# NOTICE INVITING TENDER

**FOR** 

# **INSTRUMENT AIR & PLANT AIR SYSTEM**

(OPEN DOMESTIC COMPETETIVE BIDDING)

(NIT NO: PNMM/PC-183/E-4016/NCB)



# TALCHER FERTILIZERS LIMITED

[A JOINT VENTURE OF M/s GAIL (INDIA) LIMITED (GAIL), M/s RASHTRIYA CHEMICALS & FERTILIZERS LTD. (RCF), M/s COAL INDIA LTD. (CIL), & M/s FERTILIZER CORPORATION OF INDIA LTD (FCIL)]

**ISSUED BY** 



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

15.07.2022



# INSTRUMENT AIR & PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) MASTER INDEX

PC183/E-4016 0

DOC. NO. REV.

SHEET 1 OF 3



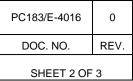
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# **INSTRUMENT AIR & PLANT AIR SYSTEM**

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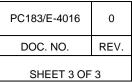




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# <u>SECTION-I</u> "INVITATION FOR BID (IFB)"

**Ref No:** PNMM/PC-183/E-4016/NCB Dated: 15.07.2022

To,

PROSPECTIVE BIDDERS

SUB: INSTRUMENT AIR & PLANT AIR SYSTEM

Dear Sir/Madam,

#### 1.0 **INTRODUCTION**:

- 1.1 GAIL (India) Limited (GAIL), Rashtriya Chemicals & Fertilizers Limited (RCF), Coal India Limited (CIL) and Fertilizer Corporation of India Limited (FCIL) have formed a Joint Venture company in the name of Talcher Fertilizers Limited (TFL) hereinafter also referred to as "Owner", intends to carry out the work of **INSTRUMENT AIR & PLANT AIR SYSTEM on package basis** for its Ammonia Urea Plant, an integrated fertilizer and chemical complex comprising of Coal Gasification and Gas Purification Unit, Ammonia Synthesis Unit, Urea Plant, along with necessary offsite and utility facilities at Talcher Unit, Angul district, in the state of Odisha, India.
- 1.2 GAIL (India) Limited is a Public Sector Unit under the Ministry of Petroleum & Natural Gas and Rashtriya Chemicals & Fertilizers Limited (RCF) & Fertilizer Corporation of India Limited (FCIL) are two Public Sector Units under the Ministry of Chemicals & Fertilizers and Coal India Limited (CIL) is a Public Sector Unit under the Ministry of Coal, Govt. of India.
- 1.3 Projects and Development India Limited (PDIL), hereinafter referred to as PROJECT MANAGEMENT CONSULTANT (PMC)on behalf of M/s Talcher Fertilizers Ltd. (TFL), hereinafter referred as OWNER, has the pleasure of inviting bids from eligible domestic bidders to submit Bid ONLINE through Central Public Procurement (CPP) Portal under Single Stage Two Bid System, for the subject works.
- 2.0 The brief details of the tender are as under:

(A)	NAME OF WORK / BRIEF SCOPE OF SERVICE/JOB	INSTRUMENT AIR & PLANT AIR SYSTEM ON PACKAGE BASIS AT TALCHER FERTILIZERS LIMITED, ODISHA (INDIA)		
(B)	NIT NO. & DATE	PNMM/PC-183/E-4016/NCB DATED 15.07.2022		
(B1)	TYPE OF TENDER	OPEN DOMESTIC COMPETITIVE BIDDING		

(C)	TYPE OF BIDDING SYSTEM	SINGLE BID SYSTEM  TWO BID SYSTEM  V	
(D)	TYPE OF TENDER	E-TENDER (CPP PORTAL)  MANUAL	
(E)	COMPLETION PERIOD	Please Refer Clause 20.0 of SPECIAL CONDITIONS OF CONTRACT.	
(F)	BID SECURITY /EARNEST MONEY DEPOSIT (EMD)	APPLICABLE  NOT APPLICABLE  EMD value: Rs. 35.59 Lakh (Rupees Thirty Five Lakh Fifty Nine Thousand Only)  Exempted Bidders (i.e. MSEs, Start-ups and Govt Dept./PSUs) are required to submit declaration for Bid security as per Form F-2B (Refer clause no.16 of ITB).  (i) CPP Portal (https://eprocure.gov.in/eprocure/app) (ii) TFL Website - http://tflonline.co.in (iii) PDIL website - www.pdilin.com  26.07.2022  01.08.2022 at 11:30 Hrs. (IST)  Pre Bid meeting Link Click here to join the meeting  16.08.2022 at 15:00 Hrs. (IST)	
(G)	AVAILABILITY OF TENDER DOCUMENT ON WEBSITE(S)		
(H)	LAST DATE OF RECEIPT OF BIDDER'S PRE-BID QUERIES		
(1)	DATE, TIME OF PRE-BID MEETING (Through Video Conferencing)		
(1)	BID SUBMISSION START DATE		
(K)	BID CLOSING DATE		
(L)	BID OPENING DATE	30.08.2022 at 15:00 Hrs. (IST)	

(M)	Address for Communication	
(i)	PDIL	M/s Projects & Development India Limited, P.D.I.L Bhawan, A-14, Sector-1, Noida, (PIN 201301) Dist. Gautam Budh Nagar (UP). (India)  Kind Attention: Mr. P.R.Sahu, Addl. General Manager (M.M) Fax no.: +91-120-2529801 Tel no.: +91-120-2544063 E-mail: prsahu@pdilin.com; anjali@pdilin.com alam@pdilin.com
(ii)	TFL	M/s Talcher Fertilizers Ltd. (TFL), C/O GAIL Training Institute, PARC Building, Plot No. 24, Sector-16A, Film City, Noida District – G.B. Nagar, U.P 201301  Kind Attention : Mr. S M Badruddoja DGM (Projects) Tel No. : +91-8859500094 E-mail : sm.badruddoja@gail.co.in; mannapaul@gail.co.in
(N)	Original Documents to be submitted at	Projects & Development India Limited, (Materials Management Department) P.D.I.L Bhawan, A-14, Sector-1, Noida, (PIN 201301) Dist. Gautam Budh Nagar (UP). (India)  Kind Attention: Mr. P.R. Sahu, Addl. General Manager (M.M) Fax no.: +91-120-2529801 Tel no.: +91-120-2544063. E-mail: prsahu@pdilin.com
(O)	Contact Person for Site visit	M/s Talcher Fertilizers Ltd. (TFL), Administrative Building, Talcher, Post: Vikrampur, Dist: Angul, Pincode-759106, Odisha  Kind Attention: Mr. Satyabrata Mishra General Manager (Projects) Tel No. : +91-9927339444 E-mail : smishra@gail.co.in

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 (Section-III of tender) depending upon Type of Tender as mentioned at Clause no. 2.0 (D) above. The IFB is an integral and inseparable part of the bidding document.
- 4.0 Bid must be submitted only on CPP Portal (<a href="https://eprocure.gov.in/eprocure/app">https://eprocure.gov.in/eprocure/app</a>). Further, the following documents in addition to uploading the bid on CPPP's Portal shall also be submitted in Original (in physical form) <a href="within 7">within 7</a> (seven) <a href="days(\*)">days(\*)</a> 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 (M) of IFB:
  - i) EMD (for all bidders except exempted category) /Declaration for Bid Security (for exempted bidders)
  - ii) Power of Attorney
  - iii) Integrity Pact
- 5.0 Bidder(s) are advised to quote strictly as per terms and conditions of the tender documents and not to stipulate any deviations/exceptions.
- 6.0 Any bidder, who meets the Bid Evaluation Criteria (BEC) and wishes to quote against this Tender Document, may download the complete Tender Document along with its amendment(s) if any from websites as mentioned at 2.0 (G) 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.

Any revision, clarification, corrigendum, time extension, etc. to this Tender Document will be hosted on the website(s) only as mentioned at 2.0 (G) 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.

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. 9.0

# This is not an Order.

Thanking You,

For and on behalf of Taloner Fertilizers limited

(P. R. Sahu)

Addl. General Manager (M.M)

Projects & Development India Limited

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

Tender Document No. : PNMM/PC-183/E-4016/NCB dated 15.07.2022

Description : INSTRUMENT AIR & PLANT AIR SYSTEM ON PACKAGE

BASIS AT TALCHER FERTILIZERS LIMITED, ODISHA (INDIA)

Due Date & Time : 29.08.2022 at 15:00 hrs.

From:	To:
	M/s Projects & Development India Limited,
	P.D.I.L Bhawan, A-14, Sector-1,
	Noida, (PIN 201301)
	Dist. Gautam Budh Nagar (UP). (India)
	Kind Attention: Mr. P.R.Sahu, Addl. General Manager (M.M)

(To be pasted on the envelope containing Physical Document)

	SECTION-II
	BID EVALUATION CRITERIA
	<u>&amp;</u>
	EVALUATION METHODOLOGY
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#### **SECTION-II**

# 1.0 BID EVALUATION CRITERIA (BEC)

Bids are hereby invited from competent Domestic Bidders meeting the technical and financial criteria of respective BEC stated hereunder.

Evaluation of Techno-Commercial offers shall be carried out for only those Bidders who shall meet the BEC.

# (A) Technical Criteria:

**A.1** The Bidder must have completed at least One "**Similar Work**" during the last Ten (10) years reckoned from the original bid opening date.

"Similar Work" shall mean the following:

Design Engineering, Supply, Installation and Testing & Commissioning of at least One Instrument Air & Plant Air System of Design capacity of minimum 8000 Nm3/hr under single stream (or multiple streams of minimum 4000 Nm3/hr capacity each) including supply of Integrally Geared centrifugal Air compressor with capacity of at least 2750 Nm3/hr.

**Note:** To meet the Technical Criteria **A.1** above, only single contract is acceptable. In case bidder has executed and completed composite works which includes the qualifying work stated above i.e. **(A.1)**, the same shall be considered for the purpose of qualification

- A.2 The said "Similar Work" referred at A.1 above must have been in operation for at least 1 (one) year from the Date of Acceptance / Commissioning of the works.
- A.3 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 A.1 & A.2 above:

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

#### (B) Financial Criteria:

- **B.1** The Annual Turnover of the bidder in any one of the last three (03) preceding financial years should be at least **INR 16.80 Crore.**
- **B.2** Net Worth of the bidder should be positive as per last audited financial year.
- B.3 The Bidder should have minimum working capital equal to INR 3.36 Crore as per last audited financial year. However, if the bidder's working capital is negative or inadequate, the bidder shall submit a letter from their Bank having Net worth of the bank not less than Rs. 100.0 Crore (or equivalent USD, confirming the availability of line of credit for INR 3.36 Crore. The line of credit from bank shall be submitted strictly as per prescribed format

#### "Notes for B.1, B.2 & B.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 September 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. Further, in case bidder is meeting the Annual Turnover criteria of BEC based on Audited Financial Statement of any one of the preceding 3 financial years (as mentioned above), the same shall suffice and bidder may submit prescribed format accordingly.

**Net Worth/Working Capital:** Immediate preceding financial year mentioned in aforesaid BEC refer to audited financial results for the immediate preceding financial year wherever the closing date of the bid is after 30th September 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 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.

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.

# (C) <u>General Notes (for both Technical BEC and Financial BEC) wherever applicable:</u>

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

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

a) **BEC (Technical):** Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the date of award of order / contract submitted by bidder.

## b) **BEC (Financial)**

- (i) For Annual Turnover: The average of Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the First date and Last date of the respective Financial Year.
- (ii) For Net Worth & Working Capital: The Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the Last date of the respective Financial Year
- c) In case, the SBI Selling rate is not available as on the date of conversion as specified above for respective cases, the exchange rate for conversion of currency shall be taken from the internet, such as -

https://www.xe.com/currencyconverter https://economictimes.indiatimes.com/markets/forex/currency-converter https://www.oanda.com/currency/converter

# (D) BEC for START-UPS:

The Technical and Financial BEC as stipulated above shall also be applicable for startups.

## (E) Documents to be submitted for Compliance to BEC

## (i) Technical Criteria of BEC:

To meet the criteria of **A.1** above, Bidder must submit copy of Detailed Letter of Acceptance (DLOA) / Work Order /relevant extract of work Order/ Contract Agreement along with detailed scope of work and Completion / Acceptance Certificate. Such certificate shall be issued by order issuing authority/ Owner/End user.

The Detailed Letter of Acceptance (DLOA) / Work Order / Contract Agreement must inter alia include Scope of work, completion time, contract value, etc. Similarly, the Completion Certificate/ Acceptance Certificate must clearly indicate reference of relevant work order/DLOA/Contract Agreement, Name of Work, and date of completion. For IA & PA capacity& other specifications, bidder shall also submit Completion Certificate / Work Order /relevant extract of work Order, etc., wherein all technical details are mentioned / specified.

To meet the criteria of **A.2**, above certificate in respect of minimum one year successful operation of the Plant/System from the date of acceptance/Commissioning of work issued by the order issuing authority/Owner/End user.

In cases where bidder has executed the work as a sub-contractor, such Completion certificate and Operation certificates (for compliance to **A.1** and **A.2** above) issued by the "Order issuing Authority" is also acceptable, provided that a certificate or letter from End User/Owner is submitted certifying that the bidder has worked as a sub-contractor for that project.

To meet the criteria **A.3** above, Bidder shall submit affidavit from the domestic manufacturers of Iron & steel products as per the Form-I enclosed with the policy documents. A bidder who is not manufacturer of Iron & Steel product and is unable to submit the Affidavit from domestic manufacturers at bidding stage, such bidder can submit the Affidavit issued by domestic manufacturers after placement of order. In this case bidder along with his bid shall submit an undertaking as per prescribed format.

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

- (a) To meet the criteria for Sr. No. **B.1**, Bidder shall submit the Audited Financial Statements of the company for any one of the preceding three (03) financial years whichever meets the annual turnover criteria.
- (b) To meet the criteria for Sr. No. **B.2**, Bidder shall submit the last Audited Financial Statements alongwith "Details of Financial Capability of the Bidder" in prescribed format duly signed and stamped by Chartered Accountant.
- (c) To meet the criteria for Sr. No. **B.3**, Bidder shall submit the last Audited Financial Statements along with (i) Bank's Letter (if applicable) and (ii) "Details of Financial Capability of the Bidder" in prescribed format duly signed and stamped by Chartered Accountant along-with Bank's letter for **B.3** (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 E (ii) above, the "Notes for B.1, B.2 & B.3 under B" (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.

#### (F) Authentication of documents submitted against BEC

#### F.1 Technical BEC

All documents in support of SI. No. A.1 & A.2 of Technical Criteria of BEC to be furnished by the Bidder shall necessarily be duly certified/ attested by Chartered Engineer as well as Notary Public with legible stamp.

#### F.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.

#### 2.0 EVALUATION METHODOLOGY:

The subject work is indivisible and complete work shall be awarded to successful overall lowest bidder as per evaluation methodology described below.

The Evaluation methodology shall be arrived as per following

# a) TOTAL CONTRACT PRICE - :

The TOTAL CONTRACT PRICE (Including all taxes, duties, levies and GST) as derived from the SCHEDULE OF PRICES as quoted by the Bidder.

## b) NPV OF TOTAL WORKS COST

Bidder shall furnish the Guaranteed Consumption Figures as per prescribed format, Annexure B of SOR. The differential Works cost (in comparison to Bidder quoting the lowest Works Cost) considering 330 stream days per year will be calculated for System and will be discounted at discount rate of 10.0% p.a. for a period of 15 years of operation starting from Preliminary Acceptance.

The NPV of differential works cost so obtained on achieving Preliminary Acceptance (15 months) shall be further discounted at the rate of 10.0% p.a. to arrive at present value i.e. month zero

Total works Cost loading for entire System (to be considered in evaluation) shall be derived by summing up all the separate Works Cost Loading values for entire system.

To summarize the above, the evaluated cost shall be ascertained as per following:

#### (a) TOTAL CONTRACT PRICE:

Plus (+)

#### (b) NPV of Total Works cost

#### Note:

- i. In case any cess on GST is applicable, same shall also be considered in evaluation.
- ii. 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).
- iii. The Price Evaluation will be subject to applicability of Purchase Preference Policies as mentioned in the tender document.

# 3.0 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.

# 4.0 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.

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POLICY FOR PROVIDING PREFERENCE TO DOMESTIC MANUFACTURED IRON & STEEL PRODUCTS IN GOVERNMENT PROCUREMENT	ALLY
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#### असाधारण

#### EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (i)

PART II-Section 3-Sub-section (i)

प्राधिकार से प्रकाशित

#### PUBLISHED BY AUTHORITY

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

#### इस्पात मंत्रालय

#### अधिसूचना

नई दिल्ली, 29 मई, 2019

**सा.का.नि. 385(अ).**—घरेलू रूप से उत्पादित किए जाने वाले लौह एवं स्टील उत्पाद की सरकारी खरीद को प्राथमिकता दिए जाने के लिए संशोधित नीति सामान्य सूचना हेत् 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 वरीयता 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 वरीयता 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 परिशष्ट 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 पुन: 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।

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- 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 (एस ई जैड) शामिल है। इसके अलावा, इस प्रकार के उत्पाद परिशिष्ट क में किये गये उल्लेख के अनुसार घरेलू न्यूनतम मुल्यवर्धन 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 हैं।
- 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 **बौह 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 सिहत) 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 अध्यधीन छूट प्रदान की जाएगी।
- 3.1.1 जहां विशिष्ट ग्रेडों 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 शिकायत निवारण करने के लिए एक अलग समिति का गठन करना।
- 4.5 स्थायी समिति इस्पात मंत्रालय को अनुमोदन हेत् अपनी सिफारिशें प्रस्तृत करेंगी।

# 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 उसे 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 वरीयता 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 पुन: 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 परामर्थ 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 पुन: 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 एस) 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 तलना 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 किसी 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।

# 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 न्युनतम निर्धारित घरेलु मुल्यवर्धन 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/उससे 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 अध्यधीन 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 एस 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 मुल्यवर्धन के मामले में किया जाता है।
- 6.8.3 यदि खरीद को डी एम आई एंड एस 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 मुल्यवर्धन आवश्यकता का उल्लेख परिशिष्ट क और परिशिष्ट ख में किया गया है।
- 7.2 घरेलू मूल्यवर्धन निवल बिकी कीमत (निवल घरेलू करों और शुल्कों को छोड़कर बीजक कीमत) होगी जिसमें से प्रतिशत में निवल बिकी 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 मुल्यवर्धन

= अंतिम उत्पाद की निवन विकी कीमत - संयेव में आयात किये गये मीह अथवा इस्पात की पहुंच मारात अंतिम उत्पाद की निवन विकी कीमत

#### पूंजीगत माल के लिए

% घरेलु मृल्यवर्धन

= अंतिम उत्पाद की निवस बिक्री कीमत – संयंत्र में आयात किये गये इतपुट सामग्री की पहुंच लागत अंतिम उत्पद की निवस विकी कीमत

#### 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 निर्घारित 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 उस 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 (सितंबर 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 सत्यतता की जांच करे। इसकी सत्यतता 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 अनरोध 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 सची 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 अध्यधीन) 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 मांनीटरिंग

- 10.1 इस नीति के प्रायधान 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 एस पी नीति के अंतर्गत सभी लागू एजेंसियां इस नीति का कार्यान्वयन सुनिश्चित करेगी और वार्षिक रूप से जून के महीने में एक घोषणा भेजेगी जिसमें इस नीति के अनुपालन की सीमा और पिछले बित्तीय वर्ष के दौरान उसके अनुपालन न किए जाने के कारणों को दर्शाया जाएगा।

## इस्पात मंत्रालय को संदर्भ

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

परिशिष्ट क - घरेलू स्तर पर निर्मित उत्पादों के लिए अनन्य

क्र. सं.	. लौह एवं इस्पात उत्पादों की सांकेतिक सूची		न्यूनतम घरेलू मूल्यवर्धन आवश्यकता
1	600 मि. मी. अथवा उससे अधिक की चौड़ाई वाले लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, हॉट रोल्ड, 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 रोल्ड (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	35%	
5	600 मि. मी. कम की चौड़ाई का लौह अथवा गैर एलॉय इस्पात का फ्लेट रोल उत्पाद, ढका हुआ, प्लेट लगाया हुआ अथवा कोड किया हुआ		35%
6	लौह एवं गैर एलॉय इस्पात का अनियमित रूप से ऐंठा हुआ क्वाइल में बार्स और रॉड, हॉट रोल्ड		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, हाँट रोल्ड, हाँट ड्रॉन अथवा हाँट एक्सट्रडेड परंत रोलिंग के बाद उसे टिविस्ट किये जाने सहित		35%
8	लौह अथवा गैर एलॉय इस्पात का अन्य बार्स एंड रोड्स	7215	35%
9	लौह अथवा गैर एलॉय इस्पात का एंगल, शेप 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 इस्पात का फ्लेट रोल्ड इस्पात		50%
12	600 मि. मी. से कम की चौड़ाई का स्टेनलैस इस्पात का फ्लेट रोल्ड इस्पात 7220		50%
13	स्टेनलैस स्टील का अन्य बार्स और रोड्स; स्टेनलैस स्टील का एंगल शेप और सेक्शन्स		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 प्रोफाडल, सीमलैस	7304	35%
18	लौह अथवा इस्पात का सर्कुलर क्रॉस सेक्शन वाले अन्य ट्यूब और पाइप (उदाहरण के लिए, बेल्ड किया हुआ, रिवेट किया हुआ अथवा समान रूप से बंद किया गया हुआ), जिसकी बाहरी त्रिज्या 406.4 मि. मी. से अधिक हो	7305	35%
19	लौंह अथवा इस्पात के अन्य ट्यूब, पाइप और होलो प्रोफाइल (उदाहरण के लिए ओपन सीन अथवा बेल्ड किया हुआ, रिवेट 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 स्लीब्स)	7307	35%
21	स्टेनलैस स्टील का अनियमित रूप से ऐंठा 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 ऐंठा हुआ क्वाइल में बार्स और रोड, हाँट 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 ड्रील बार्स और रोड्स	7228	35%
27	लौह अथवा इस्पात की शीट पाइलिंग, चाहे ड्रील 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 प्रीफेबरिकेटिड 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, बैट 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 नहों	7310	15%
31	लौह अथवा इस्पात का कम्प्रेस किया हुआ अथवा सरलीकृत गैस के लिए कन्टेनर		15%
32	लौह अथवा इस्पात का स्टेंडिड वायर, रोप, केबल, प्लेटिड बैंड, स्लिंग और उसके समान वस्त जिसे विद्युतीय रूप से इन्सुलेट न किया गया	7312	15%
33	लौह अथवा इस्पात का फेनिसेंग 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	15%
34	लौह अथवा इस्पात तार का ड्रील, नेटिंग और फेनसिंग; लौह अथवा इस्पात का विस्तार किया हआ धात्	7314	15%

35	लौह अथवा इस्पात का चैन और उसका हिस्सा	7315	15%
36	लौंह अथवा इस्पात का टैंकर, ग्रेपनेल्स और उसका हिस्सा		15%
37	लौह एवं इस्पात की वस्तुएं		15%
38	लौह एवं इस्पात की वस्तुएं		15%
39	लौह एवं इस्पात की वस्तुएं	7319	15%
40	लौह अथवा इस्पात का स्प्रिंग और स्प्रिंग के लिए लीव्स	7320	15%
41	लौह अथवा इस्पात का स्टोब्स, 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	15%
42	लौह अथवा इस्पात का केंद्रीय हिटिंग के लिए रेडियेटर जिसे विद्युतीय रूप से हीट न किया गया हो और उसका हिस्सा; लौह अथवा इस्पात का हेयर हीटर और हॉट एयर वितरक जिसे विद्युतीय रूप से हीट न किया गया हो, फेन अथवा ब्लोअर जो मोटर से चलती हो और उसके हिस्से को शामिल करते हुए	7322	15%
43	लौह अथवा इस्पात का टेबल और समान घरेलू वस्तुएं और उसका हिस्सा	7323	15%
44	लौह अथवा इस्पात का सेनेटरी वेयर और उसको पार्ट्स	7324	15%
45	लौह अथवा इस्पात का अन्य कास्ट सामान	7325	15%
46	लौह अथवा इस्पात का विद्युतीय इस्पात और अन्य वस्तु		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 एस कोड के अंतर्गत सभी उत्पादों को परिशिष्ट के भाग के रूप में शामिल किया गया है।

परिशिष्ट ख

<b>क.</b> 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 बियेरिंग, हाइड्रोलिक डिक्स ब्रेक्स, टेंकर एंड कंटेनर, पाइप कंवेयर के लिए कंवेयर बेल्ट, हाई एंगल कंवेयर प्रणाली, क्रशर्स, क्रेन रेल लुब्रिकेशन, चार गरडर ग्राइडर ई ओ टी क्रेन, क्रेन वेइंग प्रणाली, क्रेन ऐयर कंडीशिनंग, प्यूड कप्लिंग, 4 लिफ्ट ट्रक्स, हाइड्रोलिक मोटर्स, हाइड्रोलिक सिस्टम, लॉकिंग एसेम्बली (फ्रिक्शन ग्रिप), लोड सेल्स, लेबल सेर्न्स, पाइप कंवेयर प्रणाली, प्लग/पाडेल फीडर, न्यूमेटिक ढुलाई – घना एवं लिन फेस, रिक्लेमर्स, रेडियो रिमोट कंट्रोल, रेल फिक्सिंग व्यवस्था (विशेष), रेपिड/फ्लेड लोडिंग प्रणाली, स्टेकर्स, स्पेशल स्कीन, स्लिव रिंग बियरिंग, ट्रिप्पलर्स, ट्रांसफर कार, टॉग्स (स्पेशल), बाइब्रेशन, आइसोलेशन प्रणाली (स्परिंग डम्पर) वेगन टिप्पलर्स, वेगन लोडर	50%
2	मिनिरल बेनिफेक्शन (लौह अयस्क और कोयला) उपकरण	इंडस्ट्रीयल क्रशर्स, ग्राइनडिंग मिल, परम्परागत स्क्रीन, स्लूरी पम्पस, हिरेट थिकनर्स, फिल्टर्स, हाइड्रोक्लोन्स	50%

3	कॉक अवेन	कोक ओवन सिलिका रिफेक्टरी, एन्करेज सिस्टम, ब्ररंब नरइन के साथ बेस्ट गैस बाल, फ्लेस प्लेट, डोर फ्रेम, डोर बॉडी, माइनर कास्टिंग: गुजनेक, बाल बॉक्स, ए पी लिड, चार्जिंग और इंस्पेक्शन होल लिड एंड फ्रेम रिवर्सिंग मेंकेनिजम, केंद्रीकृत लूब्रिकेशन प्रणाली हाइड्रोजेट डोर क्लीनिंग तंत्र, कोड कंबेयर सिस्टम, स्किप होडस्ट, डोर लोबरिंग रैक, आइसोलेशन/रिवर्सिंग कॉक्स, II ऑटोमेशन, अवेन मशीन	50%
4	उप-उत्पाद संयंत्र	प्राथमिक गैस कूलर, इलेक्टोस्टेटिक तार प्रेसिपिटेटर, H2S, NH3 और नप्यलिन संयंत्र स्कूब्बर, कोम्बी स्ट्रीप्पर, फ्लेशिंग लिक्र पम्प, क्लास किन, क्लाक रियेक्टर, वेस्ट हीट बायलर, डिकेंटर्स	
5	सिंटर संयंत्र उपकरण	पेलेट कार, ड्राइव/डिस्चार्ज इंड स्प्रोकेट ऐसेम्बली कर्व्ड रेल, स्लाइड रेल, हॉट सिंटर ब्रेकर और ग्रिजली, डिप रेल एंड रिनंग रेल, प्रोसेस फेन के लिए इम्पेलर एसेम्बली, सिन्टर मशीन का ड्राइव एसेम्बली, उच्च तीव्रता वाला मिक्सर और नोडूलाइजर	50%
6	पेलेट संयंत्र उपकरण	पेलेट कार, ड्राइव/डिस्चार्ज इंड स्प्रोकेट ऐसेम्बली कब्ड रेल, स्लाइड रेल, रिनंग रेल वरटिकल 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	ब्लंडर वाल के साथ बेल रितत टॉप प्रणाली, एस जी आयरन स्टेव कूलर, कोपर स्टेव कूलर, स्टॉक लेवल इंडिकेटर (रडार टाइप), मड गन, ड्रिलिंग मशीन एंड मेनिपुलेटर, गैस क्लिलिंग प्लांट प्रणाली, इसके बाइस-पास वाल सिहत टॉप रिकवरी ट्रबाइन सिस्टम, डि-ब्रिकिंग मशीन, रि-रेलिंग उपकरण, पी सी आई प्रणाली, पी सी आई के लिए ग्राइनडिंग मिल, स्टॉक लेवल इंडिकेटर, ट्र्येरे स्टाक एसेम्बली, बेस्ट हीट रिकवरी प्रणाली, बी एफ एवं हॉट ब्लास्ट स्टोव प्रौद्योगिकीय वाल, एब्ब ब्रर्डन प्रोब्स, स्लग ग्रेन्यूलेशन यूनिट, ट्र्येरे एंड ट्र्येरे कूलर, टोरपेडो लेडल कार, बी एफ हरथ रिफेक्ट्री	50%
8	डायरेक्ट रिडक्शन प्लांट उपकरण	चार्ज डिस्ट्रीब्यूटर, अपर एंड लोअर सील लेग, रिफोमर एंड रि-क्यूरेटर सिस्टम, बर्डन फिडर्स, ट्रबो-एक्सपेंडर, प्रोसेस गैस कम्प्रेशर, सील गैस कम्प्रेशर एवं बोटम सील गैस कम्प्रेशर, सील गैस जेनरेटर एवं डायर्स, प्रोसेस गैस हीटर, CO2 रिमूवल प्लांट	50%
9	बेसिक ऑक्सीजन फर्नेस उपकरण	मुख्य और अनुरक्षण उपकरण जिसमें कंवेटर, गिनंग मशीन, रिफेक्ट्री/स्लग मॉनीटरिंग उपकरण, कंवेटर वेसेल, ट्रनिअन रिंग एंड सस्पेशन प्रणाली, ट्रनिअन बियरिंग और हाउसिंग, कंवेटर बुल गियर यूनिट और टिल्ट ड्राइव सिस्टम, कंवेटर के रोटेरी ज्वाइंट, बोटम स्ट्रिंग सिस्टम, क्लिपेंग के साथ लांस बाडी, लांस कोपर टिप्स, ऑक्सीजन ब्लोविंग/बोटम स्टीरिंग के लिए वाल स्टेशन, सब-लान सिस्टम, प्रोसेस मॉड्यूल अर्थात प्रोसेस साफ्टवेयर/हार्डवेयर के साथ ऑफ गैस एनेलाइजर, कंटेनर लैब मेजरमेंट प्रोब, स्विच ओवर स्टेशन, प्राइमरी गैस के लिए आई डी फेन, होट मेटल और स्टील लेडल, लेडल ट्रांसफर कार, लेडल अनुरक्षण उपकरण, स्लेग पोट, स्लग पोट ट्रांसफर कार, स्क्रेप बॉक्स क्रेप ट्रांसफर कार, लांस करेज, लांस गाइड, क्रेन एंड हाइस्ट, लांस होइस्ट एंड ट्राली, लांस टिल्टिंग उपकरण, लांस को लिफ्ट करने के लिए ट्रेबस, विभिन्न आकर के बंकर, बिन बाइब्रेटर, वेइंग हूपर, अनुरक्षण स्टेण्ड, डी डस्टिंग सक्शन हुड, टीमिंग/एच एम, लेडल रिलाइनिंग स्टेंड, स्टेंड कूलिंग स्टेक इंस्पेक्शन उपकरण, हुड ट्रेवर्स केरेज, रिफेक्ट्री, बाइपास एवं आइसोलेशन वाल्ब, फ्लेयर स्टेक एवं डगनिगेशन सिस्टम, स्क्रविंग टोवर सेल – वेट गैस क्लीनिंग सिस्टम, डॉग हाउस लेडल ड्रायर, लेडल	50%

10	इलेक्ट्रिक आर्क फर्नेस	प्री-हीटर, लेडल कूलर, पयूम कोलेक्शन हुइस, क्लीन गैस स्टेक, इस्ट सिलो, वेग विज, स्लग रिटेनिंग उपकरण फर्नेस प्रोपर (जिसमें फ्रनेस लोवर सेल, अपर सेल और रूफ, टिलटिंग प्लेटफार्म, फ्रनेस गेन्ट्री शामिल है) और ट्रांसफार्मर, इलेक्ट्रोल रेगूलेशन प्रणाली, . हाइड्रोलिंक सिस्टम, रिफेक्ट्री, लेवल I एंड II आटोमेशन सिस्टम के पार्टस। एल एफ – वाटर कूल्ड लेडल रूफ, इलेक्ट्रोड सास्ट एंड आमर्स, इलेक्ट्रोड रेगूलेटिंग सिस्टम, वायर फिडिंग सिस्टम, बोटम इनइरट गैस स्टिरिंग वाल सिस्टम पोरूस प्लग और टॉप लांस के लिए, इमरजेंसी लांसतंत्र, ड्राइव यूनिट के साथ लांस केरेजि सिस्टम, स्वचालित तापक्रम, सेम्पिलिंग और बाथ लेवल/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, वेक्यूम वेसेल, वेसेल लिफिटिंग और लोवरिंग सिस्टम शामिल है, हाइड्रोलिंग सिस्टम, मल्टी फंक्शन लांस, वाल्य रेक्स/स्टेशन, इलेक्ट्रोड क्लेप यूनिट, इलेक्ट्रोड आमर्स का कंडक्टर, वाटर कूल्ड केबल, ए आर स्टेरिंग वाल्य रेक, लांस ट्रांसपोर्ट कार, रिफेक्ट्री लांस, हाइड्रोलिक सिलेंडर, लेडल रूफ लिफटिंग सिलेंडर, लूब्रिकेशन प्रणाली, सक्शन हुड, डम्पर, वाइब्रो फीडर, वेइंग होपर, वायर फिडिंग प्रणाली, इलेक्ट्रोड निपिंलिंग स्टेड, क्रेन, होइस्ट, तापमान और सेम्पिलंग टिप्स, लेडल स्टेंड, ई एस पी, डिडविंटग हुड, रिफेक्ट्री, बेग फिल्टर, केन इत्यादि।	50%
11	सतत कास्टिंग उपकरण प्रस्वेद्ध सेन्मेंट सेन्द्रेस सेनेंट, टनडिस कोर, वंद्ध सेनेंद्रेम सेनेंद्र में जरमेंट सिस्टम, टनडिस स्टोपर रूड में केनिजम, इमरजेंसी कट-आफ गेट, मोल्ड एसेम्बली, नोजल क्विक चेंज डिवाइस, मोल्ड ओसीलेटर एंड ई एम एस सिस्टम, इलेक्ट्रो-मेंगेनेटिक ब्रेकिंग सिस्टम, स्ट्रेड गाइड सेगमेंट, विदड़ावल एंड स्ट्रेघटेनिंग यूनिट (इब्ल्यू एस यू), रोल गेप चेकर इमरजेंसी टार्च कटर, टार्च किटंग मशीन, डेवरर, मार्किंग मशीन, टेकेनोलोजी कंट्रोल सिस्टम एंड प्रोसेस मोडल, ब्लेक रिफेक्ट्रीज, स्ट्रेंड गन्डे सेग्मेंट, टनडिश, लाडले कवर, रोलर टेबल एंड आक्सीलिरीज, माल्ड एंड सेग्मेंट मेनटेनेस इक्यूपमेंट टनडिस मेनटेनेस इक्यूपमेंट, ई एम बी आर सिस्टम		50%
12	फ्लेट प्रोडक्ट मिल	इंड स्पिंडल्स; रोलर टेबल, बेकअप रोल एंड वर्क रोल चक्स क्वाइलर/टेनशन रिल/अनक्वाइलर, ए जी सी सिलंडर, 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	लॉंग प्रोडक्ट मिल	मिलस हाउसिंग, बेड प्लेट, वर्क रोल, बेकअप रोल, स्पिनडेल्स; रोलर टेबल, कॉयलर /टेंशन रिल /अनकॉयलर, शेयर्स, बिल्डट वेल्डर, पेकेजिंग मशीन, नान-कानटेक्ट गॉज/प्रोफाइल गॉज, एंटी-फ्रिक्शन रोल नेक बियरिंग, आयल फिल्म बियरिंग, फिनिशिंग ब्लाक्स, गियर बॉक्स, मिल मोटर	50%

<sup>\*</sup>परिशिष्ट स्न में मदें निर्माण करने वाले इस्पात के लिए पूंजीगत सामानों की एक सांकेतिक सूची हैं. 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 वरीयता के लिए विचार किया जाएगा।

#### फार्म - 1

में	सुपुत्र, सुपुत्री, पत्नी,	———— का निवासी			
		तद् 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 हो	उंगा।			
कि या खरीद	हां नीचे दी गई सूचना मेरे सर्वोत्तम ज्ञान और इकरने वाली एजेंसी के समक्ष संगत रिकार्ड प्रस्	विश्वास के अनुसार सही हैं और मैं घरेलू मूल्यवर्धन का आकलन करने के प्रयोजन से तुत करने का बचन देता हूं।			
कि सः मैं उस	भी इनपुट्स के लिए घरेलू मूल्यवर्धन जिसमें र में किये गये दावों की सत्यतता के लिए जिम्मेल	उक्त लौह एवं इस्पात उत्पाद शामिल हैं का सत्यापन मेरे द्वारा कर लिया गया है और दार हूं।			
कि इस	ममें उल्लिखित उत्पाद घरेलू मूल्यवर्धन सही न	हीं पाये जाने और मूल्यवर्धन के लिए निर्धारित मानदंडों को पूरा नहीं किये जाने की			
स्थिति	िमें, घरेलू मूल्यवर्धन का आकलन करने के उद्दे	श्य से खरीद करने वाली एजेंसी के आकलन के आधार पर मैं 36 महीनों की अवधि के			
		ऊंगा। इसके अलावा मैं इस प्रकार के आकलन की सभी लागतों का वहन करूंगा। रकारी खरीद में घरेलू स्तर पर निर्मित लौह एवं इस्पात उत्पादों को वरीयता दी गई			
एम डा दण्डर मैं8 व	ा का जब्त करें। में यह भी वचन देता हूं कि आ प्रांशि का भुगतान करूंगा।	ह कि खरीद करने वाली एजेंसी को एतद् द्वारा अधिकार दिया जाता है कि वह मेरे ई किलन की लागत का भुगतान करूंगा और निविदा दस्तावेज में यथा उल्लिखित सभी में निम्निलिखित सूचना रखने के लिए सहमत हूं और किसी सांविधिक प्राधिकारी को			
i.	V TRANSPORT TO SEE THE CONTRACT OF THE SECOND SECON	जीकृत कार्यालय, विनिर्माण इकाई का स्थान, कानूनी प्रतिष्ठान की प्रकृति)			
ii.	वह तिथि जब यह प्रमाण पत्र जारी किया				
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।			
٧.	दावा की गई घरेलू मूल्यवर्धन की प्रतिशतत	ता और क्या यह निर्धारित घरेलू मूल्यवर्धन के आरंभिक मूल्य को पूरा करता है।			
vi.	विनिर्माता की इकाई का नाम और संपर्क ि				
vii.	लौह और इस्पात उत्पादों की निवल बिक्री	कीमत			
viii.	संयंत्र तक भाड़ा, बीमा और रखरखाव				
ix.	लौह एवं इस्पात उत्पादों का निर्माण करने लागत मूल्य।	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 प	ार की जाती है की सूची और कुल लागत			
		आपूर्तिकर्ताओं से प्राप्त घरेलू मूल्यवर्धन प्रमाणपत्र संलग्न करें।			

आयात किये गये इनपुट इस्पात के लिए, सी आई एफ मूल्य, शुल्क और करों, पोर्ट पर उतारने से संबंधित प्रभारों और अंतर्देशीय

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

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

भाड़े की लागत के ब्यौरे के साथ भारतीय पोर्ट पर पहुंच कीमता

<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. Secv.

# 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

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

For Capital Goods

% Domestic value addition

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

#### 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 1 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%

Y		
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%
Containers for compressed or liquefied gas, of iron or steel	7311	15%
Stranded wire, ropes, cables, plaited bands, slings and the like, of iron or steel, not electrically insulated	7312	15%
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%
Grill, netting and fencing, of iron or steel wire; expanded metal of iron or steel	7314	15%
Chain and parts thereof, of iron or steel	7315	15%
Anchors, grapnels and parts thereof, of iron or steel	7316	15%
Articles of iron and steel	7317	15%
Articles of iron and steel	7318	15%
Articles of iron and steel	7319	15%
Springs and leaves for springs, of iron or steel	7320	15%
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%
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%
Tables and similar household articles and parts thereof, of iron or steel	7323	15%
Sanitary ware and parts thereof, of iron or steel	7324	15%
Other cast articles of iron or steel	7325	15%
Electrical steel and other articles of iron or steel	7326	15%
Railway or tramway passenger coaches, not self-propelled	8605	50%
Railway or tramway goods vans and wagons, not self-propelled	8606	50%
Parts of railway or tramway locomotives or rolling-stock; such as bogies, bissel-bogies, axles and forged wheels, and parts thereof	8607	50%
	exceeding 300 L, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment  Containers for compressed or liquefied gas, of iron or steel  Stranded wire, ropes, cables, plaited bands, slings and the like, of iron or steel, not electrically insulated  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  Grill, netting and fencing, of iron or steel wire; expanded metal of iron or steel  Chain and parts thereof, of iron or steel  Anchors, grapnels and parts thereof, of iron or steel  Articles of iron and steel  Articles of iron and steel  Articles of iron and steel  Springs and leaves for springs, of iron or steel  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  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  Tables and similar household articles and parts thereof, of iron or steel  Sanitary ware and parts thereof, of iron or steel  Cher cast articles of iron or steel  Electrical steel and other articles of iron or steel  Railway or tramway passenger coaches, not self-propelled  Parts of railway or tramway locomotives or rolling-stock; such as bogies,	tother 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  Containers for compressed or liquefied gas, of iron or steel  Stranded wire, ropes, cables, plaited bands, slings and the like, of iron or steel, not electrically insulated  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  Grill, netting and fencing, of iron or steel wire; expanded metal of iron or steel  Chain and parts thereof, of iron or steel wire; expanded metal of iron or steel  Anchors, grapnels and parts thereof, of iron or steel  Articles of iron and steel  Articles of iron and steel  Articles of iron and steel  Springs and leaves for springs, of iron or steel  Springs and leaves for springs, of iron or steel  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  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  Tables and similar household articles and parts thereof, of iron or steel  Tables and similar household articles and parts thereof, of iron or steel  Tables and similar household articles and parts thereof, of iron or steel  Railway or tramway passenger coaches, not self-propelled  Railway or tramway goods vans and wagons, not self-propelled  Parts of railway or tramway locomotives or rolling-stock; such as bogies,

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

SI. 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 benefaction (iron ore and coal) equipment	Industrial crushers, grinding mills, conventional screens, slurry pumps, hirate 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, H2S, NH3 & 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 stave coolers, Copper stave 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 distributer, 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, CO2 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 nipiling stand, Cranes, hoist, Temperature & sampling tips, ladle stands, ESP, Deducting 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%

<sup>\*</sup>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%

# 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
  - 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.
- 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.>

REGD. No. D. L.-33004/99



सी.जी.-डी.एल.-अ.-04012021-224171 CG-DL-E-04012021-224171

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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

आईडी प्रभाग

उद्योग भवन.

नई दिल्ली 31 दिसंबर, 2020

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

सरकारी खरीदमें स्वदेशी निर्मित लौहा 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/

3 GI/2021

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

#### l – संशोधन:तालिका 1

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

दूसरे के स्थान पर किया गया है।

#### खंड 5.1.5

यह नीति सरकार के मंत्रालय अथवा विभाग के द्वारा वित्त-यह नीति सरकार के मंत्रालय अथवा विभाग के द्वारा पोषित सभी परियोजनाओं और उनके प्रशासनिक नियंत्रण के वित्त पोषित सभी परियोजनाओं और उनके अधीन सभी एजेंसियों/ प्रतिष्ठानों पर लौह एवं इस्पात|प्रशासनिक नियंत्रण के अधीन सभी एजेंसियों/ उत्पादों की खरीद के लिए लागू है।

#### खंड 5.1.5

खंड 5.1.6

प्रतिष्ठानों पर लौह एवं इस्पात उत्पादों की खरीद के लिए लागु 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

#### खंड 5.1.6

यह नीति उन परियोजनाओं पर लागू होगी जहां लौह एवं|यह नीति उन परियोजनाओं पर लागू होगी जहां लौह इस्पात उत्पादों का खरीद मूल्य 25 करोड़ रुपए से अधिकाएवं इस्पात उत्पादों (डीएमआई एंड एसपी नीति का होता हो। यह नीति अन्य खरीद (गैर परियोजना) के लिए भी|परिशिष्ट-क) का खरीद मूल्य 5लाख रुपए से अधिक लागू होगी जहां उस सरकारी संगठन के लिए लौह एवं|होता हो। यह नीति अन्य खरीद (गैर परियोजना) के इस्पात उत्पादों का वार्षिक खरीद मूल्य 25 करोड़ रुपए से<mark>लिए भी लागू होगी जहां उस सरकारी संगठन के</mark> अधिक होता हो।

लिए लौह एवं इस्पात उत्पादों का वार्षिक खरीद

मुल्य 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।

#### खंड 7.2

घरेलू मूल्यवर्धन निवल बिक्री कीमत (निवल घरेलू करों और|घरेलू मूल्यवर्धन का तात्पर्य है- भारत में वर्धित मूल्य शुल्कों को छोड़कर बीजककीमत) होगी जिसमें से प्रतिशत मेंकि राशि जो खरीदी/बेची जाने वाली वस्तुओं का कुल निवल बिक्री कीमत के एक अनुपात केरूप में भारत में|मूल्य होगा (निवल घरेलू अप्रत्यक्ष करों को छोडकर)-निर्माण करने वाले संयंत्र में आयात की गई इनपुट सामग्री की खरीदी/बेची जाने वाली वस्तुओं के कुल मुल्य के पहुंच लागत (सभी सीमा शुल्कों को शामिल करते हुए) घटाईसिमानुपात के रूप में प्रतिशत में मद में आयातित जायेगी।

#### खंड 7.2

सामग्री का मूल्य (सभी सीमा शुल्कों सहित)।

#### खंड 7.3

यह सिफारिश की जाती है कि निविदा की प्रक्रिया में भागयह सिफारिश की जाती है कि प्रापण करने वाली लेने वाले प्रत्येक बोली लगाने वाले को नीचे दिए गए सूत्र कासरकारी एजेंसी/ निविदा की प्रक्रिया में भाग लेने उपयोग करते हुए घरेलू मूल्यवर्धन की गणना करनी चाहिएवाले प्रत्येक बोली लगाने वाले को नीचे दिए गए सत्र ताकि यह सुनिश्चित किया जा सके कि दावा किये गये घरेलूका उपयोग करते हुए घरेलू मृल्यवर्धन की गणना मूल्यवर्धन इस नीति के न्यूनतम निर्धारित घरेलू मूल्यवर्धन के करनी चाहिए ताकि यह सुनिश्चित किया जा सके कि अनुरूप है।

खंड 7.3

दावा किये गये घरेलू मूल्यवर्धन इस नीति के न्यूनतम निर्धारित घरेलू मूल्यवर्धन के अनुरूप है। लौह एवं इस्पात उत्पादों तथा पूंजीगत माल के लिए

लौह एवं इस्पात उत्पादों के लिए % घरेलू मूल्यवर्धन

> घरेलू अप्रत्यक्ष करों को छोड़कर - मद में आयातित सामग्री का मूल्य (सभी सीमा शुल्कों सहित) --------X100%

% घरेलू मूल्यवर्धन

अंतिम उत्पाद की निवल बिक्री कीमत- सयंत्र में आयात किये <sup>खरीदी</sup>/बेची जाने वाली वस्तु का कुल मूल्य (निवल गये लौह अथवा इस्पात की पहुंच लागत-X100%

अंतिम उत्पाद की निवल ब्रिकी कीमत	खरीदी/बेची जाने वाली वस्तु का कुल मूल्य
पूंजीगत माल के लिए	
% घरेलू मूल्यवर्धन	
अंतिम उत्पाद की निवल ब्रिकी कीमत- संयंत्र में आयात किये	d
गये इनपुट सामग्री की पहुंच लागत	
100%	
अंतिम उत्पाद की निवल ब्रिकी कीमत	

॥ 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	खण्ड 5.1.13 को खण्ड 5.1.12 के नीचे निम्नवत जोड़ा जाता है:
	खण्ड 5.1.13: लोहे और इस्पात उत्पादों की खरीद से संबंधित निविदाओं के लिए कोई वैश्विक निविदा इन्क्वायरी (जीटीई) आमंत्रित नहीं की जाएगी (डीएमआईऔर एसपीनीति 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 पूंजीगत सामानों की खरीद से संबंधित निविदाओं के लिए कोई वैश्विक निविदा इन्क्वायरी (जीटीई) व्यय विभाग द्वारा यथा नाम-निर्दिष्ट सक्षम प्राधिकारी के अनुमोदन के अलावा आमंत्रित नहीं की जाएगी,
2	खंड6.9 को खंड 6.8 के नीचे निम्नवत जोड़ा जाता है:
	खंड 6.9: निविदाओं और अन्य खरीद अधियाचनों में विनिर्देशन:
	6.9.1 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।
	6.9.2 क्रय इकाइयाँ यह देखने का प्रयास करेंगी कि पात्रता की शर्तें, 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।
	6.9.3 क्रय इकाइयाँ, 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।
	6.9.4 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 अनुमित 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।
	6.9.5 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) उसकीशेयरधारिता या इकाई काप्रभावी 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।

3 खंड 6.10 कोखंड 6.9 के नीचे निम्नवत जोड़ा जाता है:

खंड 6.10: 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। तत्पश्चात, 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।

#### 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 रोल्ड, 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 रोल्ड (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 कोड किया हुआ	7212	35%
6	लौह एवं गैर एलॉय इस्पात का अनियमित रूप से ऐंठा हुआ क्वाइल में बार्स और रॉड, हॉट रोल्ड	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 रोल्ड, हॉट ड्रॉन अथवा हॉट एक्सटूडेड परंतु रोलिंग के बाद उसे टिविस्ट 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 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 रोल्ड इस्पात	7219	50%
12	600 मि. मी. से कम की चौड़ाई का स्टेनलैस इस्पातका फ्लेट रोल्ड इस्पात	7220	50%
13	स्टेनलैस स्टील का अन्य बार्स और रोड्स; स्टेनलैस स्टील का एंगल शेप 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		35%
18	लौह अथवा इस्पात का सर्कुलर क्रॉस सेक्शन वाले अन्य ट्यूब और पाइप (उदाहरण के लिए, वेल्ड किया हुआ, रिवेट किया हुआ अथवा समान रूप से बंद किया गया हुआ), जिसकी बाहरी त्रिज्या 406.4 मि. मी. से अधिक हो		35%
19	लौह अथवा इस्पात के अन्य ट्यूब, पाइप और होलो प्रोफाइल (उदाहरण के लिएओपन सीन अथवावेल्ड किया हुआ, रिवेट 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 ऐंठा 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 ऐंठा हुआ क्वाइल में बार्स और रोड, हॉट रोल्ड	7227	20%
26	अन्य एलॉय स्टील का अन्य बार्स और रोड्स; अन्य एलॉय स्टील का एंगल, शेप्स और सेक्शन्स; एलॉय अथवा नॉन एलॉय स्टील का होलो ड्रील बार्स और रोड्स	7228	35%
27	लौह अथवा इस्पात की शीट पाइलिंग, चाहे ड्रील 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 प्रीफेबरिकेटिड 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	अधिकतक 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 स्टेंडिड 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 फेनिसेंग के लिए उपयोग किये जाने वाला बार किया हुआ वायर; टि्वस्ट किया हुआ हूप अथवा सिंगल फ्लेट वायर, बार्स किया हुआ अथवा नहीं और लूज तरीके से टि्वस्ट 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 सिहत), 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 उसकेपार्टस	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

SI.

# 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 31st December, 2020

Amended Clause in DMI&SP revised, 2019

## 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

Existing Clause in DMI&SP revised, 2019

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

#### **Clause 5.1.5** Clause 5.1.5: The policy is applicable to all projects funded by Ministry or Department of The policy is applicable to all projects funded by Government and all agencies/ entities under their Ministry or Department of Government and all administrative control for purchase of iron & steel agencies/ entities under their administrative products. All Central Sector Schemes control for purchase of iron & steel products. (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. Clause 5.1.6: The policy shall be applicable to Clause 5.1.6 The policy shall be applicable to projects where the procurement value of iron projects where the procurement value of iron and and steel products is greater than Rs. 25 crores. steel products (Appendix - A of the DMI&SP The policy shall also be applicable for other Policy) is greater than Rs. 5 lakhs. The policy procurement (non-project), shall also be applicable for other procurements where annual procurement value of iron and steel products for (non-project), where annual procurement value of that Government organization is greater than Rs. iron and steel products for that Government 25 crores. 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. Clause 7.2: Domestic value addition shall be the Clause 7.2: Domestic value addition means net selling price (invoiced price excluding net amount of value added in India which shall be the domestic taxes and duties) minus the landed cost total value of the item to be procured / sold of imported input materials at the manufacturing (excluding net domestic indirect taxes) minus the plant in India (including all customs duties) as a value of imported content in the item (including proportion of the net selling price, in per cent. all customs duties) as a proportion of the total value of the item to be procured / sold, in percent. Clause 7.3: It is recommended that each bidder Clause 7.3: It is recommended that procuring participating in the tender process should Government agency / bidder participating in the calculate the domestic value addition using the tender process should calculate the domestic below formula below so as to ensure the value addition using the below formula so as to domestic value addition claimed is consistent ensure that the domestic value addition claimed is with the minimum stipulated domestic value consistent with the minimum stipulated domestic addition requirement of the policy. value addition requirement of the policy. For iron and steel products For iron and steel products& capital goods % domestic value addition % domestic value addition Net selling price of final product - landed cost of imported iron or steel at the plant-----Total value of the item to be procured / sold -----X 100 % (excluding net domestic indirect taxes) - the value Net selling price of final product of imported content in the item (including all customs duties) For capital goods % domestic value addition -----X 100 % Net selling price of final product - landed cost Total value of the item to be procured / sold of imported iron or steel at the plant -----X 100 %

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)

Net selling price of final product

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

Sl. No.	Added / Inserted Clause in DMI&SP revised, 2019
1	Clause 5.1.13 is inserted below Clause 5.1.12 as:  Clause 5.1.13: No Global Tender Enquiry (GTE) shall be invited for tenders related to procurement of iron and steel products (Appendix-A of the DMI&SP Policy). No Global Tender Enquiry (GTE) shall be invited for tenders related to procurement of Capital Goods for manufacturing iron & steel products (Appendix-B of the DMI&SP Policy) having estimated value upto Rs. 200 Crore except with the approval of competent authority as designated by Department of Expenditure.
2	Clause 6.9 is inserted below Clause 6.8 as:
1	Clause 6.9: Specifications in Tenders and other procurement solicitations:
·	6.9.1 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.
	6.9.2 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.
	6.9.3 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.
	6.9.4 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.
	6.9.5 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.
3	Clause 6.10 is inserted below Clause 6.9 as:
•	Clause 6.10: 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&SP Policy.

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

Sl. No	Indicative list of Iron & Steel Products		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	7309	20%
	Thermal equipment		
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		50%
1			

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.

#### **Annexure-1 to Appendix-II**

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

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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**ORDER 2017** 

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INSTRUCTION TO BIDDERS [ITB]	
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#### (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.
- 1.2 SCOPE OF BID: The scope of work/ Services shall be as defined in Section-VI of the Tender documents.
- 1.3 The successful bidder will be expected to complete the scope of Bid within the period stated in Special Conditions of Contract.
- 1.4 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 <u>Provision for procurement from a bidder which shares a land border with India has been</u> attached as **Annexure-VII** herewith.
- 2.2 The Bidder shall not be under a declaration of ineligibility by Employer for Corrupt/ Fraudulent/ Collusive/ Coercive practices, as defined in "Instructions to Bidders [ITB], Clause No. 39" (Action in case Corrupt/ Fraudulent/ Collusive/ Coercive Practices).
- 2.3 The Bidder is not put on 'Holiday' by TFL or any of the JV partner of OWNER (viz. GAIL, RCF, CIL) or Public-Sector Project Management Consultant (like PDIL,EIL, MECON only due to "poor performance" or "corrupt and fraudulent practices") or banned/blacklisted by Government department/ Public Sector on due date of submission of bid. Further, neither bidder nor their allied agency/(ies) (as defined in the Procedure for Action in case of Corrupt/Fraudulent/Collusive/ Coercive Practices) are on banning list of TFL or any of the JV partner of OWNER viz. GAIL, RCF, CIL.

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

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

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

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

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

- 2.5 Bidder shall not be affiliated with a firm or entity:
  - (i) that has provided consulting services related to the work to the Employer during the preparatory stages of the work or of the project of which the works/services forms a part of or
  - (ii) that has been hired (proposed to be hired) by the Employer as an Engineer/ Consultant for the contract.
- 2.6 Neither the firm/entity appointed as the Project Management Consultant (PMC) for a contract nor its affiliates/ JV'S/ Subsidiaries shall be allowed to participate in the tendering process unless it is the sole Licensor/Licensor nominated agent/ vendor.
- 2.7 Pursuant to qualification criteria set forth in the bidding document, the Bidder shall furnish all necessary supporting documentary evidence to establish Bidder's claim of meeting qualification criteria.

#### 2.8 **Power of Attorney:**

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

- (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 Board of Directors through Board Resolution or by the designated officer authorized by Board to do so. Such Board Resolution should be duly countersigned by Company Secretary / MD / CMD / CEO.

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

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

#### 3 BIDS FROM "CONSORTIUM"

Not applicable.

#### 4 ONE BID PER BIDDER

- 4.1 A Bidder shall submit only 'one [01] Bid' in the same Bidding Process either as single entity or as a member of any consortium (wherever consortium bid is allowed). A Bidder who submits or participates in more than 'one [01] Bid' will cause all the proposals in which the Bidder has participated to be disqualified.
- 4.2 More than one bid means bid(s) by bidder(s) having same Proprietor / Partners / Limited Liability Partner in any other Bidder (s). Further, more than one bids shall also include two or more bidders having common power of attorney holder.
  - Failure to comply this clause during tendering process will disqualify all such bidders from process of evaluation of bids.
- 4.3 Alternative Bids shall not be considered.
- 4.4 The provisions mentioned at sl. no. 4.1 and 4.2 shall not be applicable wherein bidders are quoting for different Items / Sections / Parts / Groups/ SOR items of the same tender which specifies evaluation on Items / Sections / Parts / Groups/ SOR items basis.

#### 5 COST OF BIDDING

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

#### 6 SITE VISIT

- 6.1 The Bidder is advised to visit and examine the site of works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for the required job. The costs of visiting the site shall be borne by the Bidder.
- 6.2 The Bidder or any of its personnel or agents shall be granted permission by the Employer to enter upon its premises and land for the purpose of such visits, but only upon the express conditions that the Bidder, its personnel and agents will release and indemnify the Employer and its personnel, agents from and against all liabilities in respect thereof, and will be responsible for death or injury, loss or damage to property, and any other loss, damage, costs, and expenses incurred as a result of inspection.
- 6.3 he 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.

#### [B] -BIDDING DOCUMENTS

#### 7 CONTENTS OF BIDDING DOCUMENTS

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

Section-I : Invitation for Bid [IFB]

Section-II : BID EVALUATION CRITERIA [BEC] & Evaluation methodology
 Section-III : Instructions to Bidders [ITB], Annexure, Forms & Formats

Section-IV : General Conditions of Contract [GCC]
 Section-V : Special Conditions of Contract [SCC]
 Section-VI : Scope of Work & Technical Specifications

Section-VII : Price Schedule/ Schedule of Rates

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

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

#### 8 CLARIFICATION OF TENDER DOCUMENTS

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

#### 9 <u>AMENDMENT OF BIDDING DOCUMENTS</u>

9.1 At any time prior to the 'Bid Due Date', Employer for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by addenda / corrigendum.

<sup>\*&#</sup>x27;Request for Quotation', wherever applicable, shall also form part of the Bidding document.

- 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 (G) of IFB. Bidders, in their own advised to regularly check the websites for interest. are 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. <u>DOCUMENTS COMPRISING THE BID</u>

11.1 Bidders are requested to refer instructions for participating in e-Tendering (Annexure-I to Section III of tender), Ready Reckoner for Bidders and FAQs available in e-portaland 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 (<a href="https://eprocure.gov.in/eprocure/app">https://eprocure.gov.in/eprocure/app</a>) 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 Rates (SOR) with prices blanked out mentioning quoted / not quoted (as applicable) written against each item as a confirmation that the prices are quoted in requisite format.
- (e) 'Letter of Authority' on the Letter Head, as per 'Form F-3'
- (f) 'Agreed Terms and Conditions', as per 'Form F-5'
- (g) 'ACKNOWLEDGEMENT CUM CONSENT LETTER', as per 'Form F-6'
- (h) Duly attested documents in accordance with the "BID EVALUATION CRITERIA [BEC]" establishing the qualification.
- (i) Copy of Power of Attorney as per 'F-20'/copy of Board Resolution, in favour of the authorized signatory of the Bid, as per clause no. 2.8 of ITB (Original to be submitted physically).
- (j) Copy of EMD / 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.
- (I) 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-8A & F-8B
- (q) Tender Document, its Corrigendum/Amendment/Clarification(s) duly signed on each page (in case of manual tendering)/ digitally signed (in case of e-Tender) by the Authorized Signatory holding POA.
- (r) Additional document specified in BDS, SCC, Scope of Supply or mentioned elsewhere in the Tender Document, its Corrigendum/Amendment/Clarification(s).
- (s) Any other information/details required as per Tender Document

#### Note:

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

#### 11.1.2 PART-II: Price Bid

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

11.2 "TECHNO-COMMERCIAL/UN-PRICED BID" comprising all the above documents mentioned at 11.1.1 along with copy of EMD/Bid Security, copy of Power of Attorney and copy of integrity pact should be uploaded in the CPP 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. The prices quoted by the Bidders will be inclusive of all taxes except **GST (CGST & SGST/UTGST or IGST)**. Applicable rate of **GST (CGST & SGST/UTGST or IGST)** on the contract value shall be indicated in SOR under column for GST.
- 12.2 Prices must be filled in format for "Schedule of Rates [SOR] " enclosed as part of Tender document. If quoted in separate typed sheets and any variation in item description, unit or quantity is noticed; the Bid is liable to be rejected.
- 12.3 Bidder shall quote for all the items of "SOR" after careful analysis of cost involved for the performance of the completed item considering all parts of the Bidding Document. In case any activity though specifically not covered in description of item under "SOR" but is required to complete the works as per Specifications, Scope of Work / Service, Standards, General Conditions of Contract ("GCC"), Special Conditions of Contract ("SCC") or any other part of Bidding Document, the prices quoted shall 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 Bidder shall also mention the **Service Accounting Codes** (SAC) / **Harmonized System of Nomenclature (HSN)** at the designated place in <u>Techno-Commercial / Un-</u>Priced bid.

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

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

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

- 13.3 In case CBIC (Central Board of Indirect Taxes and Customs)/ any tax authority / any equivalent Government agency brings to the notice of TFL that the Contractor has not remitted the amount towards **GST (CGST & SGST/UTGST or IGST)** collected from TFL to the government exchequer, then, that Contractor shall be put under Holiday list of TFL for period of six months after following the due procedure. This action will be in addition to the right of recovery of financial implication arising on TFL.
- 13.4 For statutory variation in GST (CGST & SGST/UTGST or IGST), please refer clause no. 13.0 of SCC (Section V of NIT)
- 13.5 Where TFL is entitled to avail the input tax credit of **GST (CGST & SGST/UTGST or IGST)**:-
- 13.5.1 Owner/TFL will reimburse the GST (CGST & SGST/UTGST or IGST) to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/regulation of GST, to enable Owner/TFL to claim input tax credit of GST (CGST & SGST/UTGST or IGST) paid. In case of any variation in the executed quantities, the amount on which the GST (CGST & SGST/UTGST or IGST) is applicable shall be modified in same proportion. Returns and details required to be filled under GST laws & rules should be timely filed by supplier with requisite details.
- 13.6 Where TFL is not entitled to avail/take the full input tax credit of **GST (CGST & SGST/UTGST or IGST)**:
- 13.6.1 Owner/TFL will reimburse **GST (CGST & SGST/UTGST or IGST)** to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/ regulation of GST subject to the ceiling amount of **GST (CGST & SGST/UTGST or IGST)** as quoted by the bidder, subject to any statutory variations, except variations arising due to change in turnover. In case of any variation in the executed quantities (If directed and/or certified by the Engineer-In-Charge) the ceiling amount on which **GST (CGST & SGST/UTGST or IGST)** is applicable will be modified on pro-rata basis.
- 13.7 TFL will prefer to deal with registered supplier of goods/ services under GST. Therefore, bidders are requested to get themselves registered under GST, if not registered yet.
  - However, in case any unregistered bidder is submitting their bid, their prices will be loaded with applicable GST (CGST & SGST/UTGST or IGST) while evaluation of bid (if applicable as per Govt. Act/ Law in vogue). Where TFL is entitled for input credit of GST (CGST & SGST/UTGST or IGST), the same will be considered for evaluation of bid as per evaluation methodology of tender document. Further, an unregistered bidder is required to mention its Income Tax PAN in bid document.
- 13.8 In case TFL is required to pay entire/certain portion of applicable **GST (CGST & SGST/UTGST or IGST)** and remaining portion, if any, is to be deposited by Bidder directly as per **GST (CGST & SGST/UTGST or IGST)** laws, entire applicable rate/amount of **GST (CGST & SGST/UTGST or IGST)** to be indicated by bidder in the SOR.

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

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

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

#### 13.10 Anti-profiteering clause

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

- 13.11 In case the GST rating of Contractor on the GST portal / Govt. official website is negative / black listed, then the bids may be rejected by TFL. Further, in case rating of bidder is negative / black listed after award of work, then TFL shall not be obligated or liable to pay or reimburse GST to such Contractor and shall also be entitled to deduct / recover such GST along with all penalties / interest, if any, incurred by TFL.
- 13.12 GST (CGST & SGST/UTGST or IGST) is implemented w.e.f. 01.07.2017 which subsumed various indirect taxes and duties applicable before 01.07.2017. Accordingly, the provisions of General Condition of Contract relating to taxes and duties which are subsumed in GST are modified to aforesaid provisions mentioned in clause no. 12 and 13 of ITB.
- 13.13 GST, as quoted by the bidder in Schedule of Rates, shall be deemed as final and binding for the purpose of bid evaluation (applicable for tenders where bidder quotes the GST rates). In case a bidder enters "zero/blank" GST or an erroneous GST, the bid evaluation for finalizing the L1 bidder will be done considering the "Zero" or quoted GST rate GST rate, as the case may be. No request for change in GST will be entertained after submission of bids. In case GST column is left blank in the SOR, the quoted prices shall be considered as "Inclusive of GST" and evaluation shall be done accordingly.

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

In case the actual GST rate applicable is lower than the quoted GST rate, the actual GST rate will be added to the quoted basic prices. The final cash outflow will be based on actual GST rate.

In case the actual GST rate applicable is more than the quoted GST rate, the basic prices quoted will be reduced proportionately, keeping the final cash outflow the same as the overall quoted amount.

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

- 13.14 Wherever TDS under GST Laws has been deducted from the invoices raised / payments made to the Contractors, as per the provisions of the GST law / Rules, Contractors should accept the corresponding GST-TDS amount populated in the relevant screen on GST common portal (www.gst.gov.in). 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.

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#### 14 BID CURRENCIES:

Bidders must submit bid in Indian Rupees only.

#### 15 BID VALIDITY

- 15.1 Bids shall be kept valid for period specified in BDS from the final Due date of submission of bid'. A Bid valid for a shorter period may be rejected by TFL as 'non-responsive'.
- 15.2 In exceptional circumstances, prior to expiry of the original 'Bid Validity Period', the Employer may request the Bidders to extend the 'Period of Bid Validity' for a specified additional period. The request and the responses thereto shall be made in writing or by email. A Bidder may refuse the request without forfeiture of his EMD / Bid Security.

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

#### 16 EARNEST MONEY DEPOSIT

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

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

- 16.2 EMD shall not be accepted in case the same has reference of "remitter" / "financer" other than bidder on the aforementioned financial instrument of EMD submitted by the bidder and bid of such bidder will be summarily rejected.
- 16.3 OWNER shall not be liable to pay any documentation charges, Bank charges, commission, interest etc. on the amount of EMD. In case EMD is in the form of a "Bank Guarantee", the same shall be from any Indian scheduled Bank or a branch of an International Bank situated in India and registered with "Reserve Bank of India" as Scheduled Foreign Bank. However, in case of "Bank Guarantee" from Banks other than the Nationalized Indian Banks, the Bank must be commercial Bank having networth in excess of Rs. 100 Crores [Rupees One Hundred Crores] and a declaration to this effect should be made by such commercial Bank either in the "Bank Guarantee" itself or separately on its letterhead.
- 16.4 Any Bid not secured in accordance with "ITB: Clause-16.1 & Clause-16.3" may be rejected by TFL as non-responsive.
- 16.5 Unsuccessful Bidder's EMD will be discharged/ returned as promptly as possible, but not later than" thirty [30] days" after finalization of tendering process.

- 16.6 The successful Bidder's EMD will be discharged upon the Bidder's acknowledging the "Award" and signing the "Agreement" (if applicable) and furnishing the Contract Performance Security (CPS)/ Security Deposit" pursuant to clause no. 38 of ITB.
- 16.7 Notwithstanding anything contained herein, the EMD may also be forfeited in any of the following cases:
  - (a) If a Bidder withdraws his Bid during the "Period of Bid Validity"
  - (b) If a Bidder has indulged in corrupt/fraudulent /collusive/coercive practice
  - (c) If the Bidder modifies Bid during the period of bid validity (after Due Date and Time for Bid Submission).
  - (d) Violates any other condition, mentioned elsewhere in the Tender Document, which may lead to forfeiture of EMD.
  - (e) In case of Cartelization of bid.
  - (f) In the case of a successful Bidder, if the Bidder fails to:
  - (i) to acknowledge receipt of the "Notification of Award" / Fax of Acceptance[FOA] / Detailed Letter of Acceptance [DLOA]",
  - (ii) to furnish "Contract Performance Security / Security Deposit", in accordance with "ITB: Clause-38".
- 16.8 In case EMD is in the form of "Bank Guarantee", the same must indicate the Tender Document No. and the name of Tender Document for which the Bidder is quoting. This is essential to have proper correlation at a later date.
- 16.9 MSEs (Micro & Small Enterprises) are exempted from submission of EMD in accordance with the provisions of PPP-2012 and Clause 40 of ITB. However, Traders/Dealers/Distributors/Stockiest/Wholesaler are not entitled for exemption of EMD. The Government Departments/PSUs are also exempted from the payment of EMD. Further, Startups are also exempted from the payment of EMD.
- 16.10 In case of forfeiture of EMD/ Bid Security, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by TFL. The forfeiture amount will be subject to final decision of TFL based on other terms and conditions of order/contract.

#### 16.11 **DECLARATION FOR BID SECURITY**

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

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

- 17.1 The Bidder(s) or his designated representative are invited to attend a "Pre-Bid Meeting" which will be held at address specified in IFB. It is expected that a bidder shall not depute more than 02 representatives for the meeting.
- 17.2 Purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage and give hands-on e-tendering.

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

#### 18 FORMAT AND SIGNING OF BID

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

#### 19 ZERO DEVIATION AND REJECTION CRITERIA

ZERO DEVIATION: Deviation to terms and conditions of "Bidding Documents" may lead to 19.1 rejection of bid. TFL will accept bids based on terms & conditions of "Bidding Documents" only. Bidder may note TFL will determine the substantial responsiveness of each bid to the Tender documents pursuant to provision contained in clause 29 of ITB. For purpose of this, a substantially responsive bid is one which conforms to all terms and conditions of the Bidding documents without deviations or reservations. TFL's determination of a bid's responsiveness is based on the content of the bid itself without recourse to extrinsic evidence. TFL reserves the right to raise technical and/or commercial query(s), if required, may be raised on the bidder(s). The response(s) to the same shall be in writing, and no change in the price(s) or substance of the bids shall be sought, offered or permitted. The substance of the bid includes but not limited to prices, completion, scope, technical specifications, etc. Bidders are requested to not to take any deviation/exception to the terms and conditions laid down in this "Tender Documents", and submit all requisite documents as mentioned in this "Tender Documents", failing which their offer will be liable for rejection. If a bidder does not reply to the queries in the permitted time frame, then its bid shall be evaluated based on the documents available in the bid.

- 19.2 **REJECTION CRITERIA:** Notwithstanding the above, deviation to the following clauses of Tender document shall lead to summarily rejection of Bid:
  - a) Bidder not meeting Bid Evaluation Criteria as per Tender Document
  - b) Firm Price
  - c) EMD / Declaration for Bid Security (as applicable)
  - d) Specifications &Scope of Work
  - e) Schedule of Rates / Price Schedule / Price Basis
  - f) Duration / Period of Contract/ Completion Period
  - g) Payment Terms
  - h) Period of Validity of Bid
  - i) Integrity Pact
  - j) Mutually Agreed Damages
  - k) Overall ceiling on total liability
  - I) Contract Performance Security
  - m) Guarantee / Defect Liability Period
  - n) Arbitration / Settlement of Dispute
  - o) Governing laws, language & measures
  - p) Force Majeure
  - q) Undertaking forms, Form I of Annexure VII for provision for procurement from a bidder which shares a land border with India
  - r) Bidder quoting less than 20% as minimum Local content (as per make in India PPLC policy)
  - s) Any other condition specifically mentioned in the tender document elsewhere that non-compliance of the clause lead to rejection of bid

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

#### 20 E-PAYMENT

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

#### [D] - SUBMISSION OF BIDS

#### 21 <u>SUBMISSION, SEALING AND MARKING OF BIDS</u>

- 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 <u>DEADLINE FOR SUBMISSION OF BIDS</u>

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

#### 23 LATE BIDS

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

#### 24 MODIFICATION AND WITHDRAWAL OF BIDS

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

#### 24.1.1 IN CASE OF E- TENDERING

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

#### 24.1.2 IN CASE OF MANUAL BIDDING

Deleted.

#### [E] - BID OPENING AND EVALUATION

#### 25 <u>EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS</u>

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

#### 26 BID OPENING

#### 26.1 Unpriced Bid Opening:

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

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

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

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

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

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

#### 26.3 Reverse Auction

Deleted

#### **27 CONFIDENTIALITY**

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

#### 28 CONTACTING THE EMPLOYER

28.1 From the time of Bid opening to the time of award of Contract, if any Bidder wishes to contact the Employer on any matter related to the Bid, it should do so in writing.

28.2 Any effort by the Bidder to influence the Employer in the Employer's 'Bid Evaluation', 'Bid Comparison', or 'Contract Award' decisions may result in the rejection of the Bidder's Bid and action shall be initiated as per procedure for action in case Corrupt / Fraudulent / Collusive / Coercive practices in this regard, apart from forfeiture of EMD/ Bid Security, if any.

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

- 29.1 The employer's determination of a bid's responsiveness is based on the content of the bid only. Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid:
  - (a) Meets the "Bid Evaluation Criteria" of the Bidding Documents;
  - (b) Has been properly signed;
  - (c) Is accompanied by the required 'Earnest Money / Bid Security / Bid Security Declaration'
  - (d) Is substantially responsive to the requirements of the Bidding Documents; and
  - (d) Provides any clarification and/or substantiation that the Employer may require to determine responsiveness pursuant to "ITB: Clause-29.2"
- 29.2 A substantially responsive Bid is one which conforms to all the terms, conditions and specifications of the Bidding Documents without material deviations or reservations or omissions for this purpose employer defines the foregoing terms below:
  - a) "Deviation" is departure from the requirement specified in the tender documents.
  - b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirement in the tender documents.
  - c) "Omission" is the failure to submit part or all of the information or documentation required in the tender document for evaluation of bid.
- 29.3 A material deviation, reservation or omission is one that,
  - a) If accepted would,
    - i) Affect in any substantial way the scope, quality, or performance of the job as specified in tender documents.
    - ii) Limit, in any substantial way, inconsistent with the Tender Document, the Employer's rights or the tenderer's obligations under the proposed Contract.
  - b) If rectified, would unfairly affect the competitive position of other bidders presenting substantially responsive bids.
- 29.4 The employer shall examine all aspects of the bid to confirm that all requirements have been met without any material deviation, reservation or omission.
- 29.5 If a Bid is not substantially responsive, it may be rejected by the Employer and may not subsequently be made responsive by correction or withdrawal of the of material deviation, reservation or omission.

#### 30 CORRECTION OF ERRORS-

Not Applicable.

#### 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 <u>COMPENSATION FOR EXTENDED STAY [FOR APPLICABILITY OF THIS CLAUSE REFER BDS]:</u>

Not Applicable

#### 34 PURCHASE PREFERENCE

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

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

#### [F] - AWARD OF CONTRACT

#### 35 AWARD

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

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

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

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

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

#### 37 SIGNING OF AGREEMENT

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

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

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

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

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

- 38.3 Failure of the successful bidder to comply with the requirements of this article shall constitute sufficient grounds for consideration of the annulment of the award and Forfeiture of EMD/action as per declaration of Bid Security.
- 38.4 The CPS has to cover the entire contract value including extra works/services also. As long as the CPS submitted at the time of award take cares the extra works/services executed and total executed value are within the awarded contract price, there is no need for additional CPS. As soon as the total executed value is likely to burst the ceiling of awarded contract price, the contractor should furnish additional CPS.
- 38.5 DELETED
- 38.6 In addition to existing specified form (i.e. Demand Draft (DD)/ Banker's Cheque/ Bank Guarantee) mentioned in tender documents for submission of Security Deposit/ Contract Performance Security, the successful bidder can also submit the Security Deposit/ Contract Performance Security through online banking transaction i.e. IMPS/NEFT/RTGS/SWIFT etc. For this purpose, the details of TFL's Bank Account is mentioned in BDS. Further, in case a successful Bidder is willing to furnish CPS through SWIFT, the details may be obtained from Purchase Officer immediately after receipt of FOA.

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

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

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

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

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

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

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

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

- 40.1 Government of India, vide Gazette of India No. 503 dated 26.03.2012 proclaimed the Public Procurement Policy for Micro and Small Enterprises (MSEs). The following benefit is available in case of work contract also:
  - Issue of tender document to MSEs free of cost.
  - ii) Exemption to MSEs from payment of EMD/Bid Security.
- 40.2 In case bidder is a Micro or Small Enterprise the bidder shall submit the following:
  - i. Ministry of MSME vide Gazette notification no. CG-DL-E-26062020-220191 dated 26.06.2020 had notified certain criteria for classifying the enterprises as Micro, Small and Medium Enterprises and specified, form and procedure for filing the memorandum (Udyam Registration) w.e.f. 01.07.2020 (for complete details of policy refer website of Ministry of MSME i.e. <a href="https://msme.gov.in/">https://msme.gov.in/</a>)
    - Accordingly, Micro and Small Enterprises (MSEs) shall be required to submit Udyam Registration Certificate for availing benefit under Public Procurement Policy for MSEs-2012
  - ii. An enterprise registered prior to 30.06.2020 and who is not re-registered with Udyam Registration, shall continue to be valid for a period upto 30.06.2022. Such enterprise shall submit EM Part-II or Udyog Aadhaar Memorandum (UAM) for availing benefits of PPP-2012.

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

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

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

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

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

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

#### 41 AHR ITEMS

Not applicable.

#### 42 VENDOR PERFORMANCE EVALUATION

Shall be as stipulated Annexure II to ITB herewith.

#### 43 INCOME TAX & CORPORATE TAX

- 43.1 Income tax deduction shall be made from all payments made to the contractor as per the rules and regulations in force and in accordance with the Income Tax Act prevailing from time to time.
- 43.2 Corporate Tax liability, if any, shall be to the contractor's account.

#### 43.3 **TDS**

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

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

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

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

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

Accordingly, contractor should mention their PAN no. in their invoice/ bill for any transaction exceeding Rs. 2 lakhs or as amended from time to time. As provided in the notification, in case contractor 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 fulfilment 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 cooperate 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:-

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

OR

- 2.2 If a dispute arises out of or in connection with this contract, the party invoking the Arbitration shall submit that dispute to any one of the Arbitral Institutions i.e ICADR/ICA/DIAC/SFCA and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd. Supreme Court/High Court Judge to be appointed/nominated by the respective institution. The cost/expenses pertaining to the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to a specific Arbitral institution for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged.
- 2.3 The cost of arbitration proceedings shall be shared equally by the parties.
- 2.4 The Arbitration proceedings shall be in English language and the seat, venue and place of Arbitration shall be New Delhi, India only.
- 2.5 Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable. All matter relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.
- 2.6 List of Excepted matters:
  - a) Dispute(s)/issue(s) involving claims below Rs 25 lakhs and above Rs 25 crores.
  - b) Dispute(s)/issue(s) relating to indulgence of Contractor/Vendor/Bidder in corrupt/fraudulent/collusive/coercive practices and/or the same is under investigation by CBI or Vigilance or any other investigating agency or Government.
  - c) Dispute(s)/issue(s) wherein the decision of Engineer-In-Charge/owner/TFL has been made final and binding in terms of the Contract.

2.7. Disputes involving claims below Rs 25 Lakhs and above Rs. 25 crores:- Parties mutually agree that dispute(s)/issue(s) involving claims below Rs 25 Lakhs and above Rs 25 crores shall not be subject matter of Arbitration and are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.

#### 44.3 GOVERNING LAW AND JURISDICTION:

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

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

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

Any party aggrieved with the decision of the Committee at the First level (tier) may prefer an appeal before the Cabinet Secretary at the Second level (tier) within 15 days from the date of receipt of decision of the Committee at First level, through 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 <u>INAM-PRO (PLATFORM FOR INFRASTRUCTURE AND MATERIALS PROVIDERS)</u>

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 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 GAZETTE NOTIFICATION NO. D.L-33004/99 DATED 18.02.2016 AND 23.05.2017 OF MINISTRY OF COMMERCE AND INDUSTRY AND AS AMENDED FROM TIME TO TIME) [FOR APPLICABLITY REFER BDS]

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

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

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

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

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

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

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

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

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

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

### 52. PROVISION FOR PROCUREMENT FROM A BIDDER WHICH SHARES A LANDBORDER WITH INDIA.

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

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

Annexure-I

#### A Definitions:

- A.1 "Corrupt Practice" means the offering, giving, receiving or soliciting, directly or indirectly, anything of value to improperly influence the actions in selection process or in contract execution.
  - "Corrupt Practice" also includes any omission for misrepresentation that may mislead or attempt to mislead so that financial or other benefit may be obtained or an obligation avoided.
- 42 "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.
- A3 "Collusive Practice amongst bidders (prior to or after bid submission)" means a scheme or arrangement designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.
- A.4 "Coercive practice" means impairing or harming or threatening to impair or harm directly or indirectly, any agency or its property to influence the improperly actions of an agency, obstruction of any investigation or auditing of a procurement process.
- A.5 "Vendor/Supplier/Contractor/Consultant/Bidder" is herein after referred as "Agency"
- A.6 "Appellate Authority" shall mean Committee of Directors consisting of Director (Finance) and Director (BD) for works centers under Director (Projects). For all other cases committee of Directors shall consist of Director (Finance) & Director (Projects).
- A.7 "Competent Authority" shall mean the authority, who is competent to take final decision for Suspension of business dealing with an Agency/ (ies) and Banning of business dealings with Agency/ (ies) and shall be the "Director" concerned.
- A.8 "Allied Agency" shall mean all the concerns within the sphere of effective influence of banned/ suspended agencies. In determining this, the following factors may be taken into consideration:
  - (a) Whether the management is common;
  - (b) Majority interest in the management is held by the partners or directors of banned/ suspended firm.
  - (c) substantial or majority shares are owned by banned/ suspended agency and by virtue of this it has a controlling voice.

A.9 "Investigating Agency" shall mean any department or unit of TFL investigating into the conduct of Agency/ party and shall include the Vigilance Department of the TFL, Central Bureau of Investigation, State Police or any other agency set up by the Central or state government having power to investigate.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 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.	02 years
2	Corrupt/Fraudulent (except mentioned sl. no. 1 above) /Collusive/Coercive Practices	03 years

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

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

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

#### D. Procedure for Suspension of Bidder

#### **D.1** Initiation of Suspension

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

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

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

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

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

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

- D.3.1 No enquiry/bid/tender shall be entertained from an agency as long as the name of agency appears in the Suspension List.
- D.3.2 If an agency is put on the Suspension List during tendering:
- D.3.2.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the agency shall be ignored.
- D.3.2.2 after opening Technical bid but before opening the Price bid, the Price bid of the agency shall not be opened and BG/EMD submitted by the agency shall be returned to the agency.
- D.3.2.3 after opening of price, BG/EMD made by the agency shall be returned; the offer of the agency shall be ignored & will not be further evaluated. If the agency is put on Suspension list for fraud/ mis-appropriation of facts conducted in the sametender/other tender where errant agency emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.
- D.3.3 The existing contract (s)/ order (s) under execution shall continue.

D.3.4 Tenders invited for procurement of goods, works and services shall have provision that the bidder shall submit a undertaking to the effect that (i) neither the bidder themselves nor their allied agency/(ies) are on banning list of TFL and(ii) bidder is not banned by any Government department/ Public Sector.

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

- F.1 The agency may file an appeal against the order of the Competent Authority for putting the agency on banning list. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the of receipt of banning order.
- F.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the party as well as the Competent Authority.
- F.3 Appeal process may be completed within 45 days of filing of appeal with the Appellate Authority.
- G. Wherever there is contradiction with respect to terms of 'Integrity pact', GCC and 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice', the provisions of 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice' shall prevail.

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

#### 1.0 **GENERAL**

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

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

#### 2.0 **OBJECTIVE**

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

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

#### 3.0 **METHODOLOGY**

#### i) Preparation of Performance Rating Data Sheet

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

#### ii) Measurement of Performance

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

#### iii) Initiation of Measures:

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

- iv) <u>Implementation of Corrective Measures:</u>
  - 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 valuated 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:

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

- iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.
- v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

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

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

- 1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):
  - (a) First Instance: Holiday (Red Card) for Two Years
  - (b) Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Three Years
- 2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):
  - (a) First such instance: Advisory notice(Yellow Card) shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Three (3) Years.
  - (b) Second such instance in other ongoing order (s)/
    contract (s) or new order (s) /contact (s) on such Vendor/
    Supplier/ Contractor/ Consultant: Putting on Holiday
    (Red Card) for a period of One Year
  - (c) Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Three Years.
- B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 34.2.3 of GCC)
  - (a) First instance: Advisory notice (Yellow Card) shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Three (3) Years.

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

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

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

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

#### (C) Where Performance rating is "FAIR":

Issuance of warning to such defaulting 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

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

- iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.
- v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

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

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

- 1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):
  - (a) First Instance: Holiday (Red Card) for Two Years
  - (b) Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Three Years
- 2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):
  - (a) First such instance: Advisory notice(Yellow Card) shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Three (3) Years.
  - (b) Second such instance in other ongoing order (s)/
    contract (s) or new order (s) /contact (s) on such Vendor/
    Supplier/ Contractor/ Consultant: Putting on Holiday
    (Red Card) for a period of One Year
  - (c) Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Three Years.
- B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 34.2.3 of GCC)
  - (a) First instance: Advisory notice (Yellow Card) shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Three (3) Years.

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

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

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

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

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

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

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

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

#### 7.0 EFFECT OF HOLIDAY

- 7.1 If a Vendor/ Supplier/Contractor/ Consultant is put on Holiday, such Vendor/ Supplier/Contractor/ Consultant shall not be considered in ongoing tenders/future tenders.
- 7.2 However, if such Vendor/ Supplier/Contractor/ Consultant is already executing any other order/ contract and their performance is satisfactory in terms of the relevant contract, should be allowed to continue till its completion without any further increase in scope except those incidental to original scope mentioned in the contract. In such a case CPBG will not be forfeited and payment will be made as per provisions of concerned contract. However, this would be without prejudice to other terms and conditions of the contract.
- 7.3. Effect on other ongoing tendering:
- 7.3.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the party shall be ignored.
- 7.3.2 after opening Technical bid but before opening the Price bid, the Price bid of the party shall not be opened and BG/EMD submitted by the party shall be returned to the party.
- 7.3.3 after opening of price, BG/EMD made by the party shall be returned; the offer of the party shall be ignored & will not be further evaluated. If errant party emerges as the lowest (L1), then such tender shall also be cancelled and re-invited.
- 8.0 While putting the Vendor/ Supplier/Contractor/ Consultant on holiday as per the procedure, the holding company, subsidiary, joint venture, sister concerns, group division of the errant Vendor/ Supplier/Contractor/ Consultant shall not be considered for putting on holiday list. Any bidder, put on holiday, will not be allowed to bid through consortium route also in new tender during the period of holiday.

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

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

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

#### 11. **ERRANT BIDDER**

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

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

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

The Yellow card will be automatically revoked after specified period unless the same is converted into Red Card

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

Annexure-1

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

i) Project/Work Centre :
ii) Order/ Contract No. & date :
iii) Brief description of Items :

Works/Assignment

iv) Order/Contract value (Rs.) :
v) Name of Vendor/Supplier/ :
Contractor/ Consultant

vi) Contracted delivery/

Completion Schedule

vii) Actual delivery/ :

Completion date

Performance	Delivery/ Completion	Quality	Reliability	Total
Parameter	Performance	Performance	Performance#	
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:

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

Signature of Authorised Signatory:

Name:

Designation:

#### Instructions for allocation of marks

1. Marks are to be allocated as under:

#### 1.1 DELIVERY/ COMPLETION PERFORMANCE

40 Marks

Delivery Period/ Completion Schedule **Delay in Weeks** 

Marks

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	<ol> <li>No deviation</li> <li>No. of deviations ≤ 2</li> <li>No. of deviations &gt; 2</li> </ol>	5 marks 2 marks 0 marks

#### 1.3 RELIABILITY PERFORMANCE

#### 20 Marks

A.	FOR WORKS/CONTRACTS	
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	4 marks

	Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	
v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
B.	FOR SUPPLIES	
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

Annexure-2

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

i) Location Order/ Contract No. & date ii) Brief description of Items iii)

Works/Assignment

Order/Contract value (Rs.) iv) Name of Vendor/Supplier/ v)

Contractor/ Consultant

Contracted delivery/ vi) Completion Schedule

vii) Actual delivery/

Completion date

Performance	Delivery	Quality	Reliability	Total
Parameter	Performance	Performance	Performance#	
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:

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

Signature of Authorised Signatory:

Name:

Designation:

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

1. Marks are to be allocated as under:

#### 1.1 **DELIVERY/ COMPLETION PERFORMANCE**

40 Marks

**Delivery Period/ Delay in Weeks** 

**Marks** 

**Completion Schedule** 

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
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
	" 10 weeks " 12 weeks " 16 weeks More than 16 weeks  Before CDD Delay upto 4 weeks " 8 weeks " 10 weeks " 16 weeks " 20 weeks " 24 weeks

#### 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	<ol> <li>No deviation</li> <li>No. of deviations ≤ 2</li> <li>No. of deviations &gt; 2</li> </ol>	5 marks 2 marks 0 marks

#### 1.3 RELIABILITY PERFORMANCE

#### 20 Marks

A.	FOR WORKS/CONTRACTS	
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	4 marks
	Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	

v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
B.	FOR SUPPLIES	
i)	Submission of order acceptance, PBG, Drawings and other documents within time	5 marks
ii)	Attending complaints and requests for after sales service/ warranty repairs and/ or query/ advice (upto the evaluation period).	5 marks
iii)	Response to various correspondence and conformance to standards like ISO	5 marks
iv)	Submission of all required documents including Test Certificates at the time of supply	5 marks

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

1. The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

More information useful for submitting online bids on the CPP Portal may be obtained at: https://eprocure.gov.in/eprocure/app.

#### 2. REGISTRATION

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

#### 3. SEARCHING FOR TENDER DOCUMENTS

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

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

#### 4. PREPARATION OF BIDS

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

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

### 5. SUBMISSION OF BIDS

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

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

#### 6. ASSISTANCE TO BIDDERS

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

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### **BIDDING DATA SHEET (BDS)**

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

	A. GENERAL		
ITB clause	Description		
1.1	The Employer/Owner is: The Employer/Owner is: Talcher Fertilizers Limited		
1.2	The name of the Works/Services to be performed is: "Instrument Air and Plant Air System on Package Basis at Talcher Fertilizers Limited, Odisha (India)".		
3	BIDS FROM CONSORTIUM/ JOINT VENTURE:		
	APPLICABLE <b>x</b>		
	NOT VAPPLICABLE		
	B. BIDDING DOCUMENT		
ITB clause	Description		
8.1	For <u>clarification purposes</u> only, the communication address is:  M/s Projects & Development India Limited, P.D.I.L Bhawan, A-14, Sector-1, Noida, (PIN 201301) Dist. GautamBudh Nagar (UP). (India)  Kind Attention: Mr. P.R.Sahu, Addl. General Manager (M.M) Fax no.: +91-120-2529801 Tel no.: +91-120-2544063 E-mail: prsahu@pdilin.com		
	C. PREPARATION OF BIDS		
ITB clause	Description		
11.1.1 (r)	Additional documents to be submitted by the Bidder with its Part-I (Technocommercial/ Unpriced bid) :As per SCC/Scope of Work.		
13	Details of Buyer:  Services to be rendered M/s Talcher Fertilizers Ltd. (TFL), at Administrative Building, Talcher, Post: Vikrampur, Dist: Angul, Pincode-759106,		

		Odisha	
		Ouisiia	
	PAN No.	AAFCT8667A	
	GST no.	21AAFCT8667A1ZH	
	TFL Bank details	Account No.: 37088269547	
		Bank & Branch Name: SBI, CAG-II, New Delhi	
		IFSC Code: SBIN0017313	
14	The currency of the Bid	shall be INR	
15	The bid validity period sh	nall be Six (6) Months from final 'Bid Due Da	te'.
16.1, 16.10 and 38.6	In case 'Earnest Money / Bid Security' or "Contract Performance Security" is in the form of 'Demand Draft' or 'Banker's Cheque', the same should be favour of "Talcher Fertilizers Limited", payable at New Delhi.		
	Or raicher Fertilizers Lii	nited, payable at New Delli.	
	In case of submission through online banking transaction i.e. IMPS / NEFT / RTGS / SWIFT, etc, the details of TFL's Bank account are as under:		
	Account Holder's Name:Talcher Fertilizers Limited		
	Bank Name: State Bank of India		
	Branch: CAG II, New Delhi Account number: 37088269547		
	Type (Current/Saving): Current IFSC code: SBIN0017313		
	Bidder to mention reference no. "EMD/" in narration while remitting the		
	EMD / Bid Security amount and to mention reference no. "CPS/" in narration while remitting the CPS amount in TFL's Bank Account		
	D. SUBMISS	SION AND OPENING OF BIDS	
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	The submission of physi following address:	cal document as per clause no. 4.0 of IFB s	hall at
	M/s Projects & Develop	ment India Limited	
	P.D.I.L Bhawan, A-14, S	•	
	Noida, (PIN 201301)		
	Dist. Gautam Budh Nag	jar (UP). (India)	
	Kind Attention:		
	Mr. P.R.Sahu, Addl. Ge	neral Manager (M.M)	

	Fax no. : +91-120-2529	901		
	Tel no. : +91-120-2529			
	13.113. 1 101 120 20 11000			
	E. EVALUATIO	N, AND COMPA		
ITB clause		Descri	•	
32	Evaluation Methodology	is mentioned in S	Section-II of tender.	
33	Compensation for	×		
	Extended Stay:	~		
	APPLICABLE			
	NOT APPLICABLE			
	NOT APPLICABLE	✓		
	F. AV	VARD OF CONT		
ITB clause		Descri		
37			uired for Contract Agreement: Uttar	
	Pradesn/ State where E	Bidder's Register	red or Corporate Office is located.	
38	Contract Performance S	ecurity/ Security [	Deposit	
			' -	
	APPLICABLE	$\checkmark$		
	NOT		4	
	APPLICABLE	×		
	74 T EIO/ABEE			
The value/ amount of Contract Performance Security/ Security Deposit:			ce Security/ Security Deposit:	
		0 1 10 1 1		
41	CPS/SD @ 3% of Total ( Provision of AHR Item :	Order / Contract v	value (excluding GST)	
41	Provision of ARK Item.			
	APPLICABLE	×		
	NOT	$\checkmark$		
	APPLICABLE			
44.1	Quarterly Closure of Cor	ntract:		
			7	
	APPLICABLE	×		
	NOT		-	
	APPLICABLE	<b>∀</b>		
49	Applicability of BEC relation	vation relating to	Startine.	
10	Applicability of DEO Iela.	Addon Tolating to	otanapo.	
			_	
	APPLICABLE	×		
	NOT		-	
	APPLICABLE	✓		
Ī	11 - 1		1	

	Annexure-V
PUBLIC PROCUREMENT	
(PREFERENCE TO MAKE IN INDIA), ORDER 2017	
	Page   75

# 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.

.....Contd. p/2

'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 subpara 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.

### 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-l 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:
  - 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.

- (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.
- 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

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:
  - 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

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.

- 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 nonavailability 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

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.

esh Gupta) Director

Tel: 23063211

rajesh.gupta66@gov.in

### 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	Talch	er Fertilizers Limited	
	SUB	3:		
	TEN	DER	NO:	
	Dear	r Sir		
A.	Acco	ountar	the Statutory Auditor / Cost Auditor / Part / Practicing Chartered Accountant) have verified relevant reconstruction (Name of the bidder) and certify (Name of the bidder) meets the following:	ords of M/s
		SI.	Description	Confirmation
		No.		
		а	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
	L			

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

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

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

### PREAMBLE TO SCHEDULE OF RATES

- 1. The "Schedule of Rates (SOR)" 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 SOR 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 SOR 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. SOR consists of following two sheet:
  - Annexure-A: Schedule of Rates containing Total Lumpsump Turnkey Price/ TOTALCONTRACT PRICE & GST
  - Annexure- B: Guaranteed Works Cost table
- 5. It is mandatory to quote prices in SOR. It will be the responsibility of the contractor to quote for all Materials/ Equipments /Services/Civil & Structural Works etc. as per scope of work and terms and conditions defined in NIT.
- 6. CONTRACTOR 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 TOTAL LSTK PRICE /TOTAL CONTRACT 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 unpriced bid, as a confirmation of price/data quoted against each head.

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

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

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

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

**Explanation-**

- a) "Controlling ownership interest" means ownership of, or entitlement to, more than twenty-five percent of shares or capital or profits of the company;
- b) "Control" shall include the right to appoint the majority of the

directors or to control the management or policy decisions, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

- ii) In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;
- iii) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals:
- iv) Where no natural person is identified under (i) or (ii) or (iii) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
- v) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.
- 6. **"Agent"** for the purpose of this Order is a person employed to do any act for another, or to represent another in dealings with third persons.

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

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

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

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

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

The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of "contractor from a country which shares a land border with India" shall be as in Para4 herein above. A Certificate to this regard is to be submitted by bidder is placed at Form-II

### Form-I to Annexure-VII

### **UNDERTAKING ON LETTERHEAD**

I o, M/s Talch	ner Fertilizers Limited				
SUB:					
TENDER	NO:				
Dear Sir					
shares a		g Provisions for Procureme on sub-contracting to contracting to contracting to contracting to contracting to contracting to contracting the substitution of the substi			
(i)	not from such a country		]	]	
(ii)	(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 ap	opropriate option (✓ or X)	above).		
		(Name of Biddeess such contractor is registed			
	by certify that bidder <b>M/s_</b> and is eligible to be considered	ed. (Name of B	idder) fulfills	all requi	rements in this
Place: Date:		[Signature of Authorized S Name: Designation: Seal:	Signatory of B	idder]	

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### **LIST OF FORMS & FORMATS**

Form No.	Description
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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(A)	CHECKLIST
F-8(B)	CHECKLIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING DOCUMENTS
F-9	FORMAT FOR CERTIFICATE FROM BANKIF 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 - NOT APPLICABLE
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
F-17 (a)	MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR ALONG WITH BANK GUARANTEE (BG)
F-18	PROFORMA OF BANK GUARANTEE FOR PAYMENTS TOWARDS PLACEMENT OF ALL PURCHASE ORDERS OF MAJOR TAGGED ITEMS
F-19	FORMAT OF LETTER OF NO DEVIATIONS
F-20	FORMAT FOR POWER OF ATTORNEY
F-21	UNDERTAKING REGARDING SUBMISSION OF ELECTRONIC INVOICE( E-INVOICE AS PER GST LAW)
F-22	UNDERTAKING REGARDING SUBMISSION CONTRACT PERFORMANCE SECURITY (CPS) / SECURITY DEPOSIT (SD) WITHIN STIPULATED TIME LINE
F-23	PROFORMA FOR CONTRACT AGREEMENT

### <u>F-1</u>

### **BIDDER'S GENERAL INFORMATION**

To, **M/s Talcher Fertilizers Limited** 

TENDER NO:

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

11	ISO Certification, if any	
	{If yes, please furnish details}	
12	PAN No	
		[Enclose copy of relevant document]
13	GST No.	
	(refer sl. no. 8 above)	[Enclose copy of relevant document]
14	EPF Registration No.	
		[Enclose copy of relevant document]
15	ESI code No.	
		[Enclose copy of relevant document]
16	Whether Micro or Small Enterprise	Yes / No
		(If Yes, Bidder to submit requisite documents as
	Whether MSE is owned by SC/ST	specified it ITB: Clause No. 40) Yes / No
	Entrepreneur(s)	(If Yes, Bidder to submit requisite documents as specifie
	Entroproneur(3)	it ITB: Clause No. 40)
	Whether MSE is owned by Women	Yes / No
		(If Yes, Bidder to submit requisite documents as specifie it ITB: Clause No. 40)
17	Whether Bidder is Startups or not	Yes / No
		(If Yes, Bidder to submit requisite documents as specifie
40	La casa of Otantona confines the	it 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 supplied from multiple locations, bidder is required to provide in their bid, the address on which contract is to be placed.

Place: Date:	[Signature of Authorized Signatory of Bidde
Date.	Name:
	Designation:
	Seal:

### **FORMAT F-2A**

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

(To be stamped in accordance with the Stamp Act)

To,		Bank Guarantee No.	
Talch	er Fertilizers Limited (TFL)	Date of BG	
		BG Valid up to (Expiry date)	
		Claim period up to (indicate date of	
		expiry of claim period which includes	
		minimum three months from the	
		expiry date)	
		Stamp Sl. No./e-Stamp Certificate No.	
Dear S	Sir(s),		
In acc	cordance with Letter Inviting	Tender under your reference No	M/s.
	their Registered / Head Office at dender for	(hereinafter called the Tende	erer), wish to participate in
submit	ted by the Tenderer as a condition	st Earnest Money for the amount of precedent for participation in the said tender ingencies mentioned in the Tender Document	which amount is liable to
Head (and un Limited recours	Office dertake to pay immediately on c	Bank at	Local Address) guarantee ers by Talcher Fertilizers
months	s beyond the validity of the bid].If ed to such required	shall remain valid up to [this any further extension of this guarantee is reperiod on receiving instru whose behalf this guarantee is	equired, the same shall be ctions from $M/s$ .
Notwit	chstanding anything contained her	ein:	
a)	The Bank's liability under this (currency in words only)	Guarantee shall not exceed (currency in figu	ıres)
b)	This Guarantee shall remain in	n force upto (this expiry daid) and any extension(s) thereof; and	te of BG should be two
c)	claim or demand is issued to the of expiry of claim period which Guarantee) and if extended, the	I discharged from all liability under this Ge Bank on or before the midnight of	(indicate date the expiry of this Bank Guarantee. If a claim has

In witness whereof the Bank, through its a of 20_ at	authorized officer, has set its hand and stamp on thisday
WITNESS:	
(SIGNATURE)	(SIGNATURE)
(NAME)	(NAME)
	Designation with Bank Stamp
(OFFICIAL ADDRESS)	Attorney as per
	Power of Attorney No
	Date:

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

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

### **FORMAT F-2B**

### **DECLARATION FOR BID SECURITY**

(To be submitted on Letter head of Bidder)

To,			
M/s T	ALCHER I	FERTILIZERS LIMITED	
SUB:			
TEND	ER NO:		
Dear S	Sir,		
Adder	nda), we Î		d tender documents (including all corrigendum/ (Name of Bidder) have submitted ouroffer/ 
We, under		, according to your conditions, we are s	(Name of Bidder) hereby ubmitting this Declaration for Bid Security.
			day/ banning list (as per polices of TALCHER ach of our obligation(s) as per following:
(a)		thdrawn/modified/amended, impairs or od of bid validity specified in the form of	derogates from the tender, my/our Bid during 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) f	ail or refuse to accept 'arithmetical corr	ections' as per provision of tender document.
(c)	having ir	ndulged in corrupt/fraudulent /collusive/	coercive practice as per procedure.
	Place: Date:	Ň	Signature of Authorized Signatory of Bidder] ame: esignation:
		S	eal

### 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, <b>M/s T</b>	ALCHER FERTILIZERS LIMITED,
SUB: TENDI	ER NO:
	Bir,  hereby authorize the following entative(s) for attending any 'Meetings [Pre-Bid Meeting]', 'Un-priced Bid Opening' and Bid Opening' against the above Tender Documents:
	me & Designation Signature one/Cell:
E-r	mail:@
	me & Designation Signature one/Cell:
E-r	mail: @
	onfirm that we shall be bound by all commitments made by aforementioned authorised entative(s).
Place: Date:	[Signature of Authorized Signatory of Bidder] Name: Designation: Seal:
(i)	Note: This "Letter of Authority" should be on the <u>"letter head"</u> 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' /'Unpriced 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.

### <u>F-4</u>

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

To,	Bank Guarantee No.
M/s Talcher Fertilizers Lim	ited, Date of BG
Noida	BG Valid up to
	Claim period up to (There should be three months gap between expiry date of BG & Claim period)
	Stamp SI. No./e-Stamp Certificate No.
Dear Sir(s),	
wherever the context so require the job/work of	(herein after called the "contractor" which expression shall include its successors and assignees) have been placed/ awarded vide LOA /FOA No dated for Talcher Fertilizers LImited having registered a, BJB Nagar, Khorda, Bhubaneswar-751014, Odisha (herein after on shall wherever the context so require include its successors and evide that the CONTRACTOR shall pay a sum of Rs. ees ) as full Contract
Guarantee includes guarantee	rm therein mentioned. The form of payment of Contract Performance executed by Nationalized Bank/Scheduled Commercial Bank, ndemnify Talcher Fertilizers Limited, in case of default.
The said M/stheir request and in cor	has approached us and at sideration of the premises we having our office at have agreed to give such guarantee as hereinafter mentioned.
1. We	hereby undertake to neconditional guarantee to you that if default shall be made by M/s.
the tender/order/contract we shall on first demand	in performing any of the terms and conditions of or in payment of any money payable to Talcher Fertilizers Limited pay without demur, contest, protest and/ or without any recourse to in such manner as TFL may direct the said amount of Rupees only or such portion thereof not exceeding the said sum

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
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.
6.	(contractor) on whose behalf this guarantee is issued.  Bank also agrees that TFL at its option shall be entitled to enforce this Guarantee against the bank (as principal debtor) in the first instant, without proceeding against the contractor and notwithstanding any security or other guarantee that TFL may have in relation to the /contractor's liabilities.
7.	The amount under the Bank Guarantee is payable forthwith without any delay by Bank upon the written demand raised by TFL. Any dispute arising out of or in relation to the said Bank Guarantee shall be subject to the exclusive jurisdiction of courts at New Delhi.
8.	Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Contractor up to a total amount of(amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Contractor to be in default under the order/contract and without caveat or argument, any sum or sums within the limits of (amounts of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein.

9.		have power to issue this guarantee in your favor under Memorandum and Articles of sociation and the undersigned has full power to do under the Power of Attorney, dated granted to him by the Bank.
10. 11		twithstanding anything contained herein:
	a)	The Bank's liability under this Guarantee shall not exceed (currency in figures) (currency in words only)
	b)	This Guarantee shall remain in force upto (this date should be expiry
	c)	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.
		Yours faithfully,
		Bank by its Constituted Attorney
		Signature of a person duly Authorized to sign on behalf of the Bank

### <u>INSTRUCTIONS FOR FURNISHING</u> "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 CI no. 38.3 of ITB [Section-III] of Tender Document.
- 3. A letter from the issuing bank of the requisite Bank Guarantee confirming that said Bank Guarantee and all future communication relating to the Bank Guarantee shall be forwarded to Employer.
- 4. If a Bank Guarantee is issued by a commercial bank, then a letter to Employer and copy to Consultant (if applicable) confirming its net worth is more than Rs. 100,00,00,000.00 [Rupees One Hundred Crores] or its equivalent in foreign currency alongwith documentary evidence OR in the Bank Guarantee itself.
- 5. Contractor shall submit attached cover letter (Annexure) while submitting Contract Performance Security.

### Form-4 (a)

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

1.	Bank Guarantee No.						
2.	Vendor Name/ VENDOR CODE						
		NAME				]	
		VENDOR COD	VENDOR CODE				
ВА	NK GUARANTEE AMOUNT						
PU	RCHASE ORDER/LOA						
1.	Nature of Bank Guarantee [Please Tick (□) whichever is applicable]	Performance Security (CPS)		URITY OSIT	ADVANCE	EMD	
2.	BG ISSUING Bank DETAILS:		•				
	(A) E-MAIL ID						
	(B) ADDRESS						
	(C) Phone No. / Mobile No.						

# <u>F-5</u>

# **AGREED TERMS & CONDITIONS**

To, M/s TALCHER FERTILIZERS LIMITED

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.

	returned along with Un-priced Bid. Clauses confirmed hereunder need not be repeated in the Bid.					
SI.	DESCRIPTION	BIDDER'S CONFIRMATION				
1.	Bidder's name, Vendor Code of TFL (If any) and address	Bidder's Name:				
		TFL's Vendor Code:				
		Address:				
2.	Bidder confirms the currency of quoted prices is in Indian Rupees					
3.	Bidder confirms quoted prices will remain firm and fixed till complete execution of the order (except where price escalation/variation is allowed in the Tender).					
4.	Bidder confirms that they have quoted <b>GST (CGST &amp; SGST/UTGST or IGST)</b> in Price Schedule / Schedule of Rates (SOR) of Price bid.	Confirmed				
4.1	Whether in the instant tender services/works are covered in reverse charge rule of GST (CGST & SGST/UTGST or IGST)					
	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.	a				
	b. If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.	b				
4.5	Whether bidder is liable to raise E-Invoice as per GST Act.					
	If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.					
5.	Bidder confirms acceptance of relevant Terms of Payment specified in the Bid Document.					
5.A	Bidder to confirm 10% Mobilisation advance is required	Yes / NO				

SI.	DESCRIPTION	BIDDER'S CONFIRMATION
6.	Bidder confirms that Contract Performance Security will be furnished as per Bid Document within 30 days of FOA in case of successful bidder.	
7.	Bidder confirms that Contract Performance Security shall be from any Indian scheduled bank or a branch of an International bank situated in India and registered with Reserve bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalised Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect shall be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.	
8.	Bidder confirms compliance to Completion Schedule as specified in Bid document and the same shall be reckoned from the date of Fax of Acceptance.	
9.	<ul><li>(i) Bidder confirms acceptance of Mutually Agreed Damages for delay in completion schedule specified in Bid document.</li><li>(ii) In case of delay, the bills/invoices shall be submitted after reducing the price reduction due to delay (refer MAD Clause).</li></ul>	
10.	<ul><li>a) Bidder confirms acceptance of all terms and conditions of Bid Document (all sections).</li><li>b) Bidder confirms that printed terms and conditions of bidder are not applicable.</li></ul>	
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 EMD/Bid Security details as under:  a) EMD/ Bid Security No. & date  b) Value c) Validity d) Bank Address/e-mail ID/Mobile no. [in case of BG]  OR  Bidder furnishes bid security declaration [applicable for MSEs, Start-Ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue)]	
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.	Not confirmed

SI.	DESCRIPTION	BIDDER'S CONFIRMATION
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.	
18.	No Deviation Confirmation:  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.	
19.	If Bidder becomes a successful Bidder pursuant to the provisions of the Tender Document, the following Confirmation shall be automatically become enforceable:	
	"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 & 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."	
20.	Bidder to ensure all documents as per tender including clause 11 of Section III of tender and all Formats are included in their bid.	
21.	Bidder understands that Tender Document is not exhaustive. In case any activity though specifically not covered in description of 'Schedule of Rates' but is required to complete the work as per Scope of Work, Conditions of Contract, or any other part of Bidding document, the quoted rates will deemed to be inclusive of cost incurred for such activities unless otherwise specifically excluded. Bidder confirms to perform for fulfilment of the contract and completeness of the supplies in all respect within the scheduled time frame and quoted price.	
22.	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	

SI.	DESCRIPTION	BIDDER'S CONFIRMATION
	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.	
	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.	
	Bidder also confirms that they are not under any liquidation, court receivership or similar proceedings or 'bankruptcy'.	
	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.	
	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.	
23	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 & 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 of tender.	
24	Bidders confirm to submit signed copy of Integrity Pact (wherever included in tender).	
05	If Bidder is a partnership concern or a consortium, this agreement must be signed by all partners or consortium members.	
25.	Bidder confirms that, in case of contradiction between the confirmations provided in this format and to the terms & conditions mentioned elsewhere in the offer, the confirmations given in this format shall prevail.	
26.	Bidder's offer No. & Date	

Place:	[Signature of Authorized Signature of Authorized Signa	gnatory of Bidder

Name: Date: Designation: Seal:

# **ACKNOWLEDGEMENT CUM CONSENT LETTER**

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

To, M/s TALCHER FER NOIDA	TILIZERS LIMITED
SUB: TENDER NO:	
Dear Sir,	
	edge receipt of a complete set of bidding documents along with enclosures for for the information regarding the subject tender.
	bid as requested for the subject item/job and furnish following details with r quoting office:
Telephone N Contact Pers E-mail Addre Mobile No. Date Seal/Stamp  We are unab	on :
Agency's Name Signature Name Designation Date Seal/Stamp	:

# F-7 BIDDER'S EXPERIENCE

To,

# M/s TALCHER FERTILIZERS LIMITED NOIDA

SUB:

TENDER NO:

No	Job	/WO No. and	Full Postal Address & phone nos. of Client. Name, designatio n and address of Engineer/ Officer-in- Charge		Contract/	Comme ncemen t	Scheduled Completio n Time (Mo nths)	Actual Completion	for delay	Details of satisfac tory operati on from the date of Accept ance
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

Place:	[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:

**Note:**As per Note III of Clause No. A.1 of Section-II, only documents (Work Order, Completion certificate, Execution Certificate etc.) which have been referred/ specified in the bid shall be considered in reply to queries during evaluation of Bids.

## 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 ( $\sqrt{}$ ) against following points:

S. No.	DESCRIPTION	CHECK BOX
1.0	Digitally Signing (in case of e-bidding)/ Signing and Stamping (in case of manual bidding) on each sheet of offer, original bidding document including SCC, ITB,GCC, SOR DRAWINGS Corrigendum (if any)	
2.0	Confirm that the following details have been submitted in the Un-priced part of the bid	
i	Covering Letter, Letter of Submission	
ii	EMD / Declaration for Bid Security as per provisions of Tender (as applicable)	
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 unpriced bid as per bid requirement (including cl.no.11.1.1 of Section-III of tender).	
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 Form-I to Annexure-V to Section-III of tender 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 Form-II to Annexure-V of Section-II of tender are submitted.	
6.0	Confirm that Undertaking as per Form-1to Annexure-VII have been submitted by the bidder (Guidelines from Procurement from a Country sharing a Land Border with India)	
7.0	Confirm submission of Checklist against Bid Evaluation Criteria as per format F-8(B)	

(-)		
Place:	[Signature of Authorized Signatory of Bidde	er
Date:		
	Nama	

Name: Designation:

# F-8(B) CHECKLIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING DOCUMENTS (refer Section II of Tender document)

SI. 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
	Technical BEC				
1.	Experience	(a) Copy of Detailed Letter of Acceptance (DLOA) / Work Order /relevant extract of work Order/ Contract Agreement along with detailed scope of work and Completion / Acceptance Certificate. Such certificate shall be issued by order issuing authority/ Owner/End user.		Yes/No	
		<ul> <li>(b) 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, and date of completion. For IA &amp; PA capacity &amp; other specifications, bidder shall also submit Completion Certificate / Work Order /relevant extract of work Order, etc., wherein all technical details are mentioned / specified</li> <li>(c) Certificate in respect of minimum one year successful operation of the Plant/System from the date of acceptance/Commissioning of work issued by the Owner/End user shall be submitted.</li> <li>(d) Any other documents as per BEC requirement.</li> </ul>			
2.	bidder	certificate from end user		Yes/No	
	acquired as a subcontractor				

	T		_	T
3.	for Subsidiary / Fellow subsidiary/	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
	Holding			
	company.			
4.	technical	Bidder shall submit affidavit from the domestic manufacturers of such Iron & steel products as per the Form-I enclosed with the policy documents. A bidder who is not manufacturer of Iron & Steel product and is unable to submit the Affidavit from domestic manufacturers at bidding stage, such bidder can submit the Affidavit issued by domestic manufacturers after placement of order. In this case bidder along with his bid shall submit an undertaking as per prescribed format. Any other		Yes/No
1.	Financial BEC Annual Turn	documents as per BEC requirement  Audited Financial Statements [including	Submitted	Yes/No
1.	Over Turn	Audited Financial Statements [including Auditor's Report, Balance sheet, Profit & Loss Accounts statements, Notes & schedules etc.] for last Audited Financial Year. [In case the Annual Turnover criteria is not met in last Audited Financial Year, then the Audited Financial Statements for previous two years of last Audited Financial Year is to be submitted]	(Mention specific year)	I ES/INU
2.	Net Worth	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.	Working Capital	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
		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	Submitted/ Not Applicable (Bidder to tick	

		Rs.100 Crores, confirming the availability of line of credit for at least working capital requirement as stated above.	appropriate option)	
4.		Bidder shall submit "Details of financial	Submitted	
		f capability of Bidder" in prescribed format		
	financial	duly signed and stamped by a chartered		
	capability o	faccountant / Certified Public Accountant		
	Bidder	(CPA).		

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

Date:

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

(To be provided on Bank's letter head)

Date o,
I/s. TALCHER FERTILIZERS LIMITED OIDA
ear Sir,
his is to certify that M/s
he Customer has informed that they wish to bid for TFL's Tender / NIT no forfor
upply/work/services/consultancy) and as per the terms of the said Tender/NIT Document they have furnish a certificate from their Bank confirming the availability of line of credit.
ccordingly M/s (name of the Bank with address) confirms availability one of credit to M/s (name of the Bidder) for at least an amount of Re-
is also confirmed that the net worth of the Bank is more than Rs. 100 Crores (or Equivalent USE nd the undersigned is authorized to issue this certificate.
ours truly
or (Name & address of Bank)
Authorized signatory) ame of the signatory: esignation : mail Id : ontact No. : tamp
ote:

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.

# 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	e of the bidd	ler) and certify	the fo	llowing			

## A. AUDITED ANNUAL TURNOVER\* OF PRECEDING THREE FINANCIAL YEARS:

Year	Amount (Currency)
Year 1:	
Year 2:	
Year 3:	

# B. NETWORTH\* AS PER AUDITED FINANCIAL STATEMENT OF PRECEDING FINANCIAL YEAR:

Description	Year
	Amount (Currency)
1. Net Worth	

# C. WORKING CAPITAL\* AS PER AUDITED FINANCIAL STATEMENT OF PRECEDING FINANCIAL YEAR:

Description	Year
	Amount (Currency)
1. Current Assets	
2. Current Liabilities	
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: [Signature of Authorized Signatory]

Chartered Accountant/CPA Name:

Date: Designation:

Seal:

Membership No.: UDIN:

(Page 1 of 2)

## **Instructions for Format F-10**:

- 1. The Separate Pro-forma shall be used for each member in case of JV/ Consortium (If applicable).
- 2. 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 Paid up share capital plus Free Reserves & Surplus less accumulated losses, deferred expenditure and miscellaneous expenditure not written off, if any.
- 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.

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

**Not Applicable** 

# **BIDDER'S QUERIES FOR PRE BID MEETING**

To,							
M/s TALCH NOIDA	ER FERTILIZ	ERS LIMITE	D				
SUB:							
TENDER N	O:						
SI. NO.	REFERENC	E OF TEND	ER DOCUME	NT	BIDDER'S	OWNER'S	
	SEC. NO.	Page No.	Clause No	Subject	QUERY	REPLY	
NOTE: The Pre-Bid Queries may be sent by e-mail before due date for receipt of Bidder's queries.							
SIGNATURE OF BIDDER:							
NAME OF BIDDER:							

# <u>F-13</u> <u>E-Banking Mandate Form</u>

(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	
<ul> <li>a) Name of Bank</li> <li>b) Name of branch</li> <li>c) Branch code:</li> <li>d) Address:</li> <li>e) Telephone number:</li> <li>f) Type of account (current/saving etc.)</li> <li>g) Account Number:</li> <li>h) RTGS IFSC code of the bank branch</li> <li>i) NEFT IFSC code</li> <li>j) 9 digit MICR code</li> </ul>	
I/We hereby authorize TFL to release any amount above. I/We hereby declare that the particulars transaction is delayed or lost because of incomple TFL responsible.	given above are correct and complete. If the
	(Signature of vendor/customer)
BANK CER	RTIFICATE
We certify that has an Acc confirm that the details given above are correct as Bank stamp	
Date	(Signature of authorized officer of bank)

<u>F-14</u>	
INTEGRITY PACT	
<del></del>	
	Dec-   442
	Page   113

#### **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.



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"
- In case of violation of the Integrity pact by Counterparty after award of the Contract, TFL shall be entitled to terminate the Contract. Further, TFL would forfeit the security deposits/ Contract Performance Bank Guarantee and in addition, action shall be taken as per "Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices"



# **INDEPENDENT EXTERNAL MONITORS (IEMS)**

Presently the panel consisting of the following Independent External Monitors (IEMs) have been appointed by TFL, in terms of Integrity Pact (IP) which forms part of TFL Tenders / Contracts.

- i) Shri Anjan Kumar Banerjee (Email ID: <u>banerjeeanjan@gmail.com</u>)
- ii) Shri Atul Sobti (Email ID: sobtiatul@gmail.com)

This panel is authorised to examine / consider all references made to it under this tender. The bidder(s), in case of any dispute(s) / complaint(s) pertaining to this tender may raise the issue either with the designated tender issuing officer or Nodal Officer (presently Sh. Manna Paul, DGM (C&P) — Email: <a href="mannapaul@gail.co.in">mannapaul@gail.co.in</a>) in TFL or directly with the IEMs on the panel or IEM c/o Chief Vigilance Officer, Rashtriya Chemicals and Fertilizers Ltd., Priyadarshini Building, Eastern Express Highway, Sion, Mumbai Maharashtra, 400022.



## **INTEGRITY PACT**

(To be executed on plain paper)

	ween TFL (India) Limited, a Government of India Public Sector, (here-in-afterered to as "Principal").					
	AND					
	(here-in-after referred to as "The Bidder/					
Coi	ntractor").					
	ncipal and the Bidder / Contractor are here-in-after are referred to individually "Party" or collectively as "Parties").					
	PREAMBLE					
for_	Principal intends to award under laid down organizational procedures, contract/s					
use	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).					
(IEI	rder to achieve these goals, the Principal will appoint Independent External Monitors Is) who will monitor the tender process and the execution of the contract for apliance with the principles mentioned above.					
	Section 1 – Commitments of the Principal					
1.	The Principal commits itself to take all measures necessary to prevent corruption					

- 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.

# <u>Section 3 – Disqualification from tender process and exclusion</u> <u>from future contracts</u>

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

- 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 - Miscelleneous 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.

<u> </u>	
(म् ना के सामित्र के सिंगि कि मिंगिट्रां) ज्य स्वाप्त व्यक्त एवं इयं)Oy General Manager (Gar) तालंबर फरिलाइजर्स लिमिटेड/Talcher Fertilizers Ltd. जीटीआई पीएआएसी बिल्डिग/GTI PARC Building प्लॉट नं(Office Sea) भएडा—201 301 (उ.प.) Piot No. 24. Sec.—16A, Wolds-201 301 (U.P.)	(For & on Behalf of Bidder/Contractor) (Office Seal)
Place	
Witness 1: (Sign, Name & Address) [FOR PRINCIPAL]	Geogram (SURA DEDGAM) TALCHER FERTILIZERS LIMITED (TFL), PLOT. NO. 24, SECTOR-16A, NOIDA (U.P.)-201301
Witness 2: (Sign, Name & Address) [FOR BIDDER / CONTRACTOR]	

## **INDEMNITY BOND**

TFL has also advised the Contractor to execute an Indemnity Bond in general in favour of TFL indemnifying TFL and its employees and Directors including Independent Directors from all consequences which may arise out of any prospective litigation or proceedings filed or may be initiated by any third party, including any Banker / financial institution / worker(s) /vendor(s)/ subcontractor(s) etc. who may have been associated or engaged by the Contractor directly or indirectly with or without consent of TFL for above works.

NOW, THEREFORE, in consideration of the promises aforesaid, the Contractor hereby irrevocably and unconditionally undertakes to indemnify and keep indemnified TFL and all its employees, Directors, including Independent Directors, from and against all/any claim(s), damages, loss, which may arise out of any litigations/ liabilities that may be raised by the Contractor or any third party against TFL under or in relation to this contract. The Contractor undertakes to compensate and pay to TFL and/or any of its employees, Directors including Independent Directors, forth with on demand without any protest the amount claimed by TFL for itself and for and on behalf of its employees, Directors including Independent Directors together with direct/indirect expenses including all legal expenses incurred by them or any of them on account of such litigation or proceedings.

#### AND THE CONTRACTOR hereby further agrees with TFL that:

- (i) This Indemnity shall remain valid and irrevocable for all claims of TFL and/or any of its employees and Directors including Independent Directors arising out of said contract with respect to any such litigation / court case for which TFL and/or its employees and Directors including Independent Directors has been made party until now or here-in-after.
- (ii) This Indemnity shall not be discharged/ revoked by any change/ modification/ amendment/ assignment of the contract or any merger of the Contractor with other entity or any change in the constitution/structure of the Contractor's firm/ Company or any conditions thereof including insolvency etc. of the Contractor, but shall be in all respects and for all purposes binding and operative until any/ all claims for payment of TFL are settled by the Contractor and/or TFL discharges the Contractor in writing from this Indemnity.

The undersigned has full power to execute this Indemnity Bond for and on behalf of the Contractor and the same stands valid.

SIGNED BY:
For [ Contractor]

Authorised Representative Place: Dated: Witnesses:1.

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F-16
FREQUENTLY ASKED QUESTIONS (FAQs)

SL.NO.	QUESTION	ANSWER
1.0	Can any vendor quote for subject Tender?	Yes. A Vendor has to meet Bid Evaluation Criteria given under Section II of Tender document in addition to other requirements.
2.0	Should the Bid Evaluation Criteria documents be attested?	Yes. Please refer Section II of Tender document
3.0	Is attending Pre Bid Meeting mandatory.	No. Refer Clause No. 17 of Instruction to Bidders of Tender Document. However attending Pre Bid Meeting is recommended to sort out any issue before submission of bid by a Bidder.
4.0	Can a vendor submit more than 1 offer?	No. Please refer Clause No. 4 of Instruction to Bidders of Tender Document.
5.0	Is there any Help document available for e-Tender.	Refer FAQs as available on CPP Portal e- Procurement).
6.0	Are there are any MSE (Micro & Small Enterprises) benefits available?	Refer Clause No. 40 of Instructions to Bidders of Tender Document.
7.0	Are there are any benefits available to Startups?	Refer Clause No. 49 of Instructions to Bidders of Tender Document.

All the terms and conditions of Tender remain unaltered.

#### Form F-17

# PROFORMA OF BANK GUARANTEE FOR MOBILISATION ADVANCE

(ON NON-JUDICIAL PAPER OF APPROPRIATE VALUE)

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

## Dear Sir(s),

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
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 Nodated 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

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.

	erefore, we hereby affirm that we are guarantors and responsible to you on behalf of the attractor up to a total amount of(amount of guarantees in words and figures)
and	If we undertake to pay you, upon your first written demand declaring the Contractor to be in ault 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
We Ass	easons for your demand or the sum specified therein.  have power to issue this guarantee in your favour under Memorandum and Articles of sociation and the undersigned has full power to do so under the Power of Attorney/ resolution of Board of Directors dated accorded to him by the BANK.
Not	withstanding 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.
Dat	redthisday of20

Signed by	
(Person duly authorise	d by Bank)
Place:	
WITNESS:	
1	(Signature)
	(Printed Name)
	(Designation)
2	(Signature)
	(Printed Name)
(Common Seal)	(Designation)

# F-17 (A) MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR ALONG WITH BANK GUARANTEE (BG)

1. Bank Guarantee No.		
2. Vendor Name		
3. Nature of Bank Guarantee [Please		
Tick (□) whichever is applicable]	Contract Performance	
	Security	Advance
	(CPS)	
Purchase Order (PO) / Fax of		
Acceptance (FOA) / Detailed Letter of		
Acceptance (DLOA) No.		
Details of Bank issuing Bank		
Guarantