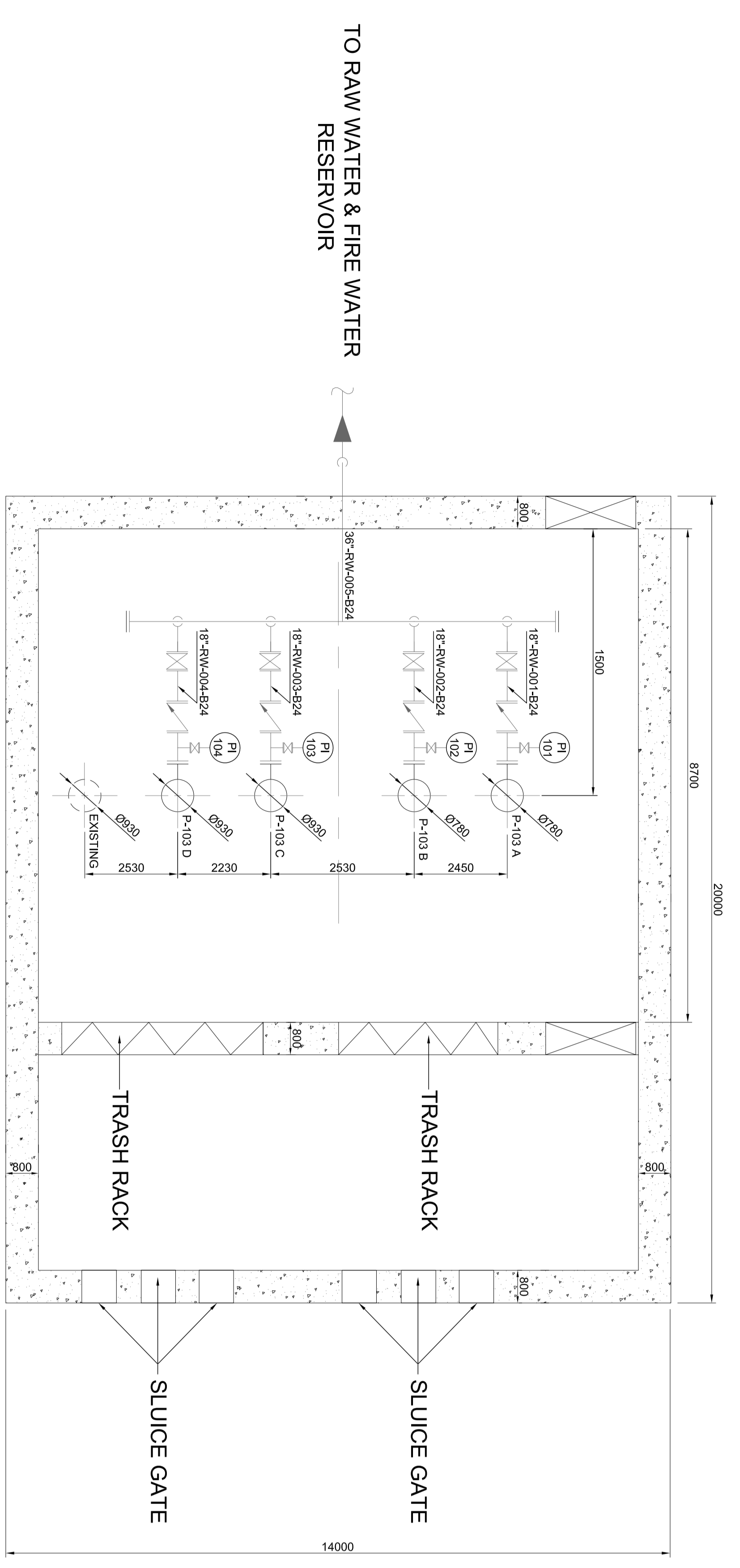
	<b>RAW WATER &amp; FIRE WATER RESERVOIR, PUMP HOUSE AND SERVICES TFL, TALCHER</b>  <u><b>DRAWINGS AND DOCUMENTS</b></u>	PNPM/PC150/E/112/SEC-12.0	0	
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18	Drg. Showing the supporting arrangement of flexible cable with main bridge and trolley.		Y		Y



REFER VIEW - A  
FOR PLAN OF EXISTING  
INTAKE WELL

EXISTING PIPELINE ROUTE FROM PUMP HOUSE  
TO TFL RAW WATER RESERVOIR



TO RAW WATER & FIRE WATER  
RESERVOIR

PLAN OF EXISTING INTAKE WELL  
VIEW - A

SI. NO.	REFERENCE DRAWINGS	NUMBERS
01	TOPOGRAPHICAL & CONTOUR SURVEY DRAWING	SA/RCP/TALCHER/2017/TOPO-DWG
02	MASTER PLAN OF MINING	FURNISHED BY CLIENT
03	MASTER PLAN [FOI, TALCHER UNIT].	DRG. NO. 501
04	INDEX PLAN [FOI, TALCHER UNIT].	DRG. NO. 635
05	PLANTS LAYOUT [FOI, TALCHER UNIT]	TFU-M-GN-6341
06	PLOT PLAN OF PROPOSED INTEGRATED COAL BASED FERTILIZER AND CHEMICALS COMPLEX	PC0009-000-0001
07	EXISTING PIPELINE ROUTE FROM PUMP HOUSE TO TFL RAW WATER RESERVOIR	WAP/WRD/PIPE LINE/EXISTING
08	PLAN & GROSS SECTION OF EXISTING INTAKE WELL OF TFL AT BRAHMANI RIVER	WAP/WRD/INTAKE WELL/EXISTING



- NOTE :-
1. BLOCK FACILITIES ARE TENTATIVE & INDICATIVE ONLY.
  2. P-103 A/B/C/D SHALL BE USED FOR RAW WATER. CONFIGURATION WELL BE (RW + 1S).
  3. MINIMUM LEVEL REQUIRED FOR PUMP OPERATION SHALL BE CONFIRMED BY PUMP VENDOR.
  4. REFER INTAKE WELL DRAWING (CIVIL DEPARTMENT PHILOSOPHY) FOR THE DEPTH OF INTAKE WELL.

**ISSUED FOR  
TENDER PURPOSE ONLY**

REV.	DATE	DESCRIPTION	BY	CHKD.	APPD.
0	13.01.2020	ISSUED FOR TENDER PURPOSE			
P	21.06.19	ISSUED FOR TENDER PURPOSE			

CLIENT : M/s. TALCHER FERTILIZER LIMITED	
LOCATION : TALCHER, ANGUL DISTRICT, ODISHA (INDIA)	
TITLE : PERMANENT RAW WATER SUPPLY SYSTEM	
DRG. NO. :-	PC150-0000-0003
FILE :-	PC150-0000-0003
<b>PROJECTS &amp; DEVELOPMENT INDIA LTD.</b>	
NOIDA	



 पी डी आई एल <b>PDIL</b>	<b>“Balance job of Supply, Erection, Testing &amp; Commissioning of Permanent Raw Water Supply System and allied facilities ” on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha”</b>	PC-150/E-121/S-VII	0	 <b>Talcher Fertilizers</b>
		DOC. NO.	REV	
		Page 1 of 1		

## **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**

Validate
Print
Help

Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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 :								
<b>SCHEDULE OF RATES-Rev.0</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
1.00	<b>PART A: SUPPLY &amp; ERECTION OF MECHANICALS WORKS</b>							
2.00	<b>PIPELINE LAYING / INSTALLATION (CARBON STEEL PIPES) UG/AG</b>							
3.00	<b>GENERAL NOTE:</b>							
3.10	Taking over" as defined in the specifications, handling, loading, transportation ,unloading and Laying of bare/coated line pipes and other materials like valve, fittings, flanges, supply & application of 3LPE coating materials, required size casing pipe etc. from Contractors suppliers locations/works 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 line pipe on the pipeline Right-of-Use/ pipeline route alignment, Carrying out inspection of materials including line pipes at the time of laying/ installation of line pipes, associated valves, tees, insulating joints, flanges & fittings for buried application of all sizes, thickness & ANSI class rating and accessories as per specification wherever required depending on site condition.							
3.11	Arrangement of all additional lands required for Contractor's storage, fabrication, access for construction, etc. procurement and supply of all materials, consumables, equipment, labour and other inputs, carrying out all temporary, ancillary, auxiliary works, etc. make ready for commissioning of pipeline as per drawings, specifications, other provisions of Contract document and instructions of Engineer-in-charge, including but not limited to carrying out the following works.Counting the number and type of trees cut in presence of DFO/concerned authorities and keeping record there of cutting/uprooting of trees within ROU, shifting of all obstruction within the ROU/pipeline route alignment viz. electrical line/pole, telephone line (poles), foreign pipeline, coordination with concerned authorities and obtaining work permits/NOC from these authorities/Statutory approvals							
3.12	Barricading the pipeline construction area prior to execution to the entire satisfaction of Owner / Engineer-in-charge.Checking, cleaning, aligning, bending, cutting and beveling (as required) of pipes for welding and field adjustments including pipe fittings, welding, carrying out non-destructive testing of welds as required and providing all requisite equipment, labour, supervision, materials, films, consumables, all facilities and personnel to process, develop, examine and interpret radiographs and other tests as required, carrying out repairs of weld joints found defective by Engineer-in-Charge, carrying out re-radiography and other tests as required on repaired joints.Carrying out installation of carrier pipe at all crossings like roads/railways/Nallah at designated depths by open cut/jacking/boring (cased crossings/ crossings carried out by HDD/AUGER BORING method)							
3.13	Crossing all the foreign pipeline/HT line/cable/any other utilities etc. with necessary concrete /PVC protection including coordination with all agencies and obtaining NOC. Supply of coating materials for all field joints ,bends, elbows, buried fittings and valves etc. including supply of coating materials etc. (i.e. heat shrinkable sleeves and high build epoxy etc/Or equivalent polyethylene materials.) as per Technical Specification compatible with coating material of the line pipe. Trenching to all depths and to a width to accommodate the new pipeline Installation / lowering the pipeline in trench to required depth as per Technical Specification & drawings. Carrying out air cleaning, flushing, cleaning and hydrostatic testing of complete pipeline including pre-testing of designated sections complete as per specification and approved by Engineer-in-Charge to specified pressures indicated elsewhere and duration after stabilization as per specification, providing all equipment, pumps, fittings, instruments, dead weight tester, pressure recorder, thermocouples etc., and services, supervision, labour, consumables, water including supply of air, etc. as required, locating of leaks and rectification of defects attributable to Contractor , re-testing after rectification, dewatering after							

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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>
3.14	Backfilling & Compaction of trench and final clean-up of right-of-use or area disturbed by contractor during their construction activities for laying of pipeline works and disposal of debris / excavated concrete pipes and surplus material to designated disposal areas and re-installing the area to its original condition as per satisfaction of Owner and / or as directed by Engineer-in-charge. Installation of all buried valves (except extended stem valves) inside the valve pit and making provision to operate the valve. ANY OTHER UNSPECIFIED CASED CROSSING BY BORING / OPEN CUT METHOD FOR ROAD CROSSING By Boring Preparation of required length of carrier pipeline welded string including all other works as mentioned in item no. 2.0 and specification/ drawings. Insertion of carrier pipeline welded string including all other works as mentioned in item no. 2.0 above and as per specification/ drawings. Insertion of carrier pipe in casing pipe after above ground pretesting at specified test pressure and installation of casing insulators as per specification/ drawings. Installation of vent and drain assembly, fixing of end seals, backfilling and restoration as original of the facilities crossed and performing all other works including cleaning, final hydro testing etc. along with mainline works and as per specification, approved procedure, drawing etc. and instruction of Engineer- in-charge and provision of contract document							
3.15	All supplies are on FOR destination (Contractor storage yard at site) including Transportation from manufacture's works to site including transit insurance" and site activity (value as indicated in SOR) should cover unloading, stacking, storage and all further work thereafter.							
4.00	<b>PIPELINE LAYING / INSTALLATION OF ABOVE GROUND PIPELINE(if any)</b>							
4.10	<b>GENERAL NOTE:</b>							
4.11	Supply ,Fabrication including cutting, edge preparation, inclusive of grinding the edges of pipes, fittings, flanges etc, to match with grinding the edges of pipes, fittings, flanges etc. to match with the matching edges of uneven / different thickness wherever required fit - up bending, welding threading etc. pipe fittings like elbows, tees, reducers, weldolets, sockolets, etc. flanges, vent and drain point connection etc. including providing stub - in connection, fabricated fittings and reinforcement pads etc. as required, supporting/Thurst Block. Erection of pipes of all types and thickness at all elevations, connecting with equipment nozzle, aligning, installation and carrying out connected activities for all types of valves, all online instruments and fittings of all sizes of elbow, reducers, tees, flanges blind flange, spectacle blind flanges, branch connection / tapping, vents and drains, required for process and hydrotesting, tapping for pressure gauges thermowells sample connections, etc. including supply and fixing of all types of gaskets bolts and nuts for all sizes. Carrying out Non-destructive testing as per specification.							

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4.12	Surface preparation before application of primer by means of sand blasting including supply of approved quality of abrasive, manpower, machineries, tools & tackles to achieve required roughness as per specification and as per instruction of Engineer-in-charge. Painting of entire system (including all pipes and accessories) as per specification, including supply of approved paints and primers, preparation of surface and application of primer and paint, identification lettering/numbering, colour coding, etc. as specified including rub down & touch up of shop primer or scrapping of shop primer wherever required by CLIENT and providing scaffolding (if required) for all heights etc. Cleaning and flushing by water/compressed air, testing of the system including hydrostatic and any other type of testing as specified, draining, and drying by compressed air / other methods approved by CLIENT. Completion of all such work in all respect as per scope of work and as per drawings specifications and instructions of the CLIENT and keeping the system ready in all respects for further commissioning and start up.							
4.13	Precommissioning & making operational all piping system and equipments. Commissioning Contractor scope shall provide all necessary assistance in term of supply of man-power, equipment, tools and tackles required amount of nitrogen for purging of entire I piping system etc. to the company during commissioning activities. Completion of all such work in all respects as per scope of work and as per drawings, specifications and instructions of the COMPANY and keeping the system ready in all respects for further commissioning and start.							
5.00	<b>PIPELINE LAYING / INSTALLATION (CARBON STEEL PIPES AS GIVEN BELOW ) :</b>							
5.10	<b>LAYING OF UNDER GROUND/ABOVE GROUND PIPE LINES</b>							
5.11	<b>INSTALLATION OF NEW 36", 20" 18" &amp; 6" 3LPE COATED PIPES</b> NSTALLATION OF NEW PIPELINE: Installation of coated linepipe, with inner lining/painting ,associated fittings and accessories, etc. as per scope of work, specifications, drawings , etc and provisions of the contract and as per instruction of Engineer-in -charge including but not limited to following:transportation and handling of linepipes from contractor's storage yard to worksite, Carrying out repairs of pipe defects/replacement in case of irreparable defects and repairs of defects of pipe coating not attributable to Ownerincluding defects / damages occurring during transportation/handlingtransportation/handling. Stringing, Aligning, bending, cutting and beveling (as required), NDT of re-bevelled area, weld joints radiography as per SOR clause 11.0, carrying out repair of weld joints, re- radiography and other NDT without any extra cost to owner.Coating of all field joints, long radius bends buried fittings , etc; excavation/associated civil work, lowering the pipelines in trench, backfilling, carrying out hydrostatic testing & associated works, providing all equipments, pumps fittings, instruments, supervision, labour, consumables, water, air, etc , locating leaks, re-testing after rectification carrying out all temporary , ancillary , auxiliary works and all incidental & associated works to complete the laying work. Disposal of debris, preparation of As-Built drawings, pipe- book and other records.Trenching to all depths by excavation in all types of soils including soft/ hard rock and different type of pavement / footpath / roads etc. including rock breaking, chiseling or otherwise cutting etc.( Excavation item shall be paid as per item mentioned in civil SOR) as required and storing top surface materials, excavated soil, reusable materials at designated area as directed by Engineer in charge as per the relevant standard / specification etc.							

**Item Rate BoQ**

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Contract No: PNP/PC-150/E/121/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
5.12	Checking, cleaning, aligning, bending, cutting and beveling (as required) of pipes for welding and field adjustments including pipe fittings, welding(Welding of Elbow, Tee, Flanges Reducers Weldolet & Sockolets etc), carrying out non-destructive testing of welds as required (to be paid separately),supporting/Thurst Block.All welding of including the tie-in(s) of the pipeline with the adjacent sections of pipeline including cutting of test header, rebeveling as required.Carrying out repairs of pipe defects/replacement in case of irreparable defects and repairs of defects of pipe coating not attributable to Owner including defects / damages occurring during transportation/handling & repair due to modification or damage in existing pipeline if any during execution of site job.							
5.13	<b>(36 "NB) 3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS with inner lining/Painting</b>	8000	Meter		0	0	0.0000	INR Zero Only
5.14	<b>(20" NB) 3LPE COATED PIPES ERW,API 5L GR.BE,SCH 10 with inner lining/Painting</b>	630	Meter		0	0	0.0000	INR Zero Only
5.15	<b>(18" NB) 3LPE COATED PIPES ERW,API 5L GR.BE,SCH 10 with inner lining/Painting</b>	20	Meter		0	0	0.0000	INR Zero Only
5.16	<b>(6" NB) , 3LPE COATED PIPES SMLS,API 5L GR.B, BE,SCH 40with inner lining/Painting</b>	30	Meter		0	0	0.0000	INR Zero Only
5.17	<b>NOTES :</b>							
5.18	Only Factory made pipes are acceptable							
5.19	This item shall be applicable for the underground steel grid main pipeline & branch pipeline including, valves, tees, bends (R=3D/1.5), flanges & fittings,accessories etc. and above ground approach pipeline.							
5.20	In above item, restoration works are to be paid as separate elsewhere mentioned in SOR.							
5.21	In above item, backfilling of pipeline trench by borrowed select soil duly approved by Owner /EIC shall be paid by separate item mentioned elsewhere in the SOR.							
5.22	Contractor shall not perform any pipeline activities along ROU without specified barricading and other safety measures.							
5.23	vi)The quantities given in above item no. are tentative only and shall not be considered to be binding. The quantities may be increased, decreased or deleted as per the actual site requirement and instructions / recommendations of Owner. The unit rate shall be operated to work out the final payment to the contractor.							
5.24	Above price shall be inclusive of all type of taxes & duties, transit insurance during transportation & other insurance etc. including all financial & commercial implication as per the tender document except GST. No other payment except as per quoted unit rate & executed quantities will be payable by the Owner. Owner/EIC shall be paid by separate item mentioned elsewhere in the SOR.The above item rate is exclusive of crossings by HDD, cased/ open cut crossings which are to be paid as separate elsewhere mentioned in the SOR.The above rates shall be inclusive of hydrotesting of complete pipeline, including hydrotesting of all crossings sections along with the mainline.							
6.00	<b>INSTALLATION OF PIPELINE INCLUDING SUPPLY OF CASING PIPE IN CROSSING BY HDD/AUGER BORING</b>							



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6.10	Installation of carrier pipes by HDD/AUGER BORING method with/without Casing pipe by HDD/AUGER BORING for road,highway & Railway crossings wherever required in all types of soils and terrain, including all associated works, including supply of all Contractor supplied materials viz. supply of Casing Pipe - IS-3589 ,10.0MM THK material with Coltar Epoxy coated(Externally). Materials for casing vents and drains etc, including supply of all other materials, equipment, consumables, manpower, welding including visual inspection of all weld joints, testing ,installation of Casing Pipe , casing insulators, end seals, backfilling and restoration as original of the facility crossed and performing all works as per drawings, specifications and instructions of Engineer -in -Charge and provisions of contract document. Direct heat shrinkable sleeves shall be applied for joint coating in case of HDD without casing. Details of Crossing by HDD/AUGER BORING Crossings at various locations as decided by EIC at site as per concerned authority requirement.							
6.11	Line pipe detail (36" Carrier pipe) 3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS or equivalent ERW 3LPE Coated pipe with 42" Casing Pipe -IS-3589 ,10.0MM THK material with Coltar Epoxy coated(Externally) by HDD/AUGER BORING (Road /highway Crossing)	250	Meter		0	0	0.0000	INR Zero Only
6.12	Line pipe detail (36 " Carrier pipe) 3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS or equivalent ERW 3LPE Coated pipe without Casing Pipe by HDD/AUGER BORING (Road/highway Crossing)	200	Meter		0	0	0.0000	INR Zero Only
6.13	Line pipe detail (36 ") 3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS or equivalent ERW 3LPE Coated without Casing Pipe by HDD (Other Crossing)	100	Meter		0	0	0.0000	INR Zero Only
6.14	Line pipe detail (36 ") 3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS or equivalent ERW 3LPE Coated by HDD/AUGER BORING without Casing Pipe (Railway Crossing)	140	Meter		0	0	0.0000	INR Zero Only
6.15	Line pipe detail (36 ") 3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS or equivalent ERW 3LPE Coated by HDD/AUGER BORING with 42" Casing Pipe -IS-3589 ,10.0MM THK material with Coltar Epoxy coated(Externally) (Railway Crossing)	80	Meter		0	0	0.0000	INR Zero Only
6.16	Line pipe detail (36 ") 3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS or equivalent ERW 3LPE Coated Through Bridge (Canal Crossing/Nallah/River)	80	Meter		0	0	0.0000	INR Zero Only
6.17	<b>Note:-</b>							
6.18	Crossing width may vary as per site condition. Tenderer are advised to visit site for actual assessment of extent of crossing. Actual string length for HDD/AUGER BORING shall be as per design calculations so that pipe is not under stress as permitted by codes/ specifications. However final length of string & cover from top of pipe shall be decided by concerned Authority/ Engineer-in-charge.							
6.19	Payment for the length of final tied-in carrier pipeline string with mainline laid by HDD/AUGER BORING method are inclusive in the above item rate and no separate payment shall be made under other item mentioned elsewhere.							

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Contract No: PNP/PC-150/E/121/NCB

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6.20	Installation of Casing Pipe, Casing insulators , casing end seals ,casing vents and drains etc are inclusive in above item rate. Payment for Supply of casing pipes shall be made under item mentioned elsewhere in SOR.							
6.21	Quantities of above crossings indicated are tentative. The widths indicated are not for any single crossings. This shall be as per requirement at site for crossing at different locations.							
7.00	<b>ANY OTHER UNSPECIFIED CASED CROSSING BY BORING / OPEN CUT METHOD FOR ROAD CROSSING</b>							
7.10	<b>By Boring</b> - Complete work of the other road crossings (between the limits as defined at site and decided by Engineer-in-charge) including supply, handling, loading, transportation, unloading to Contractor's own stock yard/work site of casing pipe of size as specified, duly coal tar epoxy coated of minimum 300 micron conforming to IS:3589 or equivalent ERW pipe, casing insulators and casing end seals as per enclosed specification/ drawings, materials for casing vents and drain assembly etc. including supply of all other materials, equipments, consumables, manpower, welding including visual inspection of all weld joints, installation of casing insulators, end seals, vents and drain - off pipes for steel casing, backfilling and restoration as original of the facility crossed and performing all works as per drawings, specifications and instructions of Engineer -in -Charge and provisions of contract document							
7.11	42" Casing Pipe -IS-3589 ,10.0MM THK material with Coltar Epoxy coated(Externally) (for36" NB Pipeline) Casing pipe installation by Open Cut/jacking/ boring method.	70	Meter		0	0	0.0000	INR Zero Only
7.12	<b>Note:-</b>							
7.13	Widths of above crossings indicated are tentative. The widths indicated are not for any single crossings. This shall be as per requirement at site for crossing at different locations.							
7.20	Payment for the lengths of carrier pipeline string with mainline laid by above method is Exclusive in the above item rate and separate payment shall be made under SOR item no 1.1 &1.2.							
8.00	<b>RESTORATION OF ROAD</b>							
8.10	Restoration of asphalt/concrete/red stone roads/pavement/Paver block including compaction of soil, to original condition as per requirement and to the entire satisfaction of Owner and / or Authorities having jurisdiction for following pavement thickness.							
8.11	Restoration of Asphalted road upto 10cm thickness	1200	Sq M		0	0	0.0000	INR Zero Only
8.12	Restoration of Asphalted road beyond 10 cm upto 20cm thickness	120	Sq M		0	0	0.0000	INR Zero Only
8.13	Restoration of Concrete road upto 10 cm thickness	150	Sq M		0	0	0.0000	INR Zero Only
8.14	Restoration of red stone road/footpath/pavement upto 4 cm thickness	90	Sq M		0	0	0.0000	INR Zero Only
8.15	Restoration of Paver Block	400	Sq M		0	0	0.0000	INR Zero Only
8.16	Restoration of Brick Pitched Road upto 75 mm thick	200	Sq M		0	0	0.0000	INR Zero Only
8.17	<b>Note:</b> The quantities mentioned above are tentative							
9.00	<b>BORROWED LOCAL/FOREIGN SELECT SOIL FOR BACKFILLING</b>							

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9.10	Additional work over and above item 1.0 for supply of specified and approved quality of borrowed local soft graded soil / sand in place of available excavated material and / or other suitable soil as per applicable standards / specifications, including backfilling of excavated trench for specified length after laying and padding of pipeline, including local transportation of such special backfill material over all distances, complete.	12500	Cu M		0	0	0.0000	INR Zero Only
9.11	<b>Note:-</b> The quantities mentioned above are tentative							
10.00	<b>PRE-COMMISSIONING AND ASSISTANCE IN COMMISSIONING OF PIPELINE SYSTEM</b>							
10.10	Swabbing, drying of the complete pipeline network and the associated facilities being installed to the specified acceptance criteria, carrying out pre-commissioning works, providing assistance during the complete duration of commissioning operations for entire pipeline network system including supply of all equipment, man-power, consumables, materials for all temporary works and performing all associated works, complete as per the relevant specifications, other provisions of Contract document and instructions of Engineer-in-charge.							
10.11	For 36" NB ,3LPE Coated UG/AG Pipeline	13000	Meter		0	0	0.0000	INR Zero Only
10.12	(20" NB) 3LPE COATED PIPES ERW,API 5L GR.BE,SCH 10 with inner lining/Painting	630	Meter		0	0	0.0000	INR Zero Only
10.13	(18" NB) 3LPE COATED PIPES ERW,API 5L GR.BE,SCH 10 with inner lining/Painting	20	Meter		0	0	0.0000	INR Zero Only
11.00	<b>VALVE PITS</b>							
11.10	All civil works including supply of all materials, excavation of pit, piping supports including all PCC and RCC works for valves pits including pedestals with insert plates as required sealing of pipe at valve pits, providing cover (Chequered plates) with handle etc. and finishing, clean-up and restoration of site, filling and grading of area around valve station for avoiding any local flooding of area, as per typical drawing and specification enclosed and instructions of Engineer-in-charge.							
11.11	Valve Pit of Size 2.5 x 2.5m (with lockable MS steel top cover plate).	4	Nos		0	0	0.0000	INR Zero Only
12.00	<b>INSTALLATION OF VALVES etc.</b>							
12.10	36 "BUTTERFLY VALVE	4	Nos		0	0	0.0000	INR Zero Only
12.11	18"CHECK VALVE	4	Nos		0	0	0.0000	INR Zero Only
12.12	18" GATE VALVE	4	Nos		0	0	0.0000	INR Zero Only
12.13	6" KINETIC AIR VALVE, 150#	4	Nos		0	0	0.0000	INR Zero Only
12.14	1" GATE VALVE	50	Nos		0	0	0.0000	INR Zero Only
12.15	1" GLOB VALVE	50	Nos		0	0	0.0000	INR Zero Only
12.16	3/4" GLOB VALVE	4	Nos		0	0	0.0000	INR Zero Only
12.17	3/4" GATE VALVE	9	Nos		0	0	0.0000	INR Zero Only
12.18	<b>Note:</b> The quantities mentioned above are tentative							

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/NCB

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13.00	<b>MODIFICATION OF 6"EXISTING PIPELINES(IF REQUIRED)-</b> Modification of 6"EXISTING PIPELINES if required got damaged during laying of 36" line.							
13.10	FLAME CUTTING C.S PIPING up to 10mm thick	10	Inch dia		0	0	0.0000	INR Zero Only
13.11	HACKSAW CUTTING C.S PIPING up to 10mm thick	60	Inch dia		0	0	0.0000	INR Zero Only
13.12	BEVELLING C.S PIPING up to 10mm thick	10	Inch dia		0	0	0.0000	INR Zero Only
13.13	Fit up & Welding C.S up to 10mm thick	10	Inch dia		0	0	0.0000	INR Zero Only
14.00	<b>SUPPLY OF MOVING MACHINERY</b>							
14.10	DESIGN, SUPPLY, TESTING & COMMISSIONING OF ELECTRIC MOTOR DRIVEN CENTRIFUGAL PUMP WITH ASSOCIATED INSTRUMENTATION AND CONTROL SYSTEM (Supply of Pumps & Its Drive Motor Etc. As per PNP/PC150/E/111/SEC-VI-4.0).Vertical Centrifugal Raw water Pumps with drive motors as per process description and Technical Specification of NIT	4	Nos		0	0	0.0000	INR Zero Only
14.11	Design, Engineering, Manufacturing, Testing, Inspection, Supply of 01 no. Double girder/ double rail type EOT Crane having 12 T main hoist hook capacity with 5 T Aux hoist including its drives and all other relevant electrical & instrumentation for Raw water Pump House as per PNP/PC150/E/111/SEC VI-4.2	1	Lot		0	0	0.0000	INR Zero Only
14.12	Design, Engineering, Manufacturing, Testing, Inspection, Supply, of 01 no. Mono rail type EOT Crane having 7.5 T capacity including its drives and all other relevant electrical & instrumentation for trash rack maintenance bay as per PNP/PC150/E/111/SEC VI-4.2	1	Lot		0	0	0.0000	INR Zero Only
15.00	<b>ERECTION/INSTALLATION OF PUMPS ALONG WITH COMPLETE ASSEMBLY:</b> Loading, Unloading, transportation, Erection, alignment,grouting & testing of pumps including all associated works.Grouting shall be paid as per 8.3 of SOR	40	MT		0	0	0.0000	INR Zero Only
16.00	<b>ERECTION/INSTALLATION OF EOT CRANE WITH COMPLETE ASSEMBLY:</b>							
16.10	Loading, Unloading, transportation, Erection, Testing & Commissioning of EOT 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.							
16.11	Loading, Unloading, transportation, Erection, Testing & Commissioning of EOT Crane having 12 T main hoist hook capacity with 5 T Aux hoist including its drives and all other relevant electrical & instrumentation for Raw water Pump House as per PNP/PC150/E/111/SEC VI-4.2	1	Lot		0	0	0.0000	INR Zero Only
16.12	Loading, Unloading, transportation, Erection, Testing & Commissioning of EOT Crane having 7.5 T capacity including its drives and all other relevant electrical & instrumentation for trash rack maintenance bay as per PNP/PC150/E/111/SEC VI-4.2	1	Lot		0	0	0.0000	INR Zero Only
17.00	<b>GROUTING</b>							
17.10	Owner/Consultant. Machineries with ≥500 H.P., Araldite of M/s CIBA Geigy or equivalent shall be used. For tall towers having height more than 10 Meter and weight more than 25 MT, 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.							

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/NCB

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17.11	SHRINKOMP-20 Or Conbextra GP-2	2	M3		0	0	0.0000	INR Zero Only
17.12	EPOXY GROUTING	1	M3		0	0	0.0000	INR Zero Only
18.00	<b>SUPPLY OF PIPES/PIPELINES, FITTINGS, FLANGES &amp; VALVES etc</b>							
18.10	Complete works of supply of pipes for (below mentioned length), flanges, fittings & valves for underground/Above Ground installation including all taxes, duties (EXCEP GST) transportation and inspection charges but not limited to, the following items in accordance with, relevant specifications & drawings indicated in job specification under this technical documents and instructions of Engineer-in-charge and as per all provisions of the CONTRACT.							
18.11	Handling including lifting, transportation from Contractor Stores to CONTRACTOR's workshop for fabrication and/ or to work site for field fabrication and erection for all piping items supplied by Contractor.							
19.00	<b>PIPES</b>							
19.10	36" ,3LPE COATED PIPES ERW/SAW,ASTM API 5L GR.B BE,SCH XS with epoxy internal lining/Painting	8000	Mtr.		0	0	0.0000	INR Zero Only
19.11	20" , 3LPE COATED PIPES ERW/SAW, API 5L GR.B,SCH 10,BE with internal lining/Painting	620	Mtr.		0	0	0.0000	INR Zero Only
19.12	18" , 3LPE COATED PIPES ERW/SAW,API 5L GR.B,SCH 10,BE with internal epoxy internal lining/Painting	20	Mtr.		0	0	0.0000	INR Zero Only
19.13	6" , 3LPE COATED PIPES SMLS,API 5L GR.B, BE,SCH 40 with epoxy internal lining/ Painting	30	Mtr.		0	0	0.0000	INR Zero Only
19.14	4" SMLS PIPE,BE ,API 5L GR.B,SCH 40	1	Mtr.		0	0	0.0000	INR Zero Only
19.15	3" SMLS PIPE,BE ,API 5L GR.B,SCH 40	1	Mtr.		0	0	0.0000	INR Zero Only
20.00	<b>BLIND FLANGE</b>							
20.10	36" ASME B16.47 SR.B, 150# CS ASTM A105-RF 125 AARH	2	Nos		0	0	0.0000	INR Zero Only
21.00	<b>CAP</b>							
21.10	0.5 ,CAP (THD) -ASME B16.11, A105,3000#	4	Nos		0	0	0.0000	INR Zero Only
21.11	0.75 ,CAP (THD) -ASME B16.11, A105,3000#	8	Nos		0	0	0.0000	INR Zero Only
21.12	1.0 ,CAP (THD) -ASME B16.11, A105, 3000#	100	Nos		0	0	0.0000	INR Zero Only
22.00	<b>VALVES</b>							
22.10	36 "BUTTERFLY VALVE,150#	4	Nos		0	0	0.0000	INR Zero Only
22.11	18"CHECK VALVE,150#	4	Nos		0	0	0.0000	INR Zero Only
22.12	18" GATE VALVE,150#	4	Nos		0	0	0.0000	INR Zero Only
22.13	6" KINETIC AIR VALVE, 150#	4	Nos		0	0	0.0000	INR Zero Only
22.14	1" GATE VALVE,800#	50	Nos		0	0	0.0000	INR Zero Only
22.15	1" GLOBE VALVE,800#	50	Nos		0	0	0.0000	INR Zero Only
22.16	3/4" GLOBE VALVE,800#	4	Nos		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Contract No: PNP/PC-150/E/121/NCB

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22.17	3/4" GATE VALVE,800#	9	Nos		0	0	0.0000	INR Zero Only
23.00	<b>ELBOW</b>							
23.10	36" ELBOW 45DEG ,1.5D .-ASME B16.9 SCHXS ASTM A234 WPB-WLDD,BW36" ELBOW 45DEG ,1.5D .-ASME B16.9 SCHXS ASTM A234 WPB-WLDD,BW	50	Nos		0	0	0.0000	INR Zero Only
23.11	36" ELBOW 90DEG ,1.5D .-ASME B16.9 SCHXS ASTM A234 WPB-WLDD, BW36" ELBOW 90DEG ,1.5D .-ASME B16.9 SCHXS ASTM A234 WPB-WLDD, BW	100	Nos		0	0	0.0000	INR Zero Only
23.12	36" ELBOW 45 DEG ,3D-ASME B16.9 SCHXS ASTM A234 WPB-WLDD, BW36" ELBOW 45 DEG ,3D-ASME B16.9 SCHXS ASTM A234 WPB-WLDD, BW	5	Nos		0	0	0.0000	INR Zero Only
23.13	36" ELBOW 90 DEG ,3D-ASME B16.9 SCHXS ASTM A234 WPB-WLDD, BW36" ELBOW 90 DEG ,3D-ASME B16.9 SCHXS ASTM A234 WPB-WLDD, BW	10	Nos		0	0	0.0000	INR Zero Only
23.14	36" ELBOW 45 DEG ,3D (Miter Bend) SCHXS,CS (As per pipe material)36" ELBOW 45 DEG ,3D (Miter Bend) SCHXS,CS (As per pipe material)	5	Nos		0	0	0.0000	INR Zero Only
23.15	36" ELBOW 90 DEG ,3D (Miter Bend) SCHXS,CS (As per pipe material)36" ELBOW 90 DEG ,3D (Miter Bend) SCHXS,CS (As per pipe material)	10	Nos		0	0	0.0000	INR Zero Only
23.16	20" ELBOW 45 DEG ,1.5D .-ASME B16.9 SCH10 ASTM A234 WPB-WLDD,BW20" ELBOW 45 DEG ,1.5D .-ASME B16.9 SCH10 ASTM A234 WPB-WLDD,BW	2	Nos		0	0	0.0000	INR Zero Only
23.17	20" ELBOW 90 DEG ,1.5D .-ASME B16.9 SCH10 ASTM A234 WPB-WLDD,BW20" ELBOW 90 DEG ,1.5D .-ASME B16.9 SCH10 ASTM A234 WPB-WLDD,BW	6	Nos		0	0	0.0000	INR Zero Only
23.18	18" ELBOW 45 DEG ,1.5D .-ASME B16.9 SCH 10 ASTM A234 WPB-WLDD,BW18" ELBOW 45 DEG ,1.5D .-ASME B16.9 SCH 10 ASTM A234 WPB-WLDD,BW	1	Nos		0	0	0.0000	INR Zero Only
23.19	18" ELBOW 90DEG ,1.5D .-ASME B16.9 SCH 10 ASTM A234 WPB-WLDD,BW18" ELBOW 90DEG ,1.5D .-ASME B16.9 SCH 10 ASTM A234 WPB-WLDD,BW	4	Nos		0	0	0.0000	INR Zero Only
23.20	6" ELBOW 90 DEG ,1.5D .-ASME B16.9 SCH 40 ASTM A234 WPB-SMLS,BW6" ELBOW 90 DEG ,1.5D .-ASME B16.9 SCH 40 ASTM A234 WPB-SMLS,BW	5	Nos		0	0	0.0000	INR Zero Only
23.21	6" ELBOW 45 DEG ,1.5D .-ASME B16.9 SCH 40 ASTM A234 WPB-SMLS,BW6" ELBOW 45 DEG ,1.5D .-ASME B16.9 SCH 40 ASTM A234 WPB-SMLS,BW	5	Nos		0	0	0.0000	INR Zero Only
24.00	<b>FLANGE</b>							
24.10	11/2 LONG W.N.FLANGE, ASME B16.5, 300#,24mm Bore,200mm Long,CS ASTM A10511/2 LONG W.N.FLANGE, ASME B16.5, 300#,24mm Bore,200mm Long,CS ASTM A105	1	Nos		0	0	0.0000	INR Zero Only
24.11	6" SLIP ON.FLANGE, ASME B16.5 ,CS ASTM A105,150#6" SLIP ON.FLANGE, ASME B16.5 ,CS ASTM A105,150#	9	Nos		0	0	0.0000	INR Zero Only

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Contract No: PNP/PC-150/E/121/NCB

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24.12	18"- SLIP ON FLANGE,B16.5-150#-CS ASTM A105 SO-RF 125 AARH18"- SLIP ON FLANGE,B16.5-150#-CS ASTM A105 SO-RF 125 AARH	20	Nos		0	0	0.0000	INR Zero Only
24.13	36" W.N. FLANGE-150#,ASME B16.47 SR.B CS ASTM A105 SCH XS WN-RF125 AARH36" W.N. FLANGE-150#,ASME B16.47 SR.B CS ASTM A105 SCH XS WN-RF125 AARH	10	Nos		0	0	0.0000	INR Zero Only
24.14	4" SLIP ON Flange CS ASTM A105 SO-RF 125 AARH,150#4" SLIP ON Flange CS ASTM A105 SO-RF 125 AARH,150#	1	Nos		0	0	0.0000	INR Zero Only
24.15	3" SLIP ON Flange CS ASTM A105 SO-RF 125 AARH,150#3" SLIP ON Flange CS ASTM A105 SO-RF 125 AARH,150#	1	Nos		0	0	0.0000	INR Zero Only
25.00	<b>INSULATING JOINT</b>							
25.10	36" SCH XS x BE, INSULATING JOINT-ASME B 31.3	4	Nos		0	0	0.0000	INR Zero Only
26.00	<b>COUPLING</b>							
26.10	1/2",ASME B16.11,CS ASTM A105,3000#,THD	5	Nos		0	0	0.0000	INR Zero Only
27.00	<b>NIPPLE</b>							
27.10	3/4"-NIPPLE (P-P)- SMLS,SMLS,API 5L GR.B SCH160	13	Nos		0	0	0.0000	INR Zero Only
27.11	3/4"-NIPPLE (P-T)- SMLS,SMLS,API 5L GR.B SCH160	13	Nos		0	0	0.0000	INR Zero Only
27.12	1"-NIPPLE (P-P)- SMLS,SMLS,API 5L GR.B SCH160	100	Nos		0	0	0.0000	INR Zero Only
27.13	1"-NIPPLE (P-T)- SMLS,SMLS,API 5L GR.B SCH160	100	Nos		0	0	0.0000	INR Zero Only
28.00	<b>SOCKOLET-</b>							
28.10	SOCKOLET-18"X3/4" MSS SP 97 CS ASTM A105-3000# SOCW	12	Nos		0	0	0.0000	INR Zero Only
28.11	SOCKOLET-36"X3/4" MSS SP 97 CS ASTM A105-3000# SOCW	1	Nos		0	0	0.0000	INR Zero Only
28.12	SOCKOLET-36"X1" MSS SP 97 CS ASTM A105-3000# SOCW	100	Nos		0	0	0.0000	INR Zero Only
29.00	<b>GASKET</b>							
29.10	36"-GASKET(SPRL-WND RF), TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG, ASME B16.20-150#	10	Nos		0	0	0.0000	INR Zero Only
29.11	18"-GASKET(SPRL-WND RF), TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG, ASME B16.20-150#	20	Nos		0	0	0.0000	INR Zero Only
29.12	6"-GASKET(SPRL-WND RF), TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG, ASME B16.20-150#	9	Nos		0	0	0.0000	INR Zero Only
29.13	1 1/2"-GASKET(SPRL-WND RF), TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG, ASME B16.20-150#	1	Nos		0	0	0.0000	INR Zero Only
30.00	<b>STUD &amp; 2NUTS</b>							
30.10	1/2 "-75mm-STUD & 2NUTS HVY HEX-ASTM A193 GR.B7/ASTM A194 GR.2H	4	Nos		0	0	0.0000	INR Zero Only
30.11	3/4 "-100mm-STUD & 2NUTS HVY HEX-ASTM A193 GR.B7/ASTM A194 GR.2H	72	Nos		0	0	0.0000	INR Zero Only
30.12	1 1/8"-150mm-STUD & 2NUTS HVY HEX-ASTM A193 GR. 7/ASTM A194 GR.2H	320	Nos		0	0	0.0000	INR Zero Only

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Contract No: PNP/PC-150/E/121/NCB

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30.13	1 1/2"-275mm-STUD & 2NUTS HVY HEX-ASTM A193 GR.B7/ASTM A194 GR.2H	320	Nos		0	0	0.0000	INR Zero Only
30.14	<b>Note:</b>							
30.15	Pipe Specification and thickness may vary depending upon availability of pipe. No extra payment shall be made for this.							
30.16	All butt welded fittings & flanges end shall generally match with connecting pipe wall thickness. However, in case of misalignment, Contractor shall have to do end preparation without any extra cost.							
30.17	The quantities mentioned above are tentative.							
31.00	<b>SWAGE (CONC)</b> -3/4"X1/2" MSS SP 95,ASTM A234 WPB-SMLSSCH80XSCH80(PLN-THD)	5	Nos		0	0	0.0000	INR Zero Only
32.00	<b>BRANCH WELD WITH RP</b>							
32.10	36"X20"SCH XS, CARCAN STEEL	1	Nos		0	0	0.0000	INR Zero Only
32.11	36"X18"SCH XS, CARCAN STEEL	4	Nos		0	0	0.0000	INR Zero Only
32.12	<b>COATING MATERIALS (SUPPLY &amp; APPLICATION)</b>							
32.13	Field LPE Coating ITEM FOR SITE WORKS (Field joints) ,Materials as specified in Specification in NIT	2000	SQ.Mtr		0	0	0.0000	INR Zero Only
33.00	<b>REPAIR OF COATING DEFECTS IN 3 LAYER PE COATING LINE PIPE</b>							
33.10	Supply of all coating repair materials as per requirement of specification, supply of all consumables, utilities, equipments and all manpower required, pipe cleaning and surface preparation, repairing of coating defects and testing including all handling, transportation, etc. for line pipes, performing all works necessary for the completion of the works strictly in accordance with relevant specification and instructions of Engineer -In - Charge. This rate shall be applicable per sq-cm of the exposed steel area.	323	SQ.Mtr		0	0	0.0000	INR Zero Only
34.00	<b>RADIOGRAPHY</b>							
34.10	36" NB-carrying out RT of welds as required .(Consideing length of pipe 12mtrs each) Note-Specially all Crossing joints should be covered.	117	No of Joints		0	0	0.0000	INR Zero Only
34.11	20", NB carrying out RT of welds as required .(Consideing length of pipe 12mtrs each)	10	No of Joints		0	0	0.0000	INR Zero Only
34.12	18",NB carrying out RT of welds as required .(Consideing length of pipe 12mtrs each)	5	No of Joints		0	0	0.0000	INR Zero Only
34.13	6"NB carrying out RT of welds as required .(Consideing length of pipe 12mtrs each)	6	No of Joints		0	0	0.0000	INR Zero Only
35.00	<b>STRUCTURAL WORKS</b>							
35.10	<b>Pipe Supports &amp; Other Structures</b>							



**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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
35.11	Supply, fabrication and erection of all types of pipe supports like clamps, saddle, guide stops, cradles, turn buckles, anchors, T-posts; stockade/ trestle and pipe bridge for overhead piping; frames for canopy, approach ladders and platforms, crossover, cable tray supports, Crash barrier and Base frame modification of Pump Intake etc. including painting suitable for highly corrosive area as per specification labour and supervision & complete work as per drawings, specifications and instruction of Engineer- in-charge. (Bolts, nuts, washers, U-clamps etc. for supporting shall be supplied by the Contractor within the rates quoted. These items will not be measured and paid separately). The work is to be completed in all respect as per scope of work and specification.	15	MT		0	0	0.0000	INR Zero Only
36.00	<b>Notes:</b>							
36.10	The quantities indicated are estimated values and hence are approximate. Final payment will be made based on actual quantities to be certified by the Consultant/EIC.							
36.11	The cost of MS bolts (permanent and service), washers, electrodes, putty, gases, cost of straightening the raw materials, cutting of flats from plates and providing splices, paints, tools, plants etc., as required for the work shall be deemed to be included in the quoted rates.							
36.12	All handling and transport charges of raw materials and fabricated structures including double handling, as required, for completion of work in accordance with time schedule, are deemed to be included in the quoted rates.							
37.00	<b>ROU Management for manline works</b> ROU management of entire pipeline route covered under SOR item no 37.10, during preconstruction survey, opening of ROU and maintenance of ROU upto completion of entire mainline works (including CP); all type of liasoning/coordination with local people /villagers, farmers, land owners or any other person/institution/ authority etc. directly or indirectly linked with the pipeline /affected by the pipeline laying activities for ensuring hindrance free construction works at the site obtaining work permits, NOC from various statutory authorities having jurisdiction for execution of the crossings under mainline works (SOR item 37.10) and complying with all stipulations/conditions/recommendations of the said authorities. <b>NOTES:</b> 1. Statutory fees/payments to farmers etc against ROU opening shall be paid by the owner. Statutory Fes, if any shall be paid by Owner as per Govt. Norms. 2 Payment shall be paid as below. a) 40 % payment after completion of welding b.) 50 % after completion of lowering & back filling c.) 10 % after obtaining NOC (after restoration) from respective land owner/farmer and statutory authorities as required							
37.10	ROU Management for manline works	9000	Meter		0	0	0.0000	INR Zero Only
38.00	<b>Utility Pipeline of Repair/Modification.</b>							
38.10	diameter 500,	100	Inch dia		0	0	0.0000	INR Zero Only
38.11	diameter 350	100	Inch dia		0	0	0.0000	INR Zero Only
38.12	diameter Up to 150 mm	100	Inch dia		0	0	0.0000	INR Zero Only
39.00	<b>deleted</b>							

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40.00	<b>PART B</b>							
41.00	<b>SCHEDULE OF RATES FOR INSTRUMENT SUPPLY &amp; INSTALLATION WORKS</b>							
42.00	<b>Transmitters Supply &amp; Erection</b>							
42.10	Supply of Clamp-on Ultrasonic Flow transmitter and remote display electronic meter including cable (power/signal) at operator room suitable for tender requirement.	1	No.		0	0	0.0000	INR Zero Only
42.11	Erection of Clamp-on Ultrasonic Flow transmitter, this job also includes following 1. Calibration of transmitter 2. Flow transmitter erection / installation (Including drilling of blind flange where ever required, impulse piping including , glanding, and termination, erection of Statction & Supports Canopy etc) Supply structural & piping material for this job Is in bidders scope , bidder to consider the cost of these items 3. Hydrotest, PMI, DP tests of impulse lines (If applicable) 4. functional check, loop checking	1	No.		0	0	0.0000	INR Zero Only
42.12	Supply of Non Contact type radar level transmitter and remote display electronic meter including cable (power and signal) at operator room suitable for tender requirement.	1	Lot		0	0	0.0000	INR Zero Only
42.13	Erection of Radar level transmitter, this job also includes following. 1. Calibration of transmitter 2. Level transmitter erection / installation (Including drilling of blind flange where ever required, impulse piping including , glanding, and termination, erection of Statction & Supports Canopy etc) Supply structural & piping material for this job Is in bidders scope , bidder to consider the cost of these items 3. Hydrotest, PMI, DP tests of impulse lines (If applicable) 4. functional check, loop checking	1	No.		0	0	0.0000	INR Zero Only
43.00	<b>Orifice plate with flanges</b>							
43.10	Supply of Orifice plate with flanges ( 1 pair of gaskets as spare) and its erection.	1	No.		0	0	0.0000	INR Zero Only
43.11	Erection of flow orifice	1	No.		0	0	0.0000	INR Zero Only
43.12	Supply of DP transmitter as per specification attached with this tender	1	No.		0	0	0.0000	INR Zero Only
43.13	Erection of DP transmitter, this job includes following 1. Calibration of transmitter 2. Pressure transmitter erection / installation (Including drilling of blind flange where ever required, impulse piping including , glanding, and termination, erection of Statction & Supports Canopy etc) Supply structural & piping material for this job Is in bidders scope , bidder to consider the cost of these items 3. Hydrotest, PMI, DP tests of impulse lines 4. functional check, loop checking	1	No.		0	0	0.0000	INR Zero Only
44.00	<b>Pressure Gauges</b>							
44.10	Supply Of pressure Gauges as per Specification mentioned in ITB ( 4 main + 1 spare)	5	Nos.		0	0	0.0000	INR Zero Only
44.11	Pressure gauge erection / installation (includes impulse piping and necessary support fabrication & installation as per the hookup attached in ITB.). Supply structural & piping material for this job Is in bidders scope , bidder to consider the cost of these items	4	Nos.		0	0	0.0000	INR Zero Only

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45.00	<b>Totalizer, Wireless Module, DAS and Modem</b>							
45.10	Supply of wireless module/Data Acquisition system and GSM modem electronics including interconnecting cables at operator room. GSM modem/GPRS router shall be complete with antenna, cable, connectors etc. And suitable for 2G/3G/4G data enable SIM cards of major service providers i.e BSNL, Vodafone, Airtel, JIO etc.	1	Lot		0	0	0.0000	INR Zero Only
45.11	Erection, Installation and commissioning of wireless module/DAS and GSM Modem.	1	Lot		0	0	0.0000	INR Zero Only
45.12	Supply of Electronic flow totalizer (Instantaneous flow and totalized flow) with RS-485 cable and connectors.	1	No.		0	0	0.0000	INR Zero Only
45.13	Erection, Installation and commissioning of Flow totalizer including cable for connection of totalizer to Wireless module, DAS, modem.	1	No.		0	0	0.0000	INR Zero Only
46.00	<b>Junction Box</b>							
46.10	Supply Of Junction Boxes(LM6) with cable glands(SS316) and caps(SS) as per Specification mentioned in ITB	1	Lot		0	0	0.0000	INR Zero Only
46.11	Erection/Installation of JB as per specification including glanding termination ,ferruling, painting etc.	1	Lot		0	0	0.0000	INR Zero Only
47.00	<b>Instrumentation Cables (Power /signal)</b>							
48.00	<b>Supply of instrumentation cables ( as per specification provided in ITB)</b>							
48.10	1P x 1.5 Sqmm	200	Mtr.		0	0	0.0000	INR Zero Only
48.11	3C x 2.5 Sqmm	200	Mtr.		0	0	0.0000	INR Zero Only
48.12	6Px1.5 Sqmm	100	Mtr.		0	0	0.0000	INR Zero Only
49.00	<b>Erection of instrumentation cables</b>							
49.10	Erection of instrumentation cables (signal) 1P x 1.5 Sqmm (Laying and termination)	200	Mtr.		0	0	0.0000	INR Zero Only
49.11	Erection of instrumentation cables(power) 3C x 2.5 Sqmm (Laying and termination)	200	Mtr.		0	0	0.0000	INR Zero Only
49.12	Erection of instrumentation cables (signal) 6P x 1.5 Sqmm (Laying and termination)	100	Mtr.		0	0	0.0000	INR Zero Only
49.13	Erection of instrumentation cables (signal) 8T x 1.5 Sqmm (Laying and termination)	200	Mtr.		0	0	0.0000	INR Zero Only
50.00	<b>Cable Trays</b>							
51.00	<b>Supply of cable trays as per specification in ITB</b>							
51.10	Aluminum Cable Trays (Perforated) Size 2500 x 50 x 55	200	Mtr		0	0	0.0000	INR Zero Only
52.00	<b>Erection Of cable trays including supports</b>							
52.10	Aluminum Cable Trays (Perforated) Size 2500 x 50 x 55	200	Mtr		0	0	0.0000	INR Zero Only
53.00	<b>PART C</b>							
53.10	<b>SCHEDULE OF RATES FOR ELECTRICAL SUPPLY &amp; INSTALLATION WORKS</b>							
53.11	<b>SUPPLY OF ELECTRICAL ITEMS</b>							
53.12	<b>33 kV ICOG PANEL</b>							

**Item Rate BoQ**

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53.13	Supply of Incoming cum Outgoing 33kV 3Ph 50Hz 31.5kA 630 A VCB Panel complete with metering and protection system free standing floor mounting cubical type as per SLD & Specification Sheet and Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and SLD No. PC150-7411B-0985A .	2	Nos.		0	0	0.0000	INR Zero Only
53.14	<b>TRANSFORMERS</b>							
53.15	Supply of below Transformers with all accessories, as specified in Technical Specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Transformer (Doc. No. PC150-TS-0801).							
53.16	5000 KVA, 33/3.45 kV Transformer (ONAN) with OLTC, OLTC Control Panels and RTCC Panels	2	Nos.		0	0	0.0000	INR Zero Only
53.17	500 KVA, 3.3/0.433 kV Transformer (ONAN)	1	Nos.		0	0	0.0000	INR Zero Only
53.18	Supply of Nitrogen Injection Fire Prevention & Extinguishing System for 5000 KVA, 33/3.45 kV Transformers complete in all respect.	2	Set		0	0	0.0000	INR Zero Only
53.19	<b>HV &amp; LV SWITCH BOARD</b>							
53.20	Supply of HV Switch Board							
53.21	3.3 KV, 150MVA, 1600 A switch board with all accessories, as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0), Technical Specification - High Voltage Switchboard (Doc. No. PC-150-0804) and SLD No. PC150-7411B-0985B	1	No.		0	0	0.0000	INR Zero Only
53.22	Supply of LV Switch Board							
53.23	Extension of existing 415V, 3 Ph & N, 1000 A, 50kA for 1 sec., Single front, Switchboard as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) Technical Specification -Medium Voltage Switchboard (Doc. No. PC-150-0803) and SLD No. PC150-7411B-0985C : 1 No. 1000 A Incomer Feeder Drawout Type	1	No.		0	0	0.0000	INR Zero Only
53.24	Extension of existing 415V, 3 Ph & N, 1000 A, 50kA for 1 sec., Single front, Switchboard as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) Technical Specification -Medium Voltage Switchboard (Doc. No. PC-150-0803) and SLD No. PC150-7411B-0985C : 18 Nos. 125A /63 A Feeders	1	Set		0	0	0.0000	INR Zero Only
54.00	<b>NGR</b>							
54.10	Supply of Neutral Grounding Resistors rated for 3.45/√3 KV ± 10%, 400A for 10 seconds & 80A Continuous Rating, 4.98 ohms ± 10%, for 11/3.45 KV, 4 MVA Transformers as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - NER (Doc. No. PC150-TS-0802).	2	Nos.		0	0	0.0000	INR Zero Only
55.00	<b>INTER LOCKED TYPE SWITCH SOCKET &amp; PLUG</b>							
55.10	Supply of Heavy duty Weather proof interlocking Switch Socket having enclosure with IP-65 degree of protection with matching Plug of following type as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Interlocking Switch Socket and Plug (Doc. No. PC150-TS-0808).							
55.11	63A, 5-pin, 415V	2	Nos.		0	0	0.0000	INR Zero Only
55.12	25A, 3 pin, 240V	6	Nos.		0	0	0.0000	INR Zero Only
56.00	<b>HT &amp; LT CABLES</b>							

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56.10	33 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, Armoured, FRLS PVC outer sheathed cables as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Cables (Doc No. PC150-TS-0812).							
56.11	3C x 300 sq. mm (Al)	120	Mtrs.		0	0	0.0000	INR Zero Only
56.12	3.3 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, Armoured, FRLS PVC outer sheathed cables as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Cables (Doc No. PC150-TS-0812).							
56.13	3C x 400 sq. mm (Al)	120	Mtrs.		0	0	0.0000	INR Zero Only
56.14	3C x 240 sq. mm (Al)	620	Mtrs.		0	0	0.0000	INR Zero Only
56.15	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, Armoured, FRLS PVC outer sheathed cables as specified in Technical Specification Doc. No. PC150-TS-0812.							
56.16	3.5C x 400 sq. mm (Al)	50	Mtrs.		0	0	0.0000	INR Zero Only
56.17	3C x 10 sq. mm (Cu)	50	Mtrs.		0	0	0.0000	INR Zero Only
56.18	3C x 6 sq. mm (Cu)	360	Mtrs.		0	0	0.0000	INR Zero Only
56.19	3C x 2.5 sq. mm (Cu)	1200	Mtrs.		0	0	0.0000	INR Zero Only
56.20	3.5C x 50 sq. mm (Al)	360	Mtrs.		0	0	0.0000	INR Zero Only
56.21	3.5C x 35 sq. mm (Al)	100	Mtrs.		0	0	0.0000	INR Zero Only
56.22	4CX 4 sq. mm (Al)	140	Mtrs.		0	0	0.0000	INR Zero Only
56.23	4CX16 sq. mm (Al)	120	Mtrs.		0	0	0.0000	INR Zero Only
56.24	5C x 2.5 sq. mm (Cu)	50	Mtrs.		0	0	0.0000	INR Zero Only
56.25	7C x 2.5 sq. mm (Cu)	100	Mtrs.		0	0	0.0000	INR Zero Only
56.26	10C x 2.5 sq. mm (Cu)	50	Mtrs.		0	0	0.0000	INR Zero Only
56.27	12C x 2.5 sq. mm (Cu)	150	Mtrs.		0	0	0.0000	INR Zero Only
56.28	19C x 2.5 sq. mm (Cu)	500	Mtrs.		0	0	0.0000	INR Zero Only
56.29	8 Triad Cable (IS 5831/84), Voltage Grade 1100V , cross section area 1.5 sq mm, conductor/drain material: Electrolytic Annealed Tinned Copper conf. to IS ; 813084, Insulation material : XLPE, Sheath material; Extruded HR PVC Type ST-2 Conf. to IS : 5831/84, Armouring : hot dipped galvanized steel, No. of strands 7	500	Mtrs.		0	0	0.0000	INR Zero Only
57.00	<b>CABLE GLANDS</b>							
57.10	Supply of heavy duty Industrial double compression ET Thread rolled Aluminum cable glands suitable for the following sizes of cables as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0).							
57.11	33 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, armoured, FRLS PVC outer sheathed cables.							
57.12	3C x 300 sq. mm (Al)	10	Nos.		0	0	0.0000	INR Zero Only

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57.13	3.3 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, armoured, FRLS PVC outer sheathed cables.							
57.14	3C x 400 sq. mm (Al)	20	Nos.		0	0	0.0000	INR Zero Only
57.15	3C x 240 sq. mm (Al)	40	Nos.		0	0	0.0000	INR Zero Only
57.16	1C x 185 sq. mm (Al)	10	Nos.		0	0	0.0000	INR Zero Only
57.17	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, armoured, FRLS PVC outer sheathed cables.							
57.18	3.5C x 400 sq. mm (Al)	8	Nos.		0	0	0.0000	INR Zero Only
57.19	3C x 10 sq. mm (Cu)	6	Nos.		0	0	0.0000	INR Zero Only
57.20	3C x 6 sq. mm (Cu)	28	Nos.		0	0	0.0000	INR Zero Only
57.21	3C x 2.5 sq. mm (Cu)	50	Nos.		0	0	0.0000	INR Zero Only
57.22	3.5C x 50 sq. mm (Al)	14	Nos.		0	0	0.0000	INR Zero Only
57.23	3.5C x 35 sq. mm (Al)	6	Nos.		0	0	0.0000	INR Zero Only
57.24	4CX 4 sq. mm (Al)	10	Nos.		0	0	0.0000	INR Zero Only
57.25	4CX16 sq. mm (Al)	12	Nos.		0	0	0.0000	INR Zero Only
57.26	5C x 2.5 sq. mm (Cu)	4	Nos.		0	0	0.0000	INR Zero Only
57.27	7C x 2.5 sq. mm (Cu)	20	Nos.		0	0	0.0000	INR Zero Only
57.28	10C x 2.5 sq. mm (Cu)	4	Nos.		0	0	0.0000	INR Zero Only
57.29	12C x 2.5 sq. mm (Cu)	12	Nos.		0	0	0.0000	INR Zero Only
57.30	19C x 2.5 sq. mm (Cu)	20	Nos.		0	0	0.0000	INR Zero Only
58.00	<b>CABLE LUGS</b>							
58.10	Supply of Bi-metallic crimping type lugs of following sizes for termination of cables.							
58.11	2.5 sq. mm	800	Nos.		0	0	0.0000	INR Zero Only
58.12	4 sq. mm	40	Nos.		0	0	0.0000	INR Zero Only
58.13	6 sq. mm	84	Nos.		0	0	0.0000	INR Zero Only
58.14	10 sq. mm	18	Nos.		0	0	0.0000	INR Zero Only
58.15	16 sq. mm	54	Nos.		0	0	0.0000	INR Zero Only
58.16	25 sq. mm	14	Nos.		0	0	0.0000	INR Zero Only
58.17	35 sq. mm	18	Nos.		0	0	0.0000	INR Zero Only
58.18	50 sq. mm	42	Nos.		0	0	0.0000	INR Zero Only
58.19	185 sq. mm	20	Nos.		0	0	0.0000	INR Zero Only
58.20	240 sq. mm	120	Nos.		0	0	0.0000	INR Zero Only
58.21	300 sq. mm	30	Nos.		0	0	0.0000	INR Zero Only
58.22	400 sq. mm	84	Nos.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/NCB

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59.00	<b>CABLE TERMINATION</b>							
59.10	Supply of following types of cable termination / jointing kits:							
59.11	Indoor type / Outdoor Type Heat shrinkable end termination kit of Raychem make suitable for 33/3.3 KV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes							
59.12	33kV (UE), 3C x 300 sq. mm (Al) XLPE armoured cables (Indoor Type)	5	Nos.		0	0	0.0000	INR Zero Only
59.13	33kV (UE), 3C x 300 sq. mm (Al) XLPE armoured cables (Outdoor Type)	5	Nos.		0	0	0.0000	INR Zero Only
59.14	3.3 kV (UE), 3 X 400 sq. mm (Al) XLPE armoured cables (Indoor Type)	10	Nos.		0	0	0.0000	INR Zero Only
59.15	3.3 kV (UE), 3 X 400 sq. mm (Al) XLPE armoured cables (Outdoor Type)	10	Nos.		0	0	0.0000	INR Zero Only
59.16	3.3 kV (UE), 3 X 240 sq. mm (Al) XLPE armoured cables (Indoor Type)	40	Nos.		0	0	0.0000	INR Zero Only
60.00	<b>JOINTING KITS</b>							
60.10	Supply of following types of jointing kits:							
60.11	Heat Shrinkable Raychem make straight through jointing kit suitable for 3.3 kV grade XLPE-A-FRLSPVC insulated armoured cables of following sizes							
60.12	3C x 400 sq. mm (Al, 3.3 KV)	1	No.		0	0	0.0000	INR Zero Only
60.13	3C x 240 sq. mm (Al, 3.3 KV)	1	No.		0	0	0.0000	INR Zero Only
61.00	<b>CABLE RACK (PREFABRICATED LADDER TYPE FRP CABLE TRAYS) &amp; ACCESSORIES</b>							
61.10	Supply of FRP ladder type Cable trays and their accessories i.e. supply of all hardware required i.e. J-hooks, GI Nut, Bolt, Washers, coupling plate etc. of following sizes and as per Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and drawings enclosed							
62.00	<b>Straight Run Cable Trays</b>							
62.10	600mm wide	300	Mtrs.		0	0	0.0000	INR Zero Only
62.11	300mm wide	200	Mtrs.		0	0	0.0000	INR Zero Only
62.12	150mm wide	150	Mtrs.		0	0	0.0000	INR Zero Only
63.00	<b>Horizontal Bends</b>							
63.10	600mm wide	4	Nos.		0	0	0.0000	INR Zero Only
63.11	300 mm wide	3	Nos.		0	0	0.0000	INR Zero Only
63.12	150mm wide	3	Nos.		0	0	0.0000	INR Zero Only
64.00	<b>Vertical Inside Bends</b>							
64.10	600mm wide	4	Nos.		0	0	0.0000	INR Zero Only
64.11	300mm wide	3	Nos.		0	0	0.0000	INR Zero Only
64.12	150mm wide	3	Nos.		0	0	0.0000	INR Zero Only
65.00	<b>Vertical Outside Bends</b>							

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65.10	600mm wide	4	Nos.		0	0	0.0000	INR Zero Only
65.11	300mm wide	6	Nos.		0	0	0.0000	INR Zero Only
65.12	150mm wide	3	Nos.		0	0	0.0000	INR Zero Only
66.00	<b>Regular Tees</b>							
66.10	600mm wide	2	No.		0	0	0.0000	INR Zero Only
66.11	300mm wide	2	No.		0	0	0.0000	INR Zero Only
66.12	150mm wide	2	Nos.		0	0	0.0000	INR Zero Only
67.00	<b>Reducers</b>							
67.10	600/300mm wide	2	Nos.		0	0	0.0000	INR Zero Only
67.11	300/150mm wide	2	No.		0	0	0.0000	INR Zero Only
68.00	<b>Cross</b>							
68.10	600mm wide	2	No.		0	0	0.0000	INR Zero Only
68.11	300mm wide	2	No.		0	0	0.0000	INR Zero Only
68.12	150mm wide	2	No.		0	0	0.0000	INR Zero Only
69.00	<b>DISTRIBUTION BOARDS</b>							
69.10	Supply of following Distribution Boards as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Sheet Steel Distribution Board (Doc. No. PC150-TS-0805).							
69.11	115 V, 2 Wire, sheet steel enclosed DC Distribution Board (DCDB) . It shall consist of 1 nos. incoming 63 A DP MCCB incomers (with ON & OFF Indication Light) and 16 Nos. 32 A DP MCB as outgoing feeders.	1	No.		0	0	0.0000	INR Zero Only
69.12	Supply of 415 V Lighting sub Distribution Board / Single Phase Socket Distribution Board, as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Lighting Sub Distribution Board (Doc. No. PC150-TS-0806).							
69.13	415 V, 9-way wall/ Steel Structure mounted Sheet steel enclosed Lighting Sub Distribution Board / Power Distribution Board in IP55 degree of protection having 1 No. Incoming (63 A 4 P MCCB) and 3 Nos. feeder circuit of 63A DP RCBO having 9 Nos. outgoing of 16 A DP RCBO (i.e. 3 nos. 16 A DP RCBO per circuit).	3	Nos.		0	0	0.0000	INR Zero Only
69.14	415 V, 9-way wall/ Steel Structure mounted Sheet steel enclosed Lighting Sub Distribution Board in IP55 degree of protection having 1 No. Incoming (63 A 4 P MCCB) and 3 Nos. feeder circuit of 63A DP RCBO having 9 Nos. outgoing of 16 A DP RCBO (i.e. 3 nos. 16 A DP RCBO per circuit), photocell/timer controlled with Contactor	1	No.		0	0	0.0000	INR Zero Only
70.00	<b>LIGHTING fixtures &amp; accessories</b>							
70.10	Supply of Lighting Fixtures & Accessories							



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70.11	240V AC,1-Ph, hose and weather proof Lighting fixtures with integral control gear, driver and lamps suitable for use in safe area having IP-65 degree of protection complete with all accessories and all hardware for fixing the lighting fittings with ceiling / wall / pole/ frame of following types as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0).							
70.12	45 W LED Street Lighting Fixtures.	6	Nos.		0	0	0.0000	INR Zero Only
70.13	90 W LED Street Lighting Fixtures.	6	Nos.		0	0	0.0000	INR Zero Only
70.14	240V 1-ph suspension/ wall mounted T8 type LED Lighting Fixture with/ without reflector having IP20 Protection							
70.15	2 x 20 W LED suspension mounted Lighting Fixture with vitreous enameled reflector type fixture.	50	Nos.		0	0	0.0000	INR Zero Only
70.16	110V DC, hose and weather proof Lighting fixtures suitable for use in safe area complete with all accessories and all hardware for fixing the lighting fittings with ceiling / wall / pole of following types as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0).							
70.17	100 W GLS Bulk head DC Panic Lighting fixtures	10	Nos.		0	0	0.0000	INR Zero Only
70.18	240V AC,1-Ph, Flame proof Lighting fixtures with integral control gear box and lamps suitable for use in hazardous area Zone-1 having IP-66 degree of protection complete with all accessories and all hardware for fixing the lighting fittings with structure / surface (Including flameproof cable glands) , as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0).							
70.19	1 x 20 W LED tube light fixture	3	Nos.		0	0	0.0000	INR Zero Only
71.00	<b>JUNCTION BOXES</b>							
71.10	Supply of 63A, 415V, 3Ph & N hose proof & weatherproof junction boxes in cast aluminium (LM-6) enclosure with IP-65 degree of protection and suitable for 2 Nos. 3.5x 35 Sq. mm (Al)cable & 1 nos. of 3Cx2.5 sq.mm(Cu) cable with terminal blocks of suitable size for easy termination of cables and as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Junction Box (Doc. No. PC150-TS-0815).	1	No.		0	0	0.0000	INR Zero Only
71.11	Supply of Junction Boxes in cast aluminium (LM6) enclosure with IP-65 degree of protection and suitable for 3Cx2.5 sq.mm(Cu) cable with cable glands & terminal blocks of suitable size for easy termination of cables and as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Junction Box (Doc. No. PC150-TS-0815).							
71.12	25A, 230V, 1Ph & N 4 Way type hose proof & weatherproof	40	Nos.		0	0	0.0000	INR Zero Only
72.00	<b>PLANT LIGHTING POLES</b>							

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72.10	Supply of hot dip galvanized MS tubular swaged lighting poles, junction box, requisite cable glands and tinned copper lugs, cable termination, necessary hardware required for excavation, providing concrete foundation ( ratio of cement : sand : stone chips = 1:2:4) for ground installation, disposal of surplus earth within 30 m lead, earthing and painting with all labour to make installation complete in all respect as per instruction and directions of engineer-in-charge, of following types suitable for wind velocity of 150 Km/Hr							
72.11	9m. high ground mounted poles (Single Arm)	2	Nos.		0	0	0.0000	INR Zero Only
72.12	5m. high ground mounted poles (Single Arm)	2	Nos.		0	0	0.0000	INR Zero Only
73.00	<b>EARTHING &amp; LIGHTNING MATERIAL</b>							
73.10	Supply of 3.8M, 100mm dia. heavy G.I. Pipe earth electrode having 100 micron zinc coating for earthing as per Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and PDS:E 605 complete with all accessories like earth bus, GI links for earth Pit connection etc. The hot dip galvanizing (minimum Zinc coating of 610 gms/ sq. M as per IS-2629) shall be done after all fabrication. The electrodes shall be made from one piece length of pipe.	20	Nos.		0	0	0.0000	INR Zero Only
73.11	Supply of G.I. Earth Bus (50mm x 12mm x 390mm), with 10 Nos earthing holes and as per PDS: E 615 enclosed.	6	Nos.		0	0	0.0000	INR Zero Only
73.12	Supply of hot dip galvanized (minimum Zinc coating of 610 gms / sq. M as per IS-2629) Earthing strip / earth wire of the following sizes :							
73.13	75mm X12mm	400	Mtrs.		0	0	0.0000	INR Zero Only
73.14	50mm X 8mm	200	Mtrs.		0	0	0.0000	INR Zero Only
73.15	32mm X 6mm	25	Mtr.		0	0	0.0000	INR Zero Only
73.16	25mm X 3mm	25	Mtr.		0	0	0.0000	INR Zero Only
73.17	8 SWG GI wire	50	Mtrs.		0	0	0.0000	INR Zero Only
73.18	Earthing Cables							
73.19	Supply of Single core XLPE insulated 3.3 KV (E) grade unarmoured FRLS PVC outer sheathed cable for earthing of following sizes							
73.20	1C x 185 Sq.mm. (Al)	80	Mtrs.		0	0	0.0000	INR Zero Only
73.21	Single core XLPE insulated 1.1 KV grade unarmoured FRLS PVC outer sheathed cable for earthing of following sizes.							
73.22	1 x 185 sq. mm (Al)	20	Mtrs.		0	0	0.0000	INR Zero Only
73.23	1 x 16 sq. mm (Al)	30	Mtrs.		0	0	0.0000	INR Zero Only
74.00	<b>MS Structure / Aluminium Sheet</b>							
74.10	Supply of MS structurals in channels, angles, flats, plates, rods etc. conforming to IS: 2026.	2.5	MT		0	0	0.0000	INR Zero Only
74.11	Supply of 8 mm thick MS Chequered plates.	0.5	MT		0	0	0.0000	INR Zero Only
74.12	Supply of 2 mm thick Aluminium sheet for fabrication of Rain protective hood	3	m2		0	0	0.0000	INR Zero Only
75.00	<b>G.I. / HDPE PIPES</b>							

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75.10	Supply of G. I. pipes; Medium Class as per IS 1239 (Part-1) of following sizes :							
75.11	50 mm NB	20	Mtrs.		0	0	0.0000	INR Zero Only
75.12	100 mm NB	20	Mtrs.		0	0	0.0000	INR Zero Only
76.00	<b>CAPACITOR BANK</b>							
76.10	Supply of Capacitor Bank alongwith VCB, RVT, series reactor, Control Panel, APFC Relay, HT vacuum contactor, HT Fuse, Relays etc. complete in all respect as per Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Capacitor (Doc. No. PC150-TS-0817).							
76.11	500 KVAR Capacitor bank (2 Steps of 250KVAR each)	2	Sets		0	0	0.0000	INR Zero Only
77.00	<b>DC SYSTEM</b>							
77.10	Supply of medium discharge Nickel Cadmium type, 110 V, 80 AH battery bank with 50 A Battery Charger complete with one no. cell booster as per specification in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0), Technical Specification - Battery Charger (Doc. No. PC150-TS-0810) and Technical Specification - Battery (Doc. No. PC150-TS-0811). The item includes batteries with all acesories including Battaery Stand ; Main Float cum Load cum Boost charger, Standby Float cum Load cum Boost charger; interconnecting Power copper cables between Charger to Batteries and Charegr to DCDB, insulated copper links etc.	1	Set		0	0	0.0000	INR Zero Only
78.00	<b>FCMA Starter</b>							
78.10	Supply of 3.3 KV FCMA Starter with Vacuum Contactors, HT Fuses, Metering etc. for 3.3 kV Motors for Water Pumps complete in all respect as per Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0).	4	Set		0	0	0.0000	INR Zero Only
79.00	<b>LOCAL CONTROL STATION ( LCS )</b>							
79.10	Supply of Weather Proof Local Control Station of following type, as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0) and Technical Specification - Local Control Stations (Doc. No. PC150-TS-0814).							
79.11	LCS with Trip-Neutral-Close control switch, Local-OFF-Remote Selector Switch with Ammeter & 5 nos. indication lamp	4	Set		0	0	0.0000	INR Zero Only
80.00	<b>POINT WIRING</b>							
80.10	THREE Light Point shall controlled by one switch							

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80.11	Supply and Providing Point Wiring system for primary light point/ceiling fan point/exhaust fan point/ call bell point/light plug point controlled by 1-6 Ampere modular type switch inclusive of the cost for providing circuit wiring from Distribution board to switch boards with 2x2.5 sq.mm.,1.1 KV grade PVC multi stranded fire resistant insulated copper conductor wire for light in required size of rigid PVC conduit with conduit accessories and 14swg bare copper earth wire continuity conductor including providing/fixing of PVC conduit of required size. Item shall also include wiring from switch board to point/fitting with 2x1.5 sq.mm copper conductor PVC insulated wire of 1100V grade with 14 SWG copper wire as earth continuity conductor for light in appropriate size of PVC conduit including providing & fixing PVC conduit with accessories such as bends,JB,sockets etc.required size of MS zinc passivated modular box with white inner plate and glossy white outer module plate for housing modular switch,sockets,fan regulators (Electronic heavy duty step up type) bell push on modular plate etc.The rates shall include cutting and refilling of chases/wall etc. including internal connections as required. All switch sockets shall be modular type fixed on modular plate. Make of modular plate,board switch, socket etc shall be as per approved Make. (Actual nos. shall be decided at site).	30	Nos.		0	0	0.0000	INR Zero Only
80.12	<u>TWO Light Point shall controlled by one switch</u>							
80.13	Supply and Providing Point Wiring system for primary light point/ceiling fan point/exhaust fan point/ call bell point/light plug point controlled by 1-6 Ampere modular type switch inclusive of the cost for providing circuit wiring from Distribution board to switch boards with 2x2.5 sq.mm.,1.1 KV grade PVC multi stranded fire resistant insulated copper conductor wire for light in required size of rigid PVC conduit with conduit accessories and 14swg bare copper earth wire continuity conductor including providing/fixing of PVC conduit of required size. Item shall also include wiring from switch board to point/fitting with 2x1.5 sq.mm copper conductor PVC insulated wire of 1100V grade with 14 SWG copper wire as earth continuity conductor for light in appropriate size of PVC conduit including providing & fixing PVC conduit with accessories such as bends,JB,sockets etc.required size of MS zinc passivated modular box with white inner plate and glossy white outer module plate for housing modular switch,sockets,fan regulators (Electronic heavy duty step up type) bell push on modular plate etc.The rates shall include cutting and refilling of chases/wall etc. including internal connections as required. All switch sockets shall be modular type fixed on modular plate. Make of	20	Nos		0	0	0.0000	INR Zero Only
80.14	Power Plug Point							
80.15	Supply and Providing Point Wiring system for 16A /6A power plug point with following sizes PVC insulated unsheathed single core multi stranded copper conductor, fire retardant wires of 1100V grade in recessed PVC conduits of required size complete with accessories such as bends,JB,Pull boxes etc with plate switches,sockets,screws and covers, Zinc Passivated MS modular boxes (16 gauge sheet construction) of suitable size, embedded in wall concealed and flush with walls including cutting and refilling the chases/Wall etc, and inclusive of 14SWG bare copper earth conductor for socket outlets as per specifications & direction of Engineer in charge. All modular type switch & socket shall be of approved make.16A, 6 Pin socket outlet with 16A switch mounted side by side with 2x4 sq.mm PVC copper wire with 14 SWG bare copper earth wire as an independent circuit from DB. (Actual nos. shall be decided at site).	12	Nos		0	0	0.0000	INR Zero Only
80.16	Exhaust Fans							
80.17	Supply of single phase exhaust fan with guards/ louvers, along with necessary brackets, all required civil works, making good the walls after fixing the fans etc.							
80.18	450 mm sweep heavy duty exhaust fan with self opening louvers.	14	Nos		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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
80.19	Supply of single phase flameproof chemical resistant industrial exhaust fan (suitable for use in hazardous area Zone-1) with guards/ louvers, along with necessary brackets, all required civil works, making good the walls after fixing the fans etc.							
80.20	300 mm sweep heavy duty exhaust fan.	2	Nos		0	0	0.0000	INR Zero Only
80.21	Supplying 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	2	Nos.		0	0	0.0000	INR Zero Only
81.00	<b>MISCELLANEOUS ITEMS</b>							
81.10	Supply of Caution boards / dangers boards written in ENGLISH & HINDI of the following voltages as per IS 2551 :							
81.11	33 KV	2	Nos.		0	0	0.0000	INR Zero Only
81.12	3.3 KV	2	Nos.		0	0	0.0000	INR Zero Only
81.13	415 Volts	5	Nos.		0	0	0.0000	INR Zero Only
81.14	Supply of rubber hand gloves with IS mark suitable for the following voltages as per relevant IS :							
81.15	33 KV	1	Set		0	0	0.0000	INR Zero Only
81.16	3.3 KV	1	Set		0	0	0.0000	INR Zero Only
81.17	415 Volts	1	Set		0	0	0.0000	INR Zero Only
81.18	Supply of Shock treatment chart conforming to Indian Electricity Rules in Aluminum frame with glass.	5	Nos.		0	0	0.0000	INR Zero Only
81.19	Supply of Do & Don't chart as per Indian Electricity Rules in Aluminum frame with glass.	2	Nos.		0	0	0.0000	INR Zero Only
81.20	Supply S/S Single Line Diagram in Aluminum frame with glass.	1	Nos.		0	0	0.0000	INR Zero Only
81.21	Supply of portable CO2 type fire extinguisher (4.5 liter capacity).	4	Nos.		0	0	0.0000	INR Zero Only
81.22	Sand buckets with stand (each with at least 3 sand buckets).	4	Nos.		0	0	0.0000	INR Zero Only
81.23	CPR (CARDIO PULMONARY RESUSCITATION) Charts.	2	Nos.		0	0	0.0000	INR Zero Only
81.24	High Voltage danger signage (Skull & bones).	10	Nos.		0	0	0.0000	INR Zero Only
81.25	Exit Route / Emergency Exit Route Signage.	2	Nos.		0	0	0.0000	INR Zero Only
81.26	First aid boxes.	2	Nos.		0	0	0.0000	INR Zero Only
81.27	Discharge Rod Make (Fluke / Meggar)Discharge Rod Make (Fluke / Meggar)	2	Nos.		0	0	0.0000	INR Zero Only
81.28	LT megger Make (Fluke / Meggar)LT & HT megger Make (Fluke / Meggar)	1	No.		0	0	0.0000	INR Zero Only
81.29	HT megger Make (Fluke / Meggar)	1	No.		0	0	0.0000	INR Zero Only
81.30	Earth megger Make (Fluke / Meggar)Earth megger Make (Fluke / Meggar)	2	Nos.		0	0	0.0000	INR Zero Only
81.31	Multi-meter Make (Fluke / Meggar)Multi-meter Make (Fluke / Meggar)	2	Nos.		0	0	0.0000	INR Zero Only
81.32	Tong Tester Make (Fluke / Meggar)Tong Tester Make (Fluke / Meggar)	2	Nos.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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
81.33	Breaker handling trolley for HT switchboards	1	Nos.		0	0	0.0000	INR Zero Only
81.34	Supply of fire retardant / extinguishing Elect. Insulated Synthetic Mat suitable for all voltages not exceeding 33 KV System (with H.T. Trolley movement) Electrically insulated PVC synthetic sheet along with suitable Resin/ Chemical bound (Hardener)/ Adhesive /Pigment/ PVC Strip etc & having minimum current leakage as per IS with dielectric strength test at 65KV, breakdown strength of 145KV and without adverse effect of mineral oil, high insulation resistance (min. 600 Mega ohm per Km.) including material for water proofing of floor & sealing of all joints having Min. width of 1000 mm ± 20mm. Mats shall conform to BIS: DOC NO. ET-02 (5440) Dt.30/04/04, meet requirements of IS 15652:2006, 5216 (part-1, 2&3), IS 8437, IS 3043 & IEC 479 Pub-1 & tested for Tensile/ Elongation properties, Insulation Resistance, effects of Acid Alkaline Diesel & Transformer Oil, Leakage Current Test, Fire Test etc.							
81.35	33KV Voltage grade having nominal thickness of 3.0 mm ± 10% Class C	6	Mtrs.		0	0	0.0000	INR Zero Only
81.36	Up to 3.3KV Voltage grade having nominal thickness of 2.0mm ± 10% Class A	40	Mtrs.		0	0	0.0000	INR Zero Only
81.37	Supply of 240V, 1-Ph, 50Hz, 1400mm sweep high speed ceiling fan with electronic regulator.	4	No.		0	0	0.0000	INR Zero Only
81.38	Petroleum Jelly	1	Kg		0	0	0.0000	INR Zero Only
81.39	Cleaning agent (Carbon tetra chloride (CTC) or equivalent)	1	Bottle		0	0	0.0000	INR Zero Only
81.40	Contact cleaner spray	1	Bottle		0	0	0.0000	INR Zero Only
81.41	Fuse wire	1	Set		0	0	0.0000	INR Zero Only
81.42	Insulation tape	1	No.		0	0	0.0000	INR Zero Only
81.43	HT tapes	1	No.		0	0	0.0000	INR Zero Only
81.44	M-seal	1	No.		0	0	0.0000	INR Zero Only
81.45	Sealing compound	1	No.		0	0	0.0000	INR Zero Only
81.46	Silica gel	1	Kg		0	0	0.0000	INR Zero Only
81.47	cotton tape	1	No.		0	0	0.0000	INR Zero Only
81.48	Teflon tape	1	No.		0	0	0.0000	INR Zero Only
81.49	Epoxy compound	1	No.		0	0	0.0000	INR Zero Only
81.50	Supply of Hume Pipes of following sizes with socket at one end:							
81.51	200 mm DIA	5	Mtrs.		0	0	0.0000	INR Zero Only
81.52	100 MM DIA	5	Mtrs.		0	0	0.0000	INR Zero Only
81.53	LOCAL CONTROL STATION ( LCS )							
81.54	Supply of Weather Proof Local Control Station of following type, as specified in Technical Specification							
81.55	Emergency stop push button (Mushroom type) for transformer with lockable facility in OFF position	3	Nos.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Contract No: PNP/PC-150/E/121/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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81.56	Supply of 4 Pole Structure with required bracing, cross arm etc for supporting the pin/strain type insulators, GOD (Double Break, Outdoor, Triple pole, Mechanically Gang operated Isolator cum earthing switch electrically interlock 33kV, 1250 A 31.5kA for 3 sec , 50 Hz + 5%), DO fuses (3No) with necessary 33 kV 10KA Station class lightning arresters, CT, PT, Insulators, Jumpers, Guy wires as required, Anti climbing device, Danger board, Outdoor cubical type Metering Panel with Trivector Meter etc. as per CESU requirement, suitable for receiving power from State Electricity Board CESU as per enclosed specifications, codes, standards, SLD, CESU guidelines etc. and complete in all respect.  Contractor shall liaison with CESU/State Electricity Board, Statutory Authorities regarding Specification of Metering Panel, CT, PT etc. and shall obtain approval from CESU/State Electricity Board/Statutory Authorities.	2	Sets		0	0	0.0000	INR Zero Only
81.57	Item wise unit prices of following spares for two years operation and maintenance:							
82.00	<b>Batteries and Battery Chargers</b>							
82.10	Battery Cell of each type	2	Nos.		0	0	0.0000	INR Zero Only
82.11	Insulators Interconnector (each type)	1	No.		0	0	0.0000	INR Zero Only
82.12	Connectors with Nuts & Bolts (each type)	1	No.		0	0	0.0000	INR Zero Only
82.13	Vent Plugs	1	No.		0	0	0.0000	INR Zero Only
82.14	Transformers							
82.15	Bushings complete with accessories for all 3 phase & neutral for all voltage grades (33/3.45 kV, 5MVA )	1	Set		0	0	0.0000	INR Zero Only
82.16	Bushings complete with accessories for all 3 phase & neutral for all voltage grades (3.3/0.433 kV, 500KVA )	1	Set		0	0	0.0000	INR Zero Only
82.17	Complete set of gaskets (33/3.45 kV, 5MVA)	1	No.		0	0	0.0000	INR Zero Only
82.18	Complete set of gaskets (3.3/0.433 kV, 500KVA)	1	No.		0	0	0.0000	INR Zero Only
82.19	Equaliser pipe and Explosion vent diaphragm (33/3.45 kV, 5MVA)	1	Set		0	0	0.0000	INR Zero Only
82.20	PRV with alarm and trip (33/3.45 kV, 5MVA)	1	Set		0	0	0.0000	INR Zero Only
82.21	Oil Level Gauge (33/3.45 kV, 5MVA)	1	No.		0	0	0.0000	INR Zero Only
82.22	Complete charge of Silica gel with breather (33/3.45 kV, 5MVA)	1	Set		0	0	0.0000	INR Zero Only
82.23	Complete charge of Silica gel with breather (3.3/0.433 kV, 500KVA )	1	Set		0	0	0.0000	INR Zero Only
82.24	Gland packing / O-rings for every valve	1	Set		0	0	0.0000	INR Zero Only
82.25	Buchholz Relay	1	No.		0	0	0.0000	INR Zero Only
82.26	Analogue type OTI	1	No.		0	0	0.0000	INR Zero Only
82.27	Analogue type WTI	1	No.		0	0	0.0000	INR Zero Only
82.28	CT for WTI	1	No.		0	0	0.0000	INR Zero Only
82.29	Remote tap position indicator	1	No.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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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82.30	Oil surge relay for OLTC	1	No.		0	0	0.0000	INR Zero Only
82.31	Starter contactors, switches and relays for electrical control panels	1	Set		0	0	0.0000	INR Zero Only
83.00	<b>RTCC Panel</b>							
83.10	Remote tap position indicator	1	No.		0	0	0.0000	INR Zero Only
83.11	Auxiliary Relays	1	No.		0	0	0.0000	INR Zero Only
83.12	MCB of each rating	1	No.		0	0	0.0000	INR Zero Only
83.13	Push Button Actuator of each type	1	No.		0	0	0.0000	INR Zero Only
83.14	Indication Lamp (of each type & colour)	1	No.		0	0	0.0000	INR Zero Only
83.15	Alarm bell (Hooter)	1	No.		0	0	0.0000	INR Zero Only
83.16	Alarm buzzer	1	No.		0	0	0.0000	INR Zero Only
83.17	Alarm annunciator (Each Type)	1	No.		0	0	0.0000	INR Zero Only
83.18	Complete Voltage Transformer (1 phase) with terminal connectors(TC).	1	No.		0	0	0.0000	INR Zero Only
83.19	Complete Current Transformer with terminal connectors(TC).	1	No.		0	0	0.0000	INR Zero Only
83.20	Surge Arrester complete with insulating base with Surge counter & accessories	1	No.		0	0	0.0000	INR Zero Only
84.00	<b>HV Switchboards</b>							
84.10	<b>BREAKER 33 kV OF EACH RATING</b>							
84.11	Trip bar spring and any other spring used in the circuit breaker mechanism	1	Set		0	0	0.0000	INR Zero Only
84.12	Shunt trip coil	1	Set		0	0	0.0000	INR Zero Only
84.13	Closing coil	1	Set		0	0	0.0000	INR Zero Only
84.14	Secondary Isolating contact blocks	1	Set		0	0	0.0000	INR Zero Only
84.15	Micro Switch for Spring Charging	1	Set		0	0	0.0000	INR Zero Only
84.16	Micro Switch for Service/Test position	1	Set		0	0	0.0000	INR Zero Only
84.17	Rack in/Rack out handle	1	No.		0	0	0.0000	INR Zero Only
84.18	Spring Charging handle	1	No.		0	0	0.0000	INR Zero Only
84.19	Door panel key	1	Set		0	0	0.0000	INR Zero Only
84.20	<b>BREAKER 3.3 kV OF EACH RATING</b>							
84.21	Trip bar spring and any other spring used in the circuit breaker mechanism	1	Set		0	0	0.0000	INR Zero Only
84.22	Shunt trip coil	1	Set		0	0	0.0000	INR Zero Only
84.23	Closing coil	1	Set		0	0	0.0000	INR Zero Only
84.24	Secondary Isolating contact blocks	1	Set		0	0	0.0000	INR Zero Only



**Item Rate BoQ**

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Contract No: PNP/PC-150/E/121/NCB

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84.25	Micro Switch for Spring Charging	1	Set		0	0	0.0000	INR Zero Only
84.26	Micro Switch for Service/Test position	1	Set		0	0	0.0000	INR Zero Only
84.27	Rack in/Rack out handle	1	No.		0	0	0.0000	INR Zero Only
84.28	Spring Charging handle	1	No.		0	0	0.0000	INR Zero Only
84.29	Door panel key	1	Set		0	0	0.0000	INR Zero Only
84.30	CONTROL SWITCHES							
84.31	Trip-Neutral-Close Control Switch	2	No.		0	0	0.0000	INR Zero Only
84.32	Local-Remote or Auto-Manual Selector Switch	2	No.		0	0	0.0000	INR Zero Only
84.33	Thermostat	2	No.		0	0	0.0000	INR Zero Only
84.34	Ammeter Selector Switch	2	No.		0	0	0.0000	INR Zero Only
84.35	Voltmeter Selector Switch	2	No.		0	0	0.0000	INR Zero Only
84.36	Push Button Element of each type	4	Sets		0	0	0.0000	INR Zero Only
84.37	Push Button Actuator of each type	4	Sets		0	0	0.0000	INR Zero Only
84.38	Indication Lamps (1 no. of each type)	4	Nos.		0	0	0.0000	INR Zero Only
84.39	MINIATURE CIRCUIT BREAKER (OF EACH RATING)	2	Sets		0	0	0.0000	INR Zero Only
84.40	METERS							
84.41	Ammeter of each type	2	Sets		0	0	0.0000	INR Zero Only
84.42	Voltmeter	1	No.		0	0	0.0000	INR Zero Only
84.43	FUSES (OF EACH RATING)							
84.44	Fuse link	2	No.		0	0	0.0000	INR Zero Only
84.45	Fuse fittings	2	No.		0	0	0.0000	INR Zero Only
84.46	MISCELLANEOUS							
84.47	Alarm bell	2	No.		0	0	0.0000	INR Zero Only
84.48	Alarm buzzer	2	No.		0	0	0.0000	INR Zero Only
84.49	Surge Suppressor	3	Nos.		0	0	0.0000	INR Zero Only
84.50	Vacuum Bottle (3.3KV, 1600A)	3	Nos.		0	0	0.0000	INR Zero Only
85.00	LV Switchboards							
85.10	METERS							
85.11	Ammeter of each type	1	No.		0	0	0.0000	INR Zero Only
85.12	CONTROL SWITCHES							

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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
85.13	Ammeter Selector Switch	2	No.		0	0	0.0000	INR Zero Only
85.14	MCCB							
85.15	MCCB 63 A	1	No.		0	0	0.0000	INR Zero Only
85.16	MCCB 125 A	1	No.		0	0	0.0000	INR Zero Only
86.00	<b>NEUTRAL EARTHING RESISTOR</b>							
86.10	Bushing with accessories	2	Set		0	0	0.0000	INR Zero Only
86.11	Support insulators	2	Set		0	0	0.0000	INR Zero Only
86.12	Resistor element	2	Set		0	0	0.0000	INR Zero Only
87.00	<b>FOR LIGHTING FIXTURE</b>							
87.10	Reflector of each type	2	Nos.		0	0	0.0000	INR Zero Only
87.11	Lamp holder of each type.	2	Nos.		0	0	0.0000	INR Zero Only
87.12	Allen keys of different sizes as applicable.	2	Nos.		0	0	0.0000	INR Zero Only
88.00	<b>FOR INTERLOCKING SWITCH SOCKET &amp; PLUG</b>							
88.10	Switch of each rating	1	Nos.		0	0	0.0000	INR Zero Only
88.11	Fuse base of each rating	1	Nos.		0	0	0.0000	INR Zero Only
88.12	Fuse of each rating	1	Nos.		0	0	0.0000	INR Zero Only
88.13	Plug Top	1	Nos.		0	0	0.0000	INR Zero Only
89.00	<b>ASDB/LSDB</b>							
89.10	16 A DP MCB	2	Nos.		0	0	0.0000	INR Zero Only
89.11	Terminal block.	2	Nos.		0	0	0.0000	INR Zero Only
90.00	<b>Capacitor</b>							
90.10	Supporting insulators	1	Set		0	0	0.0000	INR Zero Only
90.11	Gaskets	1	Set		0	0	0.0000	INR Zero Only
91.00	<b>Motor (For each rating)</b>							
91.10	Bearings (Driving end)	1	No.		0	0	0.0000	INR Zero Only
91.11	Bearings (Non driving end)	1	No.		0	0	0.0000	INR Zero Only
91.12	Cooling fan	1	No.		0	0	0.0000	INR Zero Only
91.13	Terminal block	1	No.		0	0	0.0000	INR Zero Only
91.14	Grease Nipple & Plug (if applicable)	1	No.		0	0	0.0000	INR Zero Only
91.15	Space Heater	1	No.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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91.16	Inner & Outer Cover fro DE & NDE bearings	1	Set		0	0	0.0000	INR Zero Only
92.00	<b>FOR LCS</b>							
92.10	Ammeters	1	No.		0	0	0.0000	INR Zero Only
92.11	T-N-C Control switch	1	No.		0	0	0.0000	INR Zero Only
92.12	Indication Light of each colour	1	Set		0	0	0.0000	INR Zero Only
92.13	Terminal blocks	1	No.		0	0	0.0000	INR Zero Only
92.14	<b>NIPFS</b>							
92.15	Fitted nitrogen cylinder (68 liter water Capacity)	1	No.		0	0	0.0000	INR Zero Only
92.16	Heat sensor assembly	1	No.		0	0	0.0000	INR Zero Only
92.17	Fire survival cable sufficient for one system	1	Set		0	0	0.0000	INR Zero Only
92.18	PNRBV	1	No.		0	0	0.0000	INR Zero Only
92.19	Limit switch for fire detector	1	No.		0	0	0.0000	INR Zero Only
92.20	Fire detectors	2	No.		0	0	0.0000	INR Zero Only
92.21	Heating element	2	No.		0	0	0.0000	INR Zero Only
92.22	<b>UPS</b>							
92.23	MCB, MCCB and control switches of each rating	1	Set		0	0	0.0000	INR Zero Only
92.24	Control Cards	1	Set		0	0	0.0000	INR Zero Only
92.25	Semiconductor fuses & HRC fuse links of each type	1	Set		0	0	0.0000	INR Zero Only
92.26	Isolator switch of each type	1	Set		0	0	0.0000	INR Zero Only
92.27	PCBs of each type	1	Set		0	0	0.0000	INR Zero Only
93.00	<b>CABLE TRENCH MATERIAL &amp; ACCESSORIES</b>							
93.10	Supply of fine river sand in the trench around cables up to a depth of 250 mm (100 mm below the centre line of cable and 150 mm above cable the centre line of cable)	10	M3		0	0	0.0000	INR Zero Only
93.11	Supply of Class B 9"x 4.5" x 3" bricks for cable trenches	3500	Nos.		0	0	0.0000	INR Zero Only
94.00	<b>CABLE ROUTE MARKER</b>							
94.10	Supply of Cable route markers of Round shape made of MS of dia 200mm with suitable engraving as of HT/ LT/ Control/ Data Cable jointed with angle of 30X30X5 mm grouted in concrete of size 150mm x150mm x 500mm.	3	Nos.		0	0	0.0000	INR Zero Only
94.11	Supply of 230 V AC, 2 KVA Parallel Redundant UPS System with UPS Distribution Board (with 2 Nos. Incomers with MCCB, Ammeter, Voltmeter, Frequency meter, Indication Lights with Static Switch) and 10 Nos. Outgoing Feeders (with DP MCB) to feed power supply to the instrumentation system etc. This UPS System shall be complete with 2 x 100% Ni-Cd Battery with backup of 5 Hours and other accessories.	1	Set		0	0	0.0000	INR Zero Only

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94.12	Supply of hose proof & weatherproof, Wall/ Structure mounted 24 V DC Power Supply Unit of 100 VA Rating (IP-65 degree of protection) with inbuilt choppers and other accessories suitable for Single 110 V DC Input and Single 24 V DC Output of reputed make.	4	Set		0	0	0.0000	INR Zero Only
94.13	Supply of SCR based Soft Starter for 3.3. kV Motors for Raw Water Pumps Each Soft Starter shall be suitable for Starting of 1 Nos. Motors. with Bypass Facility from Motor Feeders of 3.3 kV Switchboard.	4	Sets		0	0	0.0000	INR Zero Only
95.00	<b>deleted</b>							
96.00	<b>ERECTION/ INSTALLATION OF ELECTRICAL ITEMS</b>							
97.00	<b>TRANSFORMER</b>							
97.10	Installation, Testing and Commissioning of Transformers excluding filtration and dehydration of oil / winding, Power and Control cable termination but including transportation of transformer and its accessories from stores, dressing of foundation, placing in position on M S base channel / flat, assembly of all accessories supplied loose, topping up with tested oil, all labour and material complete as per drawings / specification and direction of the transformer manufacturer.							
97.11	5000 KVA, 33/3.45 kV Transformer (ONAN) with OLTC, OLTC Control Panels and RTCC Panels	2	Nos.		0	0	0.0000	INR Zero Only
97.12	500 KVA, 3.3/0.433 kV Transformer (ONAN)	1	Nos.		0	0	0.0000	INR Zero Only
97.13	Filtration and Dehydration of oil / winding of transformer with streamline filter machine (to be arranged by the Contractor) for bringing the dielectric strength of the oil to the required level as per IS, complete with all labour and material including transportation oil drums from stores.	6000	Liter		0	0	0.0000	INR Zero Only
97.20	Installation, Testing and Commissioning of Nitrogen Injection Fire Prevention & Extinguishing System for Transformer for 5000 KVA, 33/3.45 kV Transformers complete in all respect.	2	Set		0	0	0.0000	INR Zero Only
98.00	<b>HV &amp; LV SWITCH BOARD</b>							
98.10	Installation, testing and commissioning of following sheet steel enclosed switch boards, free standing, floor mounting, cubicle type, including transportation from the store to the site of erection, assembly, mounting, fixing and wiring of loose components like relays/meters, interconnection of shipping sections and inter panel wiring as necessary, inter bus bar jointing and earthing, operational and functional checking, 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 switch 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, but excluding termination of incoming & outgoing cables. Job shall include rigidly fixing the frame including grouting, if necessary							
99.00	<b>HV SWITCH BOARD</b>							
99.10	33kV 3Ph 50Hz 31.5kA 630 A VCB ICOG Panel	2	Nos.		0	0	0.0000	INR Zero Only
99.11	3.3 KV, 150 MVA, 1600 A switch board	1	No.		0	0	0.0000	INR Zero Only
100.00	<b>LV SWITCH BOARD</b>							

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100.10	Extension of Existing 415 V, 36 MVA, 1000 A Switchboard : 1 No. 1000 A Incomer Feeder Drawout Type	1	No.		0	0	0.0000	INR Zero Only
100.11	Extension of Existing 415 V, 36 MVA, 1000 A Switchboard : 18 Nos. 125A/63A Outgoing Feeders	1	Set		0	0	0.0000	INR Zero Only
101.00	<b>NGR</b>							
101.10	Installation of sheet steel enclosed, free standing, floor mounting, cubicle type, including transportation from the store to the site of erection, assembly, mounting, earthing, 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 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, but excluding termination of cables. Job shall include rigidly fixing the frame including grouting, if necessary.							
101.11	Neutral Grounding Resistors rated for 3.45/√3 KV ± 10%, 400A for 10 seconds & 80A Continuous Rating , 4.98 ohms ± 10%, for 33/3.45 KV, 5 MVA Transformers.	2	No.		0	0	0.0000	INR Zero Only
102.00	<b>WEATHER PROOF / HOSE PROOF SWITCH SOCKET</b>							
102.10	Installation, testing and commissioning of interlocked type switch sockets with matching plugs complete with cable glands, lugs, terminal blocks etc. of following ratings:							
102.11	63A, 5-pin, 415V (Weather Proof)	2	Nos.		0	0	0.0000	INR Zero Only
102.12	25A, 3-pin, 240V (Weather Proof)	6	Nos.		0	0	0.0000	INR Zero Only
103.00	<b>LAYING OF CABLE TRAYS</b>							
103.10	Installation, laying and connecting of FRP ladder type cable trays and horizontal & vertical bends and regular Tees of different radii of various sizes on already erected supports or risers, including joining various cable trays by bolting with G.I. bolts, nuts & washers as per approved drawings (including fixing J-hooks, reducer coupler plate, adjustable coupler plate) as per the desired cable route and as per the drawings and directions of Engineer-in-charge. Job also includes supply of all hardware required i.e. J-hooks, GI Nut, Bolt, Washers etc.							
104.00	<b>Straight Run Cable Trays</b>							
104.10	600mm wide	300	Mtrs.		0	0	0.0000	INR Zero Only
104.11	300mm wide	200	Mtrs.		0	0	0.0000	INR Zero Only
104.12	150mm wide	150	Mtrs.		0	0	0.0000	INR Zero Only
105.00	<b>Horizontal Bends</b>							
105.10	600mm wide	4	Nos.		0	0	0.0000	INR Zero Only
105.11	300 mm wide	3	Nos.		0	0	0.0000	INR Zero Only
105.12	150mm wide	3	Nos.		0	0	0.0000	INR Zero Only
106.00	<b>Vertical Inside Bends</b>							
106.10	600mm wide	4	Nos.		0	0	0.0000	INR Zero Only

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106.11	300mm wide	3	Nos.		0	0	0.0000	INR Zero Only
106.12	150mm wide	3	Nos.		0	0	0.0000	INR Zero Only
107.00	<b>Vertical Outside Bends</b>							
107.10	600mm wide	4	Nos.		0	0	0.0000	INR Zero Only
107.11	300mm wide	6	Nos.		0	0	0.0000	INR Zero Only
107.12	150mm wide	3	Nos.		0	0	0.0000	INR Zero Only
107.13	Regular Tees							
107.14	600mm wide	2	No.		0	0	0.0000	INR Zero Only
107.15	300mm wide	2	No.		0	0	0.0000	INR Zero Only
107.16	150mm wide	2	Nos.		0	0	0.0000	INR Zero Only
108.00	<b>Reducers</b>							
108.10	600/300mm wide	2	Nos.		0	0	0.0000	INR Zero Only
108.11	300/150mm wide	2	No.		0	0	0.0000	INR Zero Only
109.00	<b>Cross</b>							
109.10	600mm wide	2	No.		0	0	0.0000	INR Zero Only
109.11	300mm wide	2	No.		0	0	0.0000	INR Zero Only
109.12	150mm wide	2	No.		0	0	0.0000	INR Zero Only
110.00	<b>LAYING OF CABLES</b>							
110.10	Horizontal and vertical laying, testing (before and after laying) and commissioning of following HV (33KV & 3.3KV) / LV Power & Control cables in readymade trenches, on FRP cable trays / racks, on already installed risers, support hangers, saddles etc. pulling through pipes on walls / columns, steel structures including transportation of cable drums from storage yard to the site, unrolling the drum, laying the required length of cables including supply and fixing of necessary saddles, saddle bars, cable tags, Al clamps for cables laid vertical on walls / columns / structures, risers with all labour, consumable materials and necessary hardware to make installation complete in all respect as per approved standard drawings and direction of engineer-in-charge.							
110.11	33 KV (E) Grade, XLPE Insulated, PVC inner sheathed, Armoured, FRLS PVC outer sheathed cables along with 36" water pipe line.							
110.12	3C x 300 sq. mm (Al)	120	Mtrs.		0	0	0.0000	INR Zero Only
110.13	3.3 KV (UE) Grade, XLPE Insulated, PVC inner sheathed, FRLS PVC outer sheathed cables.							
110.14	3C x 400 sq. mm (Al)	120	Mtrs.		0	0	0.0000	INR Zero Only
110.15	3C x 240 sq. mm (Al)	620	Mtrs.		0	0	0.0000	INR Zero Only
110.16	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.							
110.17	3.5C x 400 sq. mm (Al)	50	Mtrs.		0	0	0.0000	INR Zero Only

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110.18	3C x 10 sq. mm (Cu)	50	Mtrs.		0	0	0.0000	INR Zero Only
110.19	3C x 6 sq. mm (Cu)	360	Mtrs.		0	0	0.0000	INR Zero Only
110.20	3C x 2.5 sq. mm (Cu)	1200	Mtrs.		0	0	0.0000	INR Zero Only
110.21	3.5C x 50 sq. mm (Al)	360	Mtrs.		0	0	0.0000	INR Zero Only
110.22	3.5C x 35 sq. mm (Al)	100	Mtrs.		0	0	0.0000	INR Zero Only
110.23	4CX4 sq. mm (Al)	140	Mtrs.		0	0	0.0000	INR Zero Only
110.24	4CX16 sq. mm (Al)	120	Mtrs.		0	0	0.0000	INR Zero Only
110.25	5C x 2.5 sq. mm (Cu)	50	Mtrs.		0	0	0.0000	INR Zero Only
110.26	7C x 2.5 sq. mm (Cu)	100	Mtrs.		0	0	0.0000	INR Zero Only
110.27	10C x 2.5 sq. mm (Cu)	50	Mtrs.		0	0	0.0000	INR Zero Only
110.28	12C x 2.5 sq. mm (Cu)	150	Mtrs.		0	0	0.0000	INR Zero Only
110.29	19C x 2.5 sq. mm (Cu)	500	Mtrs.		0	0	0.0000	INR Zero Only
110.30	Single core XLPE insulated 3.3 KV grade unarmoured FRLS PVC outer sheathed cable for earthing							
110.31	1C x 185 Sq.mm. (Al)	80	Mtrs.		0	0	0.0000	INR Zero Only
110.32	Single core XLPE insulated 1.1 KV grade unarmoured FRLS PVC outer sheathed cable for earthing.							
110.33	1 x 185 sq. mm (Al)	20	Mtrs.		0	0	0.0000	INR Zero Only
110.34	1 x 16 sq. mm (Al)	30	Mtrs.		0	0	0.0000	INR Zero Only
110.35	8 Triad Cable (IS 5831/84), Voltage Grade 1100V , cross section area 1.5 sq mm, conductor/drain material: Electrolytic Annealed Tinned Copper conf. to IS ; 813084, Insulation material : XLPE, Sheath material; Extruded HR PVC Type ST-2 Conf. to IS : 5831/84, Armouring : hot dipped galvanized steel, No. of strands 7.	500	Mtrs.		0	0	0.0000	INR Zero Only
111.00	<b>Termination of cables</b>							
111.10	End termination and subsequent testing of XLPE/PVC insulated single core / multi core armoured Cables of 33KV/3.3KV/1.1 KV grade, Al / Cu cable using suitable Heat Shrink Termination Kit, excluding supply of glands & lugs but including Glanding, all labour and consumable materials to make installation complete in all respect. 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 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.							
111.11	33kV (UE), 3C x 300 sq. mm (Al) XLPE armoured cables	10	Nos.		0	0	0.0000	INR Zero Only
111.12	3.3 kV (UE), 3 X 400 sq. mm (Al) XLPE armoured cables	20	Nos.		0	0	0.0000	INR Zero Only
111.13	3.3 kV (UE), 3 X 240 sq. mm (Al) XLPE armoured cables	48	Nos.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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
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111.14	1.1 KV Grade, XLPE Insulated, PVC inner Sheath, FRLS PVC outer sheathed cables.							
111.15	3.5C x 400 sq. mm (Al)	8	Nos.		0	0	0.0000	INR Zero Only
111.16	3C x 10 sq. mm (Cu)	6	Nos.		0	0	0.0000	INR Zero Only
111.17	3C x 6 sq. mm (Cu)	28	Nos.		0	0	0.0000	INR Zero Only
111.18	3C x 2.5 sq. mm (Cu)	50	Nos.		0	0	0.0000	INR Zero Only
111.19	3.5C x 50 sq. mm (Al)	14	Nos.		0	0	0.0000	INR Zero Only
111.20	3.5C x 35 sq. mm (Al)	6	Nos.		0	0	0.0000	INR Zero Only
111.21	4CX4 sq. mm (Al)	10	Nos.		0	0	0.0000	INR Zero Only
111.22	4CX16 sq. mm (Al)	12	Nos.		0	0	0.0000	INR Zero Only
111.23	5C x 2.5 sq. mm (Cu)	4	Nos.		0	0	0.0000	INR Zero Only
111.24	7C x 2.5 sq. mm (Cu)	20	Nos.		0	0	0.0000	INR Zero Only
111.25	10C x 2.5 sq. mm (Cu)	4	Nos.		0	0	0.0000	INR Zero Only
111.26	12C x 2.5 sq. mm (Cu)	12	Nos.		0	0	0.0000	INR Zero Only
111.27	19C x 2.5 sq. mm (Cu)	20	Nos.		0	0	0.0000	INR Zero Only
111.28	Single core XLPE insulated 3.3 KV grade unarmoured FRLS PVC outer sheathed cable for earthing							
111.29	1C x 185 sq. mm (Al)	10	Nos.		0	0	0.0000	INR Zero Only
111.30	Single core XLPE insulated 1.1 KV grade unarmoured FRLS PVC outer sheathed cable for earthing							
111.31	1 x 185 sq. mm (Al)	2	Nos.		0	0	0.0000	INR Zero Only
111.32	1 x 16 sq. mm (Al)	2	No.		0	0	0.0000	INR Zero Only
112.00	<b>STRAIGHT THROUGH JOINTS</b>							
112.10	Straight through jointing of HV XLPE insulated armoured cables of following sizes excluding supply of straight through jointing kit including all labour and materials complete as per Technical Specification and direction of engineer-in-charge.							
112.11	3C x 400 sq. mm (Al, 3.3 KV)	1	No.		0	0	0.0000	INR Zero Only
112.12	3C x 240 sq. mm (Al, 3.3 KV)	1	No.		0	0	0.0000	INR Zero Only
113.00	<b>DISTRIBUTION BOARDS</b>							
113.10	Installation, testing and commissioning of following floor / wall mounted DC 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 as per approved drawings, specifications and directions of engineer-in-charge.							



**Item Rate BoQ**

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Contract No: PNP/PC-150/E/121/NCB

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113.11	115 V, 2 Wire, sheet steel enclosed DC Distribution Board (DCDB) . It shall consist of 1 nos. incoming 63 A DP MCCB incomers (with ON & OFF Indication Light) and 16 Nos. 32 A DP MCB as outgoing feeders.	1	No.		0	0	0.0000	INR Zero Only
113.12	Installation, testing and commissioning of following wall mounted Lighting sub Distribution Boards / Single Phase Socket 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 as per approved drawings, specifications and directions of engineer-in-charge.							
113.13	415 V, 9-way wall/ Steel Structure mounted Sheet steel enclosed Lighting Sub Distribution Board / Power Distribution Board in IP55 degree of protection having 1 No. Incoming (63 A 4 P MCCB) and 3 Nos. feeder circuit of 63A DP RCBO having 9 Nos. outgoing of 16 A DP RCBO (i.e. 3 Nos. 16 A DP RCBO per circuit).	3	Nos.		0	0	0.0000	INR Zero Only
113.20	415 V, 9-way wall/ Steel Structure mounted Sheet steel enclosed Lighting Sub Distribution Board in IP55 degree of protection having 1 No. Incoming (63 A 4 P MCCB) and 3 Nos feeder circuit of 63A DP RCBO having 9 Nos. outgoing of 16 A DP RCBO (i.e. 3 Nos. 16 A DP RCBO per circuit), photocell/timer controlled with Contactor.	1	No.		0	0	0.0000	INR Zero Only
114.00	<b>LIGHTING FIXTURES AND JUNCTION BOXES</b>							
114.10	Installation, connection, testing and commissioning of pre-wired LED Lighting fixtures along with integral /non-integral control gears, lamps, Driver etc., mounting accessories, 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.							
114.11	45 W LED Street Lighting Fixtures.	6	Nos.		0	0	0.0000	INR Zero Only
114.12	90 W LED Street Lighting Fixtures.	6	Nos.		0	0	0.0000	INR Zero Only
114.13	240V 1-ph suspension/ wall mounted T8 type LED Lighting Fixture with/ without reflector having IP20 Protection							
114.14	2 x 20 W LED suspension mounted Lighting Fixture with vitreous enameled reflector type fixture.	50	Nos.		0	0	0.0000	INR Zero Only
114.15	110V DC, hose and weather proof Lighting fixtures suitable for use in safe area complete with all accessories and all hardware for fixing the lighting fittings with ceiling / wall / pole of following types as specified in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/SecVI-5.0).							
114.16	100 W GLS Bulk head DC Panic Lighting fixtures	10	Nos.		0	0	0.0000	INR Zero Only
114.17	240V AC,1-Ph, Flame proof Lighting fixtures with integral control gear box and lamps suitable for use in hazardous area Zone-1 having IP-66 degree of protection complete with all accessories and all hardware for fixing the lighting fittings with structure / surface (Including flameproof cable glands).							
114.18	1 x 20 W LED tube light fixture	3	Nos.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Contract No: PNP/PC-150/E/121/NCB

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114.19	Installation, connection, testing and commissioning of Junction Boxes, including cable glanding, crimping of lugs on cable conductor & connecting cables, earthing etc. including supply of all connecting materials like clamps, supports 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.							
114.20	63A, 415V, 3 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 2Nos. 3.5Cx50 Sq. mm (Al) & 1 no. 3 x 2.5mm2 cable and threaded plug.	1	Nos.		0	0	0.0000	INR Zero Only
114.21	25A, 230V, 1 Ph. & N, 4 way hoseproof & weather proof junction boxes in cast aluminium (LM6) enclosure complete with terminal block, rolled aluminium cable glands suitable for 3 x 2.5mm2 cable and threaded plug.	40	Nos.		0	0	0.0000	INR Zero Only
115.00	<b>PLANT LIGHTING POLES</b>							
115.10	Erection and commissioning of following hot dipped galvanised mild steel tubular swaged lighting poles including transportation of required items from owner's issue point to site and installation of poles, junction box, supply of requisite cable glands and tinned copper lugs, cable termination, necessary hardware required for excavation, providing concrete foundation ( ratio of cement : sand : stone chips = 1:2:4) for ground installation, disposal of surplus earth within 30 m lead, earthing and painting with all labour to make installation complete in all respect as per instruction and directions of engineer-in-charge.							
115.11	9m. high ground mounted poles (Single Arm)	2	Nos.		0	0	0.0000	INR Zero Only
115.12	5m. high ground mounted poles (Single Arm)	2	Nos.		0	0	0.0000	INR Zero Only
116.00	<b>EARTHING SYSTEM</b>							
116.10	EARTH PIT							
116.11	Installation, testing and commissioning of earth pits as per earthing layout drawings (excluding supply of safe earth electrodes & accessories) including digging the earth up to required depth, erecting safe earth electrode, disposal of surplus earth (as directed by engineer-in-charge) and back filling of the pit as required including supply of erection material providing necessary brick works and other civil works, fixing G.I. L-shaped test links and brackets, twisted piece and connecting to it earth electrodes and earth strips with all labour and materials to complete installation work in all respect as per approved drawings, specifications and directions of engineer-in-charge	20	Nos.		0	0	0.0000	INR Zero Only
116.12	EARTH BUS BAR							
116.13	Installation and commissioning of hot dip galvanised earth bus bar of size 360 mm x 75 mm x 10 mm with 10 holes of 14 mm dia. including all labour and materials to complete installation in all respect as per approved drawings, specifications and directions of engineer-in-charge.	6	Nos.		0	0	0.0000	INR Zero Only
116.14	EARTHING GRID							

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116.15	Installation, testing and commissioning of Hot dip galvanised G.I. earthing strip running on O.H. cable trays / cable trays in underground cable trenches / buried under soil in already excavated cable trenches of depth 600mm or supported by G.I. saddles & saddle bars as mentioned below including interconnection between different earth pits, strip / cable for connection to various equipments & system neutral, necessary hardware for connection and interconnection between earth bus bars including all labour and miscellaneous materials to make installations complete in all respect as per approved drawings, specifications, instructions and directions of engineer-in-charge.							
116.16	75mm X12mm	400	Mtrs.		0	0	0.0000	INR Zero Only
116.17	50mm X 8mm	200	Mtrs.		0	0	0.0000	INR Zero Only
116.18	32mm X 6mm	25	Mtr.		0	0	0.0000	INR Zero Only
116.19	25mm X 3mm	25	Mtr.		0	0	0.0000	INR Zero Only
116.20	8 SWG GI wire	50	Mtrs.		0	0	0.0000	INR Zero Only
117.00	<b>FABRICATION OF STEEL STRUCTURE</b>							
117.10	Fabrication and installation of MS frame supports and brackets for various equipment base frame, miscellaneous electrical equipment support, made of channels, angles, flats etc. of different sections including bolting, welding, riveting, supply of necessary anchor bolts and grouting etc. including 2 coats of zinc rich anti-rust epoxy primer and 2 finished coats of epoxy paint including breaking wall, floor etc. and making good the same with all labour and consumable materials to complete installation in all respect as per approved drawings, specifications and directions of engineer-in-charge	2.5	MT		0	0	0.0000	INR Zero Only
117.11	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.	0.5	MT		0	0	0.0000	INR Zero Only
117.12	Fabrication & installation of 2 mm thick Al sheet for rain protective hood for equipment e.g. motors, switch sockets, junction boxes etc.	3	m2		0	0	0.0000	INR Zero Only
118.00	<b>G.I. PIPES / HDPE PIPES</b>							
118.10	Installation of G.I. pipes of following sizes for cable protection, floor sleeves etc. fixed on a steel structure, concrete, laid in trenches including concrete cutting, bending, threading etc.to a clamp, nuts, bolts sockets, reducers, spacers, plug, bushing, chipping of concrete floor, breaking of concrete cable trench, walls and complete with all labour and material as per directions of engineer-in-charge.							
118.11	50 mm NB	20	Mtrs.		0	0	0.0000	INR Zero Only
118.12	100 mm NB	20	Mtrs.		0	0	0.0000	INR Zero Only
118.13	Cutting, chipping, breaking of RCC floor and wall for making holes/cut out/grooves etc. and making good the damage after laying pipes, cable etc. With cement, sand mortar as required.	1	m3		0	0	0.0000	INR Zero Only
118.14	Same as above but for brick walls.	1	m3		0	0	0.0000	INR Zero Only
118.15	Drilling of hole under Road for laying of Pipe for Cable pulling							
118.16	100 NB Dia.	10	Mtrs.		0	0	0.0000	INR Zero Only

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118.17	150 NB Dia.	10	Mtrs.		0	0	0.0000	INR Zero Only
119.00	<b>CAPACITOR BANK</b>							
119.10	Installation, Testing & Commissioning of Capacitor Bank alongwith VCB, RVT, series reactor, Control Panel, APFC Relay, HT vacuum contactor, HT Fuse, Relays etc. complete in all respect.							
119.11	500 KVAR Capacitor bank (2 Steps of 250KVAR each)	2	Sets		0	0	0.0000	INR Zero Only
120.00	<b>DC SYSTEM</b>							
120.10	Installation & Commissioning of medium discharge Nickel Cadmium type, 110 V, 80 AH battery bank with 50 A Battery Charger complete with one no. cell booster as per specification in Technical specification - Electrical System (Doc No. PC150/E/111/P-II/Sec-5.0), Technical Specification - Battery Charger (Doc. No. PC150-TS-0810) and Technical Specification - Battery (Doc. No. PC150-TS-0811). The item includes batteries batteries with all acesories including Battaery Stand; Main Float cum Load cum Boost charger, Standby Float cum Load cum Boost charger; interconnecting Power copper cables, insulated copper links, earthing of battery Charger and battery stand, connection and termination of power and control cables of battery charger, battery bank and etc., supply of double compression rolled aluminium cable glands and suitable cable lugs (Bi metallic), 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 Engineer-in-Charge.	1	Set		0	0	0.0000	INR Zero Only
121.00	<b>FCMA Starter</b>							
121.10	Installation, Testing & Commissioning of 3.3 KV FCMA Starter with Vacuum Contactors, HT Fuses, Metering etc. for 3.3 kV Motors for Water Pumps complete in all respect .	4	Set		0	0	0.0000	INR Zero Only
122.00	<b>LOCAL CONTROL STATION ( LCS )</b>							
122.10	Installation & Commissioning of Weather Proof Local Control Station of following type.							
122.11	LCS with Trip-Neutral-Close control switch, Local-OFF-Remote Selector Switch with Ammeter & 5 nos. indication lamp	4	Set		0	0	0.0000	INR Zero Only
123.00	<b>EXHAUST FANS</b>							
123.10	Installation & Commissioning of single phase exhaust fan with guards/ louvers, along with necessary brackets, all required civil works, making good the walls after fixing the fans etc.							
123.11	450 mm sweep heavy duty exhaust fan with self opening louvers.	14	Nos		0	0	0.0000	INR Zero Only
123.12	Installation & Commissioning of single phase flameproof chemical resistant industrial exhaust fan (suitable for use in hazardous area Zone-1) with guards/ louvers, along with necessary brackets, all required civil works, making good the walls after fixing the fans etc.							
123.13	300 mm sweep heavy duty exhaust fan.	2	Nos		0	0	0.0000	INR Zero Only
123.14	Installation & Commissioning 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	2	Nos.		0	0	0.0000	INR Zero Only
124.00	<b>MISCELLANEOUS</b>							

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124.10	Fixing of Caution boards / dangers boards written in ENGLISH & HINDI of the following voltages.							
124.11	33 KV	2	Nos.		0	0	0.0000	INR Zero Only
124.12	3.3 KV	2	Nos.		0	0	0.0000	INR Zero Only
124.13	415 Volts	5	Nos.		0	0	0.0000	INR Zero Only
124.14	Fixing of shock treatment chart written in English and Local language duly framed and approved by engineer-in-charge.	5	Nos.		0	0	0.0000	INR Zero Only
124.15	Fixing of Do & Don't chart as per Indian Electricity Rules in Aluminum frame with glass	2	Nos.		0	0	0.0000	INR Zero Only
124.16	Fixing of S/S Single Line Diagram in Aluminum frame with glass.	1	No.		0	0	0.0000	INR Zero Only
124.17	Installation of portable CO2 type fire extinguisher (4.5 liter capacity).	4	Nos.		0	0	0.0000	INR Zero Only
124.18	Installation of Sand buckets with stand (each with at least 3 sand buckets).	4	Nos.		0	0	0.0000	INR Zero Only
124.19	Fixing of CPR (CARDIO PULMONARY RESUSCITATION) Charts.	2	Nos.		0	0	0.0000	INR Zero Only
124.20	Fixing of High Voltage danger signage (Skull & bones).	10	Nos.		0	0	0.0000	INR Zero Only
124.21	Fixing of Exit Route / Emergency Exit Route Signage.	2	Nos.		0	0	0.0000	INR Zero Only
124.22	Fixing of synthetic insulating mats in front of various panel boards as per directions of engineer-in-charge including supply of all consumables for fixing.							
124.23	33KV Voltage grade having nominal thickness of 3.0 mm ± 10% Class C	6	Mtrs.		0	0	0.0000	INR Zero Only
124.24	Up to 3.3KV Voltage grade having nominal thickness of 2.0mm ± 10% Class A	40	Mtrs.		0	0	0.0000	INR Zero Only
124.25	Grouting and Installation of Cable Route Marker	3	Nos.		0	0	0.0000	INR Zero Only
124.26	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.	4	No.		0	0	0.0000	INR Zero Only
124.27	Installation and commissioning of 32 Amps D.P./ 63/ 125A T.P.N. switch/ Welding receptacles/ Photocell Switch/ Energy Meter/ Telephone DP or other equipment of equivalent size in box on suitable angle iron frame or in a M.S. Box including grouting on walls or welding with structure.	5	No.		0	0	0.0000	INR Zero Only
124.28	Installation, Testing & Commissioning of 4 pole structure with required bracing, cross arm etc for supporting the pin/strain type insulators, , GOD, DO fuses (3No) with necessary 33 kV 10KA Station class lightening arresters, trifurcating cable box, CT, PT, , Insulators, Jumpers, Guy wires as requiredAnti climbing device, Danger board etc. , Outdoor cubical type Metering Panel with Trivector Meter as per CESU requirement , suitable for receiving power from State Electricity Board CESU as per enclosed specifications, codes, standards, SLD, CESU guidelines etc. and complete in all respect.	2	Sets		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/NCB

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124.29	Testing and commissioning of 3-Phase, Squirrel Cage, Weatherproof 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 Owner's Engineer-in-charge. (Contractor to keep proper record of tests on motors for NO LOAD & ON LOAD runs).							
124.30	3.3 kV Motors of Rating upto 1000 KW	4	Nos.		0	0	0.0000	INR Zero Only
125.00	<b>EXCAVATION AND BACK FILLING</b>							
125.10	Excavation 300 mtr. length x 1000 mm wide x 1250 mm deep and 7000 mtr. Length x 300 mm x 750 mm deep for laying of cables including disposal of excavated earth, lead up to 100 mtrs. and lift up to 1.5 mtrs., disposed earth to be levelled and neatly dressed	110	M3		0	0	0.0000	INR Zero Only
125.11	Back filling with excavated earth in trench including consolidating each deposited layer by ramming, dressing etc.	100	M3		0	0	0.0000	INR Zero Only
126.00	<b>FINE RIVER SAND</b>							
126.10	Spreading of approved fine river sand in cable trenches up to a depth of 250 mm (100 mm below the centre line of cable and 150 mm above cable the centre line of cable) including all labour and materials to make the installation complete in all respect as per approved drawings, specifications and directions of engineer-in-charge.	10	M3		0	0	0.0000	INR Zero Only
127.00	<b>BRICKS</b>							
127.10	Spreading of approved first class bricks of 4 inch thickness in cable trenches for cable protection including all labour and materials to make installation complete in all respect.	3500	Nos.		0	0	0.0000	INR Zero Only
127.11	Dismantling of Electrical equipments in the existing Pump House Area and shifting of same as per direction of Engineer-in-charge.	6	MT		0	0	0.0000	INR Zero Only
128.00	<b>Installation of Hume Pipes of following sizes:-</b>							
128.10	200 mm Dia.	5	Mtr.		0	0	0.0000	INR Zero Only
128.11	100 mm Dia.	5	Mtr.		0	0	0.0000	INR Zero Only
128.12	Installation, testing and commissioning of 230 V AC, 2 KVA Parallel Redundant UPS System with UPS Distribution Board (with 2 Nos. Incomers with MCCB, Ammeter, Voltmeter, Frequency meter, Indication Lights with Static Switch) and 10 Nos. Outgoing Feeders (with DP MCB) to feed power supply to the instrumentation system etc. This UPS System shall be complete with 2 x 100% Ni-Cd Battery with backup of 5 Hours and other accessories.	1	Set		0	0	0.0000	INR Zero Only
128.13	Installation, testing and commissioning of hose proof & weatherproof, Wall/ Structure mounted 24 V DC Power Supply Unit of 100 VA Rating (IP-65 degree of protection) with inbuilt choppers and other accessories suitable for Single 110 V DC Input and Single 24 V DC Output of reputed make.	4	Sets		0	0	0.0000	INR Zero Only

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Contract No: PNP/PC-150/E/121/NCB

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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>
128.20	Installation, testing and commissioning of SCR based Soft Starter for 3.3. kV Motors for Raw Water Pumps Each Soft Starter shall be suitable for Starting of 1 Nos. Motors. with Bypass Facility from Motor Feeders of 3.3 kV Switchboard.	4	Sets		0	0	0.0000	INR Zero Only
129.00	<b>deleted</b>							
130.00	<b>Schedule of Rates For Temporary &amp; Permanent Cathodic Protection System</b>							
130.10	Basic surveys, Design, Detailed Engineering, Supply, testing at works, transportation on FOT Project site in well packed condition, Storage at site, transportation to work place, Physical verification/ inspection at site, Installation, testing ,commissioning of TCP & PCP system for underground steel pipeline network of 36"dia, 3LPE Coated Pipelines which shall includes but not limited to MMO anodes, Cables, Deep well anode ground beds, TR units, AJB, CJB, Sacrificial Mg anode, Zn ribbon anodes for casing protection, Type A/A1/B/C/D/E/F/G Test Stations, Cu/CuSO4 reference electrode, Spark gap surge diverter with Zinc grounding cell for Monolithic insulating/insulating flange joint, Zinc Grounding Anodes & Solid State Polarisation cell for HT Electric Line Crossing, Thermit Weld Kit along with all accessories for 25/06/10 sq.mm cable to pipe connection including all work labour, materials, hardwares, civil masonry & structural materials. Scope shall also include Supply of tools and equipments for Erection, Pre commissioning & Commissioning activities, Supply of Mandatory Spares etc. Further scope shall also includes Post Commissioning CP surveys like CIPL, DCVG, AC/DC interference detection & mitigation Survey etc, supply and installation of mitigative measures in order to achieve adequate level of protection as per NACE criteria, TCP system monitoring for 24 weeks from date of commissioning of TCP, Monitoring of complete PCP for 3 month from date of commissioning, complete with all work, labour, materials, hardware, civil masonry & structural materials. Above activities shall be as per Technical Specification for Electrical System (PC150/E/111/) and its attachments Technical Specification - Cathodic Protection Power Supply Module (CPPSM) (PC150-TS-0817), Technical Specification - Cathodic Protection Transformer Rectifier Unit (PC150-TS-0818), Technical Specification - Impressed Current Cathodic Protection System (PC150-TS-0819), drawings and instruction of Owner's Engineering-charge.							
130.11	Specified Size Thk (inch) Material Coating Type (inch) 36" CS 3LPE COATING``	13000	Mtrs		0	0	0.0000	INR Zero Only
131.00	<b>deleted</b>							
132.00	<b>deleted</b>							
133.00	<b>PART D</b>							
134.00	<b>SCHEDULE OF RATES FOR CIVIL WORKS</b>							
135.00	<b>DREDGING WORKS, BATHYMETRIC &amp; PIPELINE ROUTE SURVEY</b>							

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135.10	Dredging and desilting of sediments/materials/ Aquatic plants viz: hydrilla, water hyacinth, duck weed, trash etc., and deepening the Brahmani river in and around the Intake well and intake channel bed, upto a depth of 1.5 m below minimum water level required for intake well, using Cutter Suction dredger. Dismantling and desiltation of the natural spur formed u/s of intake well. De-silting by dredging shall be carried out in approx. 2.5 hectares of area demarcated in the Brahmani river and adjoining land and disposing the dredged materials up to a distance of 2.5 km. With inclusive of soils such as sand, silt mixed with/without clay or soft clay. Including Mobilization of equipment, loading and transporting complete in all respect and as per direction of Engineer-in-Charge.	100000	Cu.M		0	0	0.0000	INR Zero Only
135.11	Bathymetric Survey in and around intake well up to the required depth to ascertain the quantity of river bed material prior to an after dredging work at a suitable grid interval, as decided by EIC, is to be done.	1	LS		0	0	0.0000	INR Zero Only
136.00	<b>ARCHITECT PLANNER</b>							
136.10	Engagement of the services of Architect Planner for the renovation work of the existing structure as well new structures (inclusive of supply of materials and services)	1	LS		0	0	0.0000	INR Zero Only
137.00	<b>EARTH WORKS</b>							
137.10	Excavation to required side slopes below ground level in all kinds of soils as defined in IS: 1200 for foundations, isolated pits, trenches for pipelines /cables, pipe sleepers, drains, etc., to the required levels and grades in both dry and wet conditions, including de-watering of accumulated water from any source, dressing of sides and ramming of bottoms, getting out excavated earth with lift upto 1.50 M and disposal of surplus excavated materials within a lead of 500 M including stacking in layer not exceeding 20 cm, levelling and dressing etc., including providing temporary supports to all service lines such as overhead and underground water, sewage and drain pipes, cables etc. and shoring and strutting including dewatering wherever necessary, complete in all respects as per direction of Engineer-in-Charge.	2000	Cu.M		0	0	0.0000	INR Zero Only
137.11	Lift from 1.5 M to 3.0 M.	2000	Cu.M		0	0	0.0000	INR Zero Only



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137.12	Locating and survey of existing 900mm buried concrete pipeline and other facilities in the ROU, obtaining work permits/NOC from various statutory authorities having jurisdiction before execution of the work, and complying with all stipulations/conditions/recommendations of the authorities; cleaning & grading of the ROU; Counting the number and type of trees cut in presence of DFO/concerned authorities and keeping record thereof; cutting/uprooting of trees within ROU, shifting of all obstruction within the ROU/pipeline route alignment viz. electrical line/pole, telephone line (poles), foreign pipeline, coordination with concerned authorities and obtaining work permits/NOC from these authorities, surveys for crossings;trenching to all depths including excavation in all types of soils including chiseling as required for removal of the existing buried pipeline, including removal of pipe casings, valves, deployment of required equipments, machinery & manpower, carrying out necessary co-ordination, liason & interface with local people & other agencies, providing temporary access way/ pathway for local people (as required); Arrangement of all additional land required for contractors storage, access to construction; supply of all materials, consumables; carrying out cutting, lifting, removal , transportation, handling, including loading and unloading of existing pipeline including deployment of trailers, trucks, equipments & cranes; transportation and disposal of the unserviceable excavated concrete pipes up to authorized dumping ground as decided by EIC, stacking of serviceable concrete pipes within plant battery limit/as per decesion of EIC, including suitable end blinding of the pipeline sections at crossings or sections where pipeline are not/cannot be removed; carrying out all temporary , ancillary , auxiliary works and all incidental & associated works not indicated herein but required to complete the work as per scope of work, specifications, standards, drawings and other provisions of the contract & instructions of Engineer-in-charge.	13000	RM		0	0	0.0000	INR Zero Only
137.13	Disposal : Removal and carriage of surplus excavated earth, debris, etc., from the site of work to dump yard as per instructions of EIC, beyond the initial lead of 500 M and spreading and levelling the same in layers not exceeding 20 cm thickness including loading and unloading as per the direction of Engineer-in-Charge.	1000	Cu.M		0	0	0.0000	INR Zero Only
137.14	Same as item No. 137.13, but for lead distance up to 5-10 km	1000	Cu.M		0	0	0.0000	INR Zero Only
137.15	Same as item No. 137.13, but for lead distance up to 10-20 km	1000	Cu.M		0	0	0.0000	INR Zero Only
137.16	Backfilling: 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 etc., at all depths in layers not exceeding 20cm. in thickness including consolidating and dressing each deposited layer by ramming and watering with lead upto 50 metres, complete in all respects.	867	Cu.M		0	0	0.0000	INR Zero Only
137.17	Banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with ½ tonne roller, or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up, in embankments for roads, flood banks, marginal banks, and guide banks, reservoirs etc., lead upto 50 m and lift upto 1.5 m : - All kinds of soil	300	Cu. M		0	0	0.0000	INR Zero Only
137.18	Dry stone pitching 22.5 cm thick including supply of stones and preparing surface complete.	500	Sq.m		0	0	0.0000	INR Zero Only
138.00	<b>PLAIN CEMENT CONCRETE (PCC)</b>							

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138.10	Providing and laying Plain Cement Concrete (PCC) of 1:4:8 (1 cement: 4 coarse sand: 8 graded stone aggregate 20 mm nominal size), machine mixed and mechanically vibrated in foundations and plinth beams, for rafts, footings, bases of pedestals, trenches and pits, machine and equipment foundations, pile caps, pipe supports, etc., including all necessary cost of centering and shuttering, complete in all respects as per direction of Engineer-in- Charge.	34	Cu.M		0	0	0.0000	INR Zero Only
138.11	Providing and laying Plain Cement Concrete (PCC) of 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size), machine mixed and mechanically vibrated in foundations and plinth beams, for rafts, footings, bases of pedestals, trenches and pits, machine and equipment foundations, pile caps, pipe supports, etc., including all necessary cost of centering and shuttering, complete in all respects as per direction of Engineer-in- Charge.	45	Cu.M		0	0	0.0000	INR Zero Only
139.00	<b>REINFORCED CEMENT CONCRETE (RCC)</b>							
139.10	Providing and laying in position reinforced cement concrete in columns, beams etc. including the cost of centering, shuttering, finishing but excluding reinforcement - All work above plinth level							
139.11	Design mix M20 grade concrete	50	Cu.M		0	0	0.0000	INR Zero Only
139.12	Design mix M25 grade concrete	250	Cu.M		0	0	0.0000	INR Zero Only
139.13	Design mix M30 grade concrete	100	Cu.M		0	0	0.0000	INR Zero Only
139.14	Providing and laying in position reinforced cement concrete in foundations, walls, plinth beams etc. including the cost of centering, shuttering, finishing but excluding reinforcement - All work up to plinth level							
139.15	(1) Design mix M20 grade concrete	130	Cu.M		0	0	0.0000	INR Zero Only
139.16	(2)Design mix M25 grade concrete	140	Cu.M		0	0	0.0000	INR Zero Only
139.17	(3)Design mix M30 grade concrete	50	Cu.M		0	0	0.0000	INR Zero Only
139.18	Repairing & Renewing existing RCC/Cement concrete works in patches including chipping / dismantling the damaged portion to required depth/thickness and re-doing the same with rich cement concrete/cement mortar and making good the same as the existing shape. Including scaffolding, centering, shuttering and disposal of unserviceable material within 500 metres leads.etc. Complete in all respects as per direction of Engineer-in- Charge.	20	Cu.M		0	0	0.0000	INR Zero Only
139.19	Grading roof for water proofing treatment with - Cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)	20	Cu.M		0	0	0.0000	INR Zero Only
139.20	Neat cement punning.	500	Sq.m		0	0	0.0000	INR Zero Only
140.00	<b>REINFORCEMENT AND EMBEDMENTS</b>							
140.10	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete with hot rolled, cold twisted, weldable high yield deformed CRSD (Corrosion Resistance Steel with Fe500D properties) rebar having Characteristic yield strength 500N/mm <sup>2</sup> ,in accordance with IS:1786. (Fe 500 of only TATA/SAIL/JSW/RINL/SHYAM STEEL make steel to be used)	71	MT		0	0	0.0000	INR Zero Only

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140.11	Anchor Bolts: Supplying, fabricating and fixing in position M.S. holding down bolts assembly consisting anchor bolts, heads, nuts, washers etc., and the like including embedding in cement concrete/R.C.C. works including one coat of approved quality anti-corrosive paint over a coat of approved quality primer. (All material supply is in contractor's scope.)	500	Kg.		0	0	0.0000	INR Zero Only
140.12	Insert Plates: Supplying, fabricating, erecting and fixing in position to line and level all M.S Inserts such as anchor plates, angles, tees, channels, plates with lugs, hooks, sleeves etc. embedding in cement concrete /R.C.C. works at all levels including welding, bolting, drilling, cutting, scaffolding, holding in position, providing one coat of approved anti-corrosive paint and / or Bituminous paint on exposed surfaces, etc. all complete in all respects and as per direction of Engineer-in-Charge.(Templates if any required for fixing the inserts will not be paid for).	1000	Kg		0	0	0.0000	INR Zero Only
141.00	<b>STRUCTURAL STEEL</b>							
141.10	Supplying, de-rusting by shot blasting fabricating, erecting, hoisting and fixing in position structural steel work in rolled steel joints, channels, angles tees, flats, plates, lattice members built up / compound sections in columns, portals, girders, beams, bracings, trusses, Purlins, rafters, staircase, steps, hand-railings, walkway, toe plates, side walling, trestles, Conveyor gantries, screens etc. including gusset plates, anchor plates etc., including site and shop fasteners, riveting, bolting, welding at shop or work site at all heights etc. & epoxy painting complete direction of Owner / Consultant. (All material supply is in contractor's scope including paints)							
141.11	With providing and applying two coats of chlorinated rubber based high build zinc phosphate primer of approved brand and manufacture compatible to chlorinated rubber paint at a dry film thickness of 50 micron per 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 on structural steel work complete in all respects as per specifications and direction of Engineer-in-Charge.	20	MT		0	0	0.0000	INR Zero Only
141.12	Providing and fixing rolling shutters of approved make made of 80 mm wide MS laths and interlocked together through their entire length and jointed together at the ends by end locks, mounted on specially designed pipe shaft with bracket plates, guide channels and arrangement for inside and outside locking with push-pull operation complete including cost of wire spring and hood cover for the shutters and painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade - new work with two coats including a coat of approved steel primer and a coat of mordant solution with 38 gms of copper acetate in a litre of soft water.	200	Sq.m		0	0	0.0000	INR Zero Only
141.13	Extra for providing mechanical device chain and crank operation for operating rolling shutters. - Exceeding 16.80 sqm in the area	50	Sq.m		0	0	0.0000	INR Zero Only
141.14	Structural steel work in single section/built up section, fixed with or without connecting plate, including cutting, hoisting, fixing in position and painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade - new work with two coats including a coat of approved steel primer and a coat of mordant solution with 38 gms of copper acetate in a litre of soft water.	15600	Kg.		0	0	0.0000	INR Zero Only

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141.15	Steel work welded in built up sections/ framed work/MS Screens for Sluice Gates/trash racks, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required. - In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works	500	kg		0	0	0.0000	INR Zero Only
141.16	Providing mechanical device chain and crank operation for lifting mechanism - for above	2	LS		0	0	0.0000	INR Zero Only
141.17	Providing, fabricating and fixing in position double leaf transformer 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 plates welded to insert plates embedded in RCC columns, bolts and nuts for hinge etc. including surface preparation by shot blasting/power driven brushes, providing and applying painting, complete in all respects as per drawings and direction of Engineer-in-Charge							
141.18	With providing and applying two coats of high build zinc phosphate primer of approved brand and manufacture compatible to chlorinated rubber paint at a dry film thickness of 50 micron per 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.	8	MT		0	0	0.0000	INR Zero Only
142.00	<b>BRICK WORK, PLASTERING &amp; FINISHING</b>							
142.10	Providing and constructing Brick work with non modular fly ash bricks conforming to IS:12894, class designation 10 average compressive strength in 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.	147	Cu.M		0	0	0.0000	INR Zero Only
142.11	Supplying and providing coarse rubble stone masonry (300 Thick) in cement mortar 1: 6 ( 1 cement: 6 coarse sand) on sloping surfaces of earthen embankment at all heights above ground bed level, complete in all respect and as per direction of Engineer-in-Charge.	500	Sq.M		0	0	0.0000	INR Zero Only
142.12	Repairs to plaster of thickness 12 mm to 20 mm in patches of area 2.5 sq. meters and under, including cutting the patch in proper shape, raking out joints and preparing and plastering the surface of the walls complete, including disposal of rubbish to the dumping ground, all complete as per directions of Engineer-In-Charge. - With cement mortar 1:4 (1 cement : 4 fine sand)	598	Sq.M		0	0	0.0000	INR Zero Only
142.13	12 mm thick cement plaster 1:6 (1 cement: 6 fine sand) after properly cleaning etc. as per instruction of PDIL Engineer.	854	Sq.M		0	0	0.0000	INR Zero Only
142.14	15 mm thick cement plaster 1:6 (1 cement: 6 fine sand) after properly cleaning etc. as per instruction of PDIL Engineer.	1000	Sq.M		0	0	0.0000	INR Zero Only
142.15	6mm thick cement plaster to ceiling of mix 1:3 (1 cement: 3 fine sand).	775	Sq.M		0	0	0.0000	INR Zero Only

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142.16	Providing and applying two (2) coats of Oil bound washable distemper paint over Interior walls of plastered surfaces as per IS 161, of approved manufacturer and in approved shades, including cleaning and preparing the wall surface, one layer of primer with distemper primer, curing, labour, material, scaffolding, equipment, handling, transportation etc. Cleaning stain from floors, walls, glass panes etc. all complete as per instructions of the Engineer. etc.at all elevations.							
142.17	On new work	500	Sq.M		0	0	0.0000	INR Zero Only
142.18	On old work	1350	Sq.M		0	0	0.0000	INR Zero Only
142.19	Providing and applying two (2) coats of Acrylic smooth of approved make (Asian/ Nerolac/ Berger or equivalent) as per IS 15489 of approved manufacture, quality and shades over exterior walls including labour, materials, equipment, handling, transportation, finishing, scaffolding and preparing the surface etc. Cleaning stain from floors, walls, glass panes etc. all complete instructions of the Engineer at all elevations. Roller to be used in the paint application.							
142.20	On new work	500	Sq.M		0	0	0.0000	INR Zero Only
142.21	On old work	700	Sq.M		0	0	0.0000	INR Zero Only
142.22	Painting with synthetic enamel paint of approved brand and manufacture including a coat of approved primer, of required colour to give an even shade.	1000	Sq.M		0	0	0.0000	INR Zero Only
142.23	Providing and applying plaster of paris putty of 2 mm thickness over plastered surface to prepare the surface even and smooth complete.	9700	Sq.M		0	0	0.0000	INR Zero Only
142.24	Distemping with dry distemper of approved brand and manufacture (two or more coats) of required shade on new work, over and including water thinnable priming coat to give an even shade.	1000	Sq.M		0	0	0.0000	INR Zero Only
143.00	<b>FENCING (MESH) &amp; PAVER BLOCK</b>							
143.10	Providing and fixing G.I. chain link fabric fencing 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. - Made of G.I. wire of dia 4 mm	50	Sq.M		0	0	0.0000	INR Zero Only
143.11	Providing and fixing concertina coil fencing with punched tape concertina coil 600 mm dia 10 metre openable length ( total length 90 m), having 50 nos rounds per 6 metre length, upto 3 m height of wall with existing angle iron 'Y' shaped placed 2.4m or 3.00 m apart and with 9 horizontal R.B.T. reinforced barbed wire, stud tied with G.I. staples and G.I. clips to retain horizontal, including necessary bolts or G.I. barbed wire tied to angle iron, all complete as per direction of Engineer-in-charge, with reinforced barbed tape(R.B.T.) / Spring core (2.5mm thick) wire of high tensile strength of 165 kg/ sq.mm with tape (0.52 mm thick) and weight 43.478 gm/ metre (cost of M.S. angle, C.C. blocks shall be paid separately)	50	RM		0	0	0.0000	INR Zero Only

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143.12	Providing and laying factory made chamfered edge Cement Concrete paver blocks In foot path, park & lawns driveway 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 course 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, all complete as per manufacturer's specifications & direction of Engineerin-Charge. - 80mm thick Cement concrete paver block of M-30 grade with approved colour, design & pattern.	500	Sq.M		0	0	0.0000	INR Zero Only
144.00	<b>FLOORING</b>							
144.10	Providing and laying TRIMIX RCC of grade M25 machine mixed, mechanically vibrated and fair finish the surface with heavy duty ironite floor topping (as per manufacturer specification) in panel not more than 3.0 m x 3.0 m, including cost of shuttering & curing but excluding cost of reinforcement.	300	Sq.M		0	0	0.0000	INR Zero Only
144.11	Providing and laying Vitrified finish ceramic floor tiles on skirting made from tiles 600mm x 600mm (thickness to be specified by manufacturer) of height 100mm of first quality tiles conforming to IS:15622 of KAZARIA, NAVEEN, NITCO, ORIENT, SOMANY or equivalent make in all colours, shade and design as approved by E.I.C. laid on 20mm thick cement mortar 1:4 (1 cement: 4 coarse sand) including pointing the joints with white cement and matching pigment of matching shade complete in all respect at any level.	50	Sq.M		0	0	0.0000	INR Zero Only
144.12	Providing and laying 1st quality ceramic glazed tiles 300mm x 300mm conforming to IS: 15622 of minimum thickness 5mm of approved make like KAJARIA, NITCO, ORIENT, SOMANY or equivalent make on walls in all colours, shade and design as approved by E.I.C. over 12mm thick bed of cement mortar 1:3 (1 cement: 3 coarse sand) and jointing with grey cement slurry @ 3.3Kg per Sq.m. including pointing in white cement mixed with pigment of matching shade complete.	100	Sq.M		0	0	0.0000	INR Zero Only
144.13	IPS Flooring: Providing and laying in position at all heights cement concrete mix 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate) in panels of 2 metre square or as directed and finished with floating coat of neat cement including providing cement slurry ( with cement @ 2.2 kg/sq.m.), rounding of edges and glass strips but excluding the cost of nosing of steps etc., complete : - 40 mm. thick with 20.0 mm nominal size stone aggregate	300	Sq.M		0	0	0.0000	INR Zero Only
144.14	Making Plinth protection 50mm thick of cement concrete 1:3:6 (1 cement: 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over 75mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including necessary excavation, levelling & dressing & finishing the top smooth.	550	Sq.M		0	0	0.0000	INR Zero Only
145.00	<b>SANITARY INSTALLATION</b>							
145.10	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, 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 with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in Charge. Concealed work, including cutting chases and making good the walls etc.							
145.11	15 mm nominal outer dia pipes	100	R.M.		0	0	0.0000	INR Zero Only

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145.12	20 mm nominal outer dia pipes	100	R.M.		0	0	0.0000	INR Zero Only
145.13	Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion, Single socketed pipes.							
145.14	75 mm dia.	100	R.M.		0	0	0.0000	INR Zero Only
145.15	100 mm dia.	100	R.M.		0	0	0.0000	INR Zero Only
145.16	Providing and fixing vitreous china wash basin of Parryware or approved make and colour with C.I. brackets 15mm C.P. brass Pillar taps Jaquar, no.011, 32 mm C.P. brass waste of standard pattern , including painting of fittings and C.I. brackets, cutting and making good the walls wherever required. White Vitreous China Wash basin size 630 x 450 mm with a pair of 15 mm C.P. brass pillar taps	2	Nos.		0	0	0.0000	INR Zero Only
145.17	Providing and fixing white vitreous china pedestal type water closet (European type W.C. pan) of Cera make or equivalent with seat and lid, 10 litre low level white PVC flushing cistern with manually controlled device conforming to IS: 7231 with all fittings and fixtures complete including cutting and making good the walls and floors wherever required, including providing and fixing jet to W.C. Pan(European). - W.C. pan with ISI marked white solid plastic seat and lid	1	No.		0	0	0.0000	INR Zero Only
145.18	Providing and fixing C.P. brass bib cock of Jaquar / Cera / Hindware / Parryware or equivalent make, chrome finish of approved quality and 15 mm nominal bore.							
145.19	Long body bib cock	10	Nos.		0	0	0.0000	INR Zero Only
145.20	Short body bib cock	10	Nos.		0	0	0.0000	INR Zero Only
145.21	Providing and fixing C.P. brass angle valve, 15 mm nominal bore of Jaquar make no.053 chrome finish or equivalent for Wash basins, urinals etc. of approved quality conforming to IS:8931	5	Nos.		0	0	0.0000	INR Zero Only
145.22	Providing and fixing toilet paper holder C.P. brass of approved make Jaquar / Cera / Hindware / Parryware or equivalent chrome finish.	5	Nos.		0	0	0.0000	INR Zero Only
145.23	Providing and fixing PTMT liquid soap container 109mm wide, 125mm high and 112mm distance from wall of standard shape with bracket of the same material with snap fitting of approved colour and make, complete in all respect.	5	Nos.		0	0	0.0000	INR Zero Only
145.24	Providing and fixing PVC waste pipe 32mm or 40mm rigid with elbow, tee, reducer etc. as required to complete in all respect to wash basin etc.	5	Nos.		0	0	0.0000	INR Zero Only
145.25	Providing and fixing CP Jalli of approved make for traps.	10	Nos.		0	0	0.0000	INR Zero Only
145.26	Providing and fixing brass ferrule with C.I. mouth cover including boring and tapping the main : - 20 mm nominal bore	10	Nos.		0	0	0.0000	INR Zero Only
145.27	Providing and placing on terrace (at all floor levels) polyethylene water storage tank, IS : 12701 marked, with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.	1000	Per Litre		0	0	0.0000	INR Zero Only

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145.28	Providing and construction of septic tank 2.0x0.9x2.0M (Inner Dimension) and soakpit 0.75x0.75x3.0M (Honey Comb Shaft Dimension) in all respect as per scope of work, technical specification and direction of the engineer-incharge Rate to include cost of following item:- 1) Execavation and backfilling 2) 230 thk. Brick work.in cement mortar 1:6 3) 100thk RCC top slab with 300 dia C.I.cover 3) Bedding PCC (1:2:4) 4) 15th Plaster in Cement mortar 1:6 5) Chemical resistant Paint 6) Supplying and Filling of material such as Gravel, Coarse aggregate, Etc and complete in all respect	1	No.		0	0	0.0000	INR Zero Only
145.29	Providing and fixing white vitreous china flat back half stall urinal of size 580x380x350 mm with white PVC automatic flushing cistern, with fittings, standard size C.P. brass flush pipe, spreaders with unions and clamps (all in C.P. brass) with waste fitting as per IS : 2556, C.I. trap with outlet grating and other couplings in C.P. brass,including painting of fittings and cutting and making good the walls and floors wherever required : - Range of two half stall urinals with 5 litre P.V.C. automatic flushing cistern	2	Nos.		0	0	0.0000	INR Zero Only
145.30	Providing and fixing water closet squatting pan (Indian type W.C. pan ) with 100 mm sand cast Iron P or S trap, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever) conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required: - White Vitreous china Orissa pattern W.C. pan of size 580x440 mm with integral type foot rests	1	No.		0	0	0.0000	INR Zero Only
145.31	Providing and fixing PTMT towel ring trapezoidal shape 215 mm long, 200 mm wide with minimum distances of 37 mm from wall face with concealed fittings arrangement of approved quality and colour, weighing not less than 88 gms.	2	Nos.		0	0	0.0000	INR Zero Only
145.32	Providing and fixing PTMT swivelling shower, 15 mm nominal bore, weighing not less than 40 gms	2	Nos.		0	0	0.0000	INR Zero Only
145.33	Providing and fixing bevelled edge mirror of superior glass (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 screws and cup washers etc. All complete as per the directions of engineer In-charge.	2	Nos.		0	0	0.0000	INR Zero Only
145.34	Providing Gola 75mm x 75mm in cement concrete 1:2:4 (1cement: 2 coarse sand: 4 stone aggregate 10mm and down grade) including finishing with cement mortar 1:3 (1 cement: 3 fine sand) as per standard design. - In 75 x 75 mm deep chase	20	R.M		0	0	0.0000	INR Zero Only
145.35	Providing and fixing trap of self cleansing design with screwed down or hinged grating with or without vent arm complete, including cost of cutting and making good the walls and floors : - PVC make, 100 mm inlet & 100 mm outlet (Sand cast iron S&S as per IS: 3989)	5	Nos.		0	0	0.0000	INR Zero Only
145.36	Providing and fixing CP Brass 32mm size Bottle Trap of approved quality & make and as per the direction of Engineer-in-charge.	5	Nos.		0	0	0.0000	INR Zero Only
145.37	Providing and fixing PTMT extension nipple for water tank pipe, fittings of approved quality and colour. - 25mm nominal bore, weighing not less than 62 gms.	5	Nos.		0	0	0.0000	INR Zero Only



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145.38	Providing and fixing PTMT stop cock of approved quality and colour - Concealed stop cock, 15 mm nominal bore, 108 mm long, weighing not less than 108 gms	5	Nos.		0	0	0.0000	INR Zero Only
146.00	<b>DOORS, WINDOWS AND VENTILATORS</b>							
146.10	Providing and fixing aluminium work for doors, windows, ventilators and partitions 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) - <b>For Fixed Portion - Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC 15)</b>	1473	kg.		0	0	0.0000	INR Zero Only
146.11	For shutters of doors, windows & ventilators 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:- Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC 15).	960	kg.		0	0	0.0000	INR Zero Only
146.12	Providing and fixing 12 mm thick prelaminate particle board flat pressed three layer or graded wood particle board conforming to IS: 12823 Grade I Type II, in panelling fixed in aluminum doors, windows shutters and partition frames with C.P. brass / stainless steel screws etc. complete as per architectural drawings and directions of engineer-in-charge. - <b>Pre-laminated particle board with decorative lamination on one side and balancing lamination on other side</b>	23	Sq.M.		0	0	0.0000	INR Zero Only
146.13	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>	28	Sq.M.		0	0	0.0000	INR Zero Only
146.14	Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in-charge. - <b>With brass cover plate minimum 1.25 mm thickness</b>	8	No.		0	0	0.0000	INR Zero Only
146.15	Providing and fixing aluminium tower bolts, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868 ) transparent or dyed to required colour or shade, with necessary screws etc. Complete.							
146.16	200x10 mm	10	No.		0	0	0.0000	INR Zero Only
146.17	150x10 mm	10	No.		0	0	0.0000	INR Zero Only
146.18	100x10 mm	10	No.		0	0	0.0000	INR Zero Only

**Item Rate BoQ**

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/NCB

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146.19	Providing and fixing Brass 100mm mortice latch and lock with 6 levers without pair of handles (best make of approved quality) for aluminium doors including necessary cutting and making good etc. complete.	15	No.		0	0	0.0000	INR Zero Only
146.20	Providing and fixing aluminium handles, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. Complete.							
146.21	125 mm	15	No.		0	0	0.0000	INR Zero Only
146.22	100mm	7	No.		0	0	0.0000	INR Zero Only
146.23	Providing and fixing aluminium sliding door bolts, ISI marked anodised (anodic coating not less than grade AC 10 as per IS : 1868), transparent or dyed to required colour or shade, with nuts and screws etc. complete : 250 mm x 16 mm	15	No.		0	0	0.0000	INR Zero Only
146.24	30 mm thick factory made Polyvinyl Chloride (PVC) door shutter made of styles and rails of a uPVC hollow section of size 60x30 mm and wall thickness 2 mm (± 0.2 mm), with inbuilt decorative moulding edging on one side. 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 25x20 mm and 1 mm (± 0.1 mm) wall thickness. The lock rail made up of 'H' section, a uPVC hollow section of size 100x30 mm and 2 mm (± 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 620 mm, 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.	20	Sq.M.		0	0	0.0000	INR Zero Only
146.25	Providing and fixing in position collapsible steel shutters with vertical channels 20x10x2 mm and braced with flat iron diagonals 20x5 mm size, with top and bottom rail of T-iron 40x40x6 mm, with 40 mm dia steel pulleys, complete with bolts, nuts, locking arrangement, stoppers, handles, including applying a priming coat of approved steel primer.	10	Sq.M.		0	0	0.0000	INR Zero Only
146.26	Providing and fixing aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 36 kg to 80 kg and door width from 701 mm to 1000 mm), with double speed adjustment with necessary accessories and screws etc. complete	10	No.		0	0	0.0000	INR Zero Only
146.27	Fixing chowkhat in existing opening in brick/ RCC wall with dash fasteners/Chemical fasteners of appropriate size (3 nos on each vertical member of door chowkhat and 2 nos on each vertical member of window chowkhats), including Cost of dash fasteners/ chemical fastener.	50	No.		0	0	0.0000	INR Zero Only
146.28	Centering and shuttering with 12mm thick shuttering plywood conforming to IS 4990:2011 and removal of form at all heights. Plywood will be supported on lock bars. - <b>Suspended floors, roofs, landings, balconies and access platform.</b>	50	Sq.M.		0	0	0.0000	INR Zero Only
146.29	<b>WATER PROOFING TREATMENT</b>							

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Contract No: PNP/PC-150/E/121/NCB

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146.30	Providing and laying APP (Atactic Polypropylene Polymer) modified prefabricated five layer, 3 mm thick water proofing membrane, black finished reinforced with glass fibre matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 litre/sqm by the same membrane manufactured of density at 25°C, 0.87 - 0.89 kg/litre and viscosity 70 - 160 cps. Over the primer coat the layer of membrane shall be laid using butane torch and sealing all joints etc., and preparing the surface complete. The vital physical and chemical parameters of the membrane shall be as under : Joint strength in longitudinal and transverse direction at 23°C as 350/300 N/5 cm. Tear strength in longitudinal and transverse direction as 60/80N. Softening point of membrane not less than 150°C. Cold flexibility shall be upto -2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacturer of membrane : - <b>3 mm thick</b>	445	Sq.M.		0	0	0.0000	INR Zero Only
146.31	Pressure grouting with the help of threaded nozzle of suitable length fixed in leaking portion of water retaining structures ( of approx 250m thickness) and later removing and making the holes good, checking the leak proofness etc. all complete up to the satisfaction of Engineer-in-Charge. (The rate shall be inclusive of fixing nozzle in old concrete, drilling of holes of suitable size preferably by using electrically operated repercessive hammer drill and fixing grouting nozzle in the holes. After nozzles are fully set , a neat cement slurry admixed with water soluble non shrink polymer/monomer or equivalent based chemical shall be injected through the nozzle with low pressure grout pumps at a pressure of about 2.0 Kg/Sq.cm. Pressure grouting material shall be of reputed make like Sika, Forsoc, BASF etc. or equivalent Comprising high flow non shrink cementitious grout)	250	No.		0	0	0.0000	INR Zero Only
146.32	Providing and laying "SHRINKKOMP- 10" or any other approved equivalent anti-shrinkage grouting in pockets, under base plates of light static equipments, structural steel columns, etc, complete in all respects as per direction of Engineer-in-Charge.	1	Cu.M		0	0	0.0000	INR Zero Only

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146.33	Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc consisting of following operations: (a) Applying a slurry coat of neat cement using 2.75 kg/sqm of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCCslab including adjoining walls upto 300 mm height including cleaning the surface before treatment. (b) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115 mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand ) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs. (c) After two days of proper curing applying a second coat of cement slurry using 2.75 kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineerin-charge. (d) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineerin- charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3 mm deep. (e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test."All above operations to be done in order and as directed and specified by the Engineer-in-Charge :							
146.34	With average thickness of 120 mm and minimum thickness at khurra as 65 mm.	50	Sq.M.		0	0	0.0000	INR Zero Only
147.00	<b>HAND RAILING</b>							
147.10	Providing and fixing M.S pipe hand railing (medium grade) conforming to IS-1239 consisting of top and middle horizontal rails of 40 mm dia. and 32 mm dia. nominal bore respectively, 1050 mm high upright members of 40 mm dia. nominal bore at 1500 mm 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 . - Two coats of chlorinated rubber based paint at dry film thickness of 40 microns per coat over two coats of high built zinc phosphate primer compatible to chlorinated rubber based paint at dry film thickness of 25 microns per coat.	8	MT		0	0	0.0000	INR Zero Only
148.00	<b>HILTI WORKS</b>							

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148.10	Supplying, Drilling/Cleaning hole and injecting slow curing time, high bond stress value heavy duty HIT-RE500V3 with Rebar or HIT-V Threaded Rod with a pre-defined ratio (3:1) of resin and hardener in a soft foil pack of 330ml, 500ml. The product should be approved by ETA, ICC, CSTB, COLA, BZS with Shock approval, Seismic approval in Anchors and Rebars to use in cracked/un-cracked concrete, tested for service temperature of -40deg C to +80 deg C. Application to be designed separately for Rebares as Simply Supported Moment or Splice as per EC2/TR23 or relevant tested and accepted rebar guidelines. Anchoring with HIT-V with RE500V3 to be designed as per ETAG guidelines of post installation of anchors and TR 29. LEED certified injection adhesive for rebar fixing in wet/dry flooded holes conditions for diameters. The chemical should have service life of more than 100 years and is to be tested for water tightness. Drilling hole with double flute type drill bits/hollow drill bits to the required depth by rotary hammer drill, cleaning with brush and jet of clean air, filling resin and hardener using serrated nozzle to eliminate mixing error with standard HDE A22 battery dispenser along with piston plug and extension hose for longer depths to ensure no air bubbles are in the hole and then fixing the re-bar, conducting occasional site inspection, executing work by trained personnel and occasional supervision from the manufacturer's representative in India. The installation and the setting instructions should be strictly followed as per the manufacturer's recommendations. RE 500 V3 for rebar application must have approval for Seismic, Fatigue and Fire. Reinforcements/rebars shall be supplied separately and the payments shall be made against respective items. Item includes all necessary scaffoldings required for completion of the work.							
148.11	16 mm dia. HYSB rebars. @240mm	25	No.		0	0	0.0000	INR Zero Only
148.12	20 mm dia. HYSB rebars. @ 300mm	25	No.		0	0	0.0000	INR Zero Only
148.13	Suppling, Drilling/Cleaning hole and fixing HILTI make heavy duty ETA Approved HVU2 +HAS-E Chemical Anchor of appropriate size and fixing plates subsequently. Anchor comprises of HVU2 flexible foil capsule that contains styrene free Urethane Methacrylate resin, hardener, quartz, sand/corundum and HAS-E threaded rod of minimum 5.8 steel grade conforming to IS 1367, galvanised to minimum 5 microns. The anchor must be approved for Cracked concrete and Seismic Conditions. Manufacture should submit Anchor Design report on cracked concrete based on design loads & other parameters as provided by consultants. Chemical anchors should be designed in accordance with EOTA-TR-029 "guidelines for anchorage of chemical anchors for use in concrete" for approval. HAS-E-R threaded rod (stainless steel: A4-70) to be used in severely corrosive environment. Plates shall be supplied separately & the payments shall be made against respective items. Fixing methodology to be followed as per manufacturers guidelines. Item includes all necessary scaffoldings required for completion of the work..							
148.14	Anchor size HVU2+HAS-E M16x125	20	No.		0	0	0.0000	INR Zero Only
148.15	Anchor size HVU2+HAS-E M20x170	20	No.		0	0	0.0000	INR Zero Only
148.16	Anchor Size HVU2+HAS-E M24x210	20	No.		0	0	0.0000	INR Zero Only
148.17	Providing and wet drilling (core of RCC works of grade M 40 ), accurate and clean holes of following diameter, 500 mm depth in RCC using HILTI DD 750 Hydraulic motor unit power output of mx 11 KW, oil pressure max 170 bar 4 gear unit along with Hilti DLP32 Power pack 32 KW (Maximum operating pressure of 210 bar / 400V unit requiring 3 phase supply, current of 63 amp Working on hydraulic system.							
148.18	600mm dia – 500mm deep core	1	No.		0	0	0.0000	INR Zero Only

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148.19	800mm dia – 500mm deep core	1	No.		0	0	0.0000	INR Zero Only
148.20	Providing and cutting concrete M 25 grade ( Rectangle / square ) upto 750mm deep using Hilti D-LP 32/ DS-TS 32 or DS WS 20 E (electric cutting) 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 for at least 5 - 10 meter distance operation from plate of cutting. 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.	2	RM		0	0	0.0000	INR Zero Only
149.00	<b>SLUICE GATE</b>							
149.10	Providing & fixing in R.C.C. work, Using HILTI chemical fastneres Single Face sluice gate, Class- 1 ( Rising Type) of 1260 x 1600 mm (approx.) size, conforming to IS : 3042 along with hand wheels, spindles, guide rails& all other fitting accessories required, complete as per directions of Engineer-in-Charge.	6	No.		0	0	0.0000	INR Zero Only
150.00	<b>DISMANTLING &amp; DEMOLISHING</b>							
150.10	Demolishing plain cement concrete under floor including disposal of material outside Building premises as directed by Engineer-in-charge. - <b>1:3:6 or richer mix.</b>	70	Cum		0	0	0.0000	INR Zero Only
150.11	Dismantling old plaster or skirting, raking out joints and cleaning the surface for plaster including disposal of rubbish as directed by Engineer-in-charge.	100	Sq.M		0	0	0.0000	INR Zero Only
150.12	Dismantling of existing tiles in floor and wall laid in cement mortar including stacking of serviceable materials as directed.	100	Sq.M		0	0	0.0000	INR Zero Only
150.13	Dismantling of existing G.I. water supply pipes with all fittings / fixtures / clamps and stacking of serviceable materials as per instruction of Engineer- in charge.	100	R.M.		0	0	0.0000	INR Zero Only
150.14	Dismantling of C.I. / Ductile Iron pipes (waste water & soil water) with fittings/fixtures and clamps including traps and stacking of serviceable materials as per instruction of Engineer- in charge.	100	R.M.		0	0	0.0000	INR Zero Only
150.15	Dismantling C.I. or asbestos rain water pipe with fittings and clamps including stacking the material within 500 metres lead : - <b>150mm dia pipe</b>	100	R.M.		0	0	0.0000	INR Zero Only
150.16	Dismantling doors, windows and clerretory windows (steel or wood) shutter including chowkhats, architravs, holdfasts etc. complete and stacking within 500 m lead:							
150.17	Of area 3 Sq.m. and below	50	No.		0	0	0.0000	INR Zero Only
150.18	Of area beyond 3 Sq.m.	50	No.		0	0	0.0000	INR Zero Only
150.19	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 500 metres lead as per direction of Engineer-in-charge. - <b>In cement mortar</b>	123	CuM		0	0	0.0000	INR Zero Only
150.20	Demolishing water proofing in terracing and disposal of material outside Plant boundary as per direction of Engineer-in-charge.	479	CuM		0	0	0.0000	INR Zero Only
150.21	Dismantling steel work manually/ by mechanical means in built up sections without dismembering and stacking within 500 metres lead as per direction of Engineer-in-charge.	218	Kg.		0	0	0.0000	INR Zero Only
150.22	Dismantling aluminium/ Gypsum partitions, doors, windows, fixed glazing and false ceiling including disposal of unserviceable surplus material and stacking of serviceable material within 500 meters lead as directed by Engineer-in-charge.	4	Sq.M		0	0	0.0000	INR Zero Only

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150.23	Demolishing/ dismantling and removing the scraps of existing MS sluice gate along with hand wheels, spindles, guide rails & all other accessories and fittings and stacking the serviceable materials at a place as desired by Engineer-in-charge and Disposal of un-serviceable materials beyond a lead of 500 m.	2	No.		0	0	0.0000	INR Zero Only
150.24	Taking out cinders and other filling materials, drying it and backfilling it in position in sunken floor of toilet.	20	CuM		0	0	0.0000	INR Zero Only
150.25	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 500 metres lead as per direction of Engineer - in- charge.	147	CuM		0	0	0.0000	INR Zero Only
150.26	Dismantling roofing including ridges, hips, valleys and gutters etc., and stacking the material within 500 metres lead of:							
150.27	G.S. Sheet	50	Sq.M		0	0	0.0000	INR Zero Only
150.28	Asbestos cement sheet	28	Sq.M		0	0	0.0000	INR Zero Only
151.00	<b>MISCELLANEOUS</b>							
151.10	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level, surface dressing of the ground including removing in-equalities not exceeding 15 cm deep and removal of rubbish lead up to a distance of 500 m (lift up to 1.5 m),outside the periphery of the area cleared.	100	Sq.M		0	0	0.0000	INR Zero Only
151.11	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) - Treatment of existing masonry using chemical emulsion @ one litre per hole at 300 mm interval including drilling holes at 45 degree and plugging them with cement mortar 1:2 (1cement : 2 coarse sand) to the full depth of the hole : - <b>With Chlorpyriphos/Lindane E.C. 20% with 1% concentration</b>	100	R.M		0	0	0.0000	INR Zero Only
151.12	Disposal of building rubbish / malba / similar unserviceable, dismantled or waste materials or vegetation, grass, brush wood, trees and saplings of girth up to 30 cm by mechanical means, including loading, transporting, unloading to municipal approved dumping ground or as approved by Engineer-in-charge, beyond 500 m initial lead, for lead distance upto 5 km including all lifts involved.	600	CuM		0	0	0.0000	INR Zero Only
151.13	Same as item No. 151.12, but for lead distance up to 5-10 km	300	CuM		0	0	0.0000	INR Zero Only
151.14	Same as item No. 151.12, but for lead distance up to 10-20 km	300	CuM		0	0	0.0000	INR Zero Only
151.15	Providing and laying Non Pressure NP-3 class (Medium duty) R.C.C. pipes including collars/spigot jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. Complete.							
151.16	450 mm dia. R.C.C. Pipe (Laying by manual/ machanical means)	100	R.M.		0	0	0.0000	INR Zero Only
151.17	600 mm dia. R.C.C. Pipe (Laying by manual/ machanical means)	100	R.M.		0	0	0.0000	INR Zero Only
151.18	900 mm dia. R.C.C. Pipe (Laying by manual/ machanical means)	100	R.M.		0	0	0.0000	INR Zero Only
151.19	1200 mm dia. R.C.C. Pipe (Laying by manual/ machanical means)	100	R.M.		0	0	0.0000	INR Zero Only

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Name of Work: "Balance job of Supply, Erection, Testing & Commissioning of Permanent Raw Water Supply System and allied facilities " on item Rate basis at Talcher Fertilizers Limited, Talcher, Odisha"

Contract No: PNP/PC-150/E/121/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)**

<b>SCHEDULE OF RATES-Rev.0</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
151.20	Providing corrugated G.S. sheet roofing including vertical / curved surface fixed with polymer coated J or L hooks, bolts and nuts 8 mm diameter with bitumen and G.I. limpet washers or with G.I. limpet washers filled with white lead, including a coat of approved steel primer and two coats of approved paint on overlapping of sheets complete (up to any pitch in horizontal/ vertical or curved surfaces), excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required. - <b>1.00 mm thick with zinc coating not less than 275 gm/m²</b>	500	Sq.M		0	0	0.0000	INR Zero Only
151.21	Providing 300 mm to 500 mm thick Mechanically Stabilised Mix (MSM) layer in foundation or under floor at a depth upto 2.0 m below finished ground level in layers not exceeding 150 mm in depth, each consisting of 60% graded stone aggregate of size 40 mm and down, 25% medium to coarse sand and 15% moorum well mixed and compacted to 95% modified proctor density in all complete as per direction of Engineer-in-charge. - <b>Consolidation by hand / mechanical rammers</b>	25	CuM		0	0	0.0000	INR Zero Only
151.22	Cleaning of reinforcement from rust from the reinforcing bars to give it a total rust free steel surface by using alkaline chemical rust remover of approved make with paint brush and removing loose particles after 24 hours of its application with wire brush and thoroughly washing with water and allowing it to dry, all complete as per direction of Engineer-In-Charge.							
151.23	Bars upto 12 mm diameter	50	Metre		0	0	0.0000	INR Zero Only
151.24	Bars above 12 mm diameter	50	Metre		0	0	0.0000	INR Zero Only
151.25	Chipping of unsound/weak concrete material from slabs, beams, columns etc. with manual Chisel and/ or by standard power driven percussion type or of approved make including tapering of all edges, making square shoulders of cavities including cleaning the exposed concrete surface and reinforcement with wire brushes etc. and disposal of debris for all lead and lifts all complete as per direction of Engineer-In-Charge							
151.26	75mm average thickness	100	Sq.M		0	0	0.0000	INR Zero Only
151.27	50mm average thickness	100	Sq.M		0	0	0.0000	INR Zero Only
151.28	Drilling suitable holes in reinforced or plain cement concrete with power driven drill machine to a minimum depth of 100mm upto 200mm in RCC beams, lintels, columns and slabs to introduce steel bars for sunshades/balconies including fixing the steel bars in position using epoxy resin anchor grout of approved make but excluding the cost of reinforcement, all complete as per direction of Engineer-In-Charge. - <b>Upto and including 12mm dia.</b>	100	No.		0	0	0.0000	INR Zero Only
151.29	Providing, mixing and applying bonding coat of approved adhesive on chipped portion of RCC as per specifications and direction of Engineer-In-charge complete in all respect.							
151.30	SBR Polymer (@10% of cement weight) modified cementitious bond coat @ 2.2 kg cement per sqm of surface area mixed with specified proportion of approved polymer	10	Sq.M		0	0	0.0000	INR Zero Only
151.31	Epoxy bonding adhesive having coverage 2.20 sqm/kg of approved make	50	Sq.M		0	0	0.0000	INR Zero Only



**Item Rate BoQ**

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151.32	Providing, mixing and applying SBR polymer (of approved make) modified Cement mortar in proportion of 1:4 (1 cement: 4 graded coarse sand with polymer minimum 2% by wt. of cement used) as per specifications and directions of Engineer-in-charge. Note: Measurement and payment: The pre-measurement of thickness shall be done just after the surface preparation is completed and Payment under this item shall be made only after proper wet curing has been done and surface has been satisfactorily evaluated by sounding / tapping with a blunt metal instrument and/or the 75mm size cube crushing strength at the end of 28 days to be not less than 30 N/Sqmm2). - <b>12 mm average thickness.</b>	50	Sq.M		0	0	0.0000	INR Zero Only
151.33	Providing, mixing and applying SBR polymer (of approved make @ minimum 2% by wt. of cement used) modified plain/reinforced cement <b>concrete for structural members</b> having minimum characteristic compressive strength [with ordinary portland cement, coarse sand and graded stone aggregate of 10mm maximum size in proportion as per design criteria] with specified average thickness. Note: Rates shall be for finished surface area of concrete and shall include the cost of labour, concrete and appropriate approved Super- Plasticiser for rendering concrete as flowable and SBR polymer but shall exclude cost of reinforcement, bond coat, Shear Keys, centering and shuttering, strutting, propping etc (Payment under this item shall be made only after proper wet curing has been done and surface has been satisfactorily evaluated by sounding/tapping with a blunt metal instrument)							
151.34	50mm thick in Grade M 25 with cement content not less than 330 kg per cum	100	Sq.M		0	0	0.0000	INR Zero Only
151.35	75mm thick in Grade M 25 with cement content not less than 330 kg per cum	100	Sq.M		0	0	0.0000	INR Zero Only
151.36	Providing and laying SBR Polymer modified (of approved make @ minimum 2% by wt. of cement used) plain/reinforced <b>concrete jacket</b> for the structural members e.g. columns, pillars, piers, beams etc with concrete having the specified minimum characteristic compressive strength [with ordinary portland cement, coarse sand and graded stone aggregate of 10mm maximum size in proportion as per design criteria] with specified average thickness all-round existing core of RCC member. Note: Rates shall be for finished surface area of concrete and shall include the cost of making holes in existing RCC slab, if required, for pouring concrete in shuttering mould of jacket and appropriate approved Super-Plasticiser for rendering concrete as flowable self compacting and SBR polymer but shall exclude cost of reinforcement, bond coat, Shear Keys, centering and shuttering, strutting, propping etc (Payment under this item shall be made only after proper wet curing has been done and surface has been satisfactorily evaluated by sounding/tapping with a blunt metal instrument)							
151.37	50mm thick in Grade M 25 with cement content not less than 330 kg per cum	50	Sq.M		0	0	0.0000	INR Zero Only
151.38	75mm thick in Grade M 25 with cement content not less than 330 kg per cum	50	Sq.M		0	0	0.0000	INR Zero Only
151.39	Providing and inserting 12mm dia galvanised steel injection nipple in honey comb area and along crack line including drilling of holes of required diameter (20mm to 30mm) up to depth from 30mm to 80mm at required spacing and making the hole & crack dust free by blowing compressed air, sealing the distance between injection nipple with adhesive chemical of approved make and allow it to cure complete as per direction of Engineer-In-Charge.	100	No.		0	0	0.0000	INR Zero Only

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151.40	Providing and fixing tiled false ceiling of specified materials of size 595x595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanized steel sections ( galvanized @ 120 grams/ sqm, both side inclusive) consisting of main "T" runner with suitably spaced joints to get required length and of size 24x38 mm made from 0.30 mm thick (minimum) sheet, spaced at 1200 mm center to center and cross "T" of size 24x25 mm made of 0.30 mm thick (minimum) sheet, 1200 mm long spaced between main "T" at 600 mm center to center to form a grid of 1200x600 mm and secondary cross "T" of length 600 mm and size 24x25 mm made of 0.30 mm thick (minimum) sheet to be interlocked at middle of the 1200x600 mm panel to form grids of 600x600 mm and wall angle of size 24x24x0.3 mm and laying false ceiling tiles of approved texture in the grid including, required cutting/making, opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc. Main "T" runners to be suspended from ceiling using GI slotted cleats of size 27 x 37 x 25 x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm GI adjustable rods with galvanised butterfly level clips of size 85 x 30 x 0.8 mm spaced at 1200 mm center to center along main T, bottom exposed width of 24 mm of all T-sections shall be pre-painted with polyester paint, all complete for all heights as per specifications, drawings and as directed by Engineer-in-charge.							
151.41	12.5 mm thick fully Perforated Gypsum Board tile made from plasterboard having glass fibre conforming to IS: 2095 part I, of size 595x595 mm, having perforation of 9.7x9.7 mm at 19.4 mm c/c with center borders of 48 mm and the side borders of 30 mm, backed with non woven tissue on the back side, having an NRC (Noise Reduction Coefficient) of 0.79, with 50 mm resin bonded glass wool backing.	50	Sq.M		0	0	0.0000	INR Zero Only
151.42	Providing & Laying of Pebbles (20mm to 50mm) round in shape of good quality, free form organic material sulphates or any deleterious material.	100	Cu.M		0	0	0.0000	INR Zero Only
152.00	deleted							
<b>Total in Figures</b>						<b>0.00</b>	<b>0.00</b>	INR Zero Only
<b>Quoted Rate in Figures</b>			Select			<b>0.0000</b>	<b>0.0000</b>	Zero Only
<b>Quoted Rate in Words</b>			<b>INR Zero Only</b>					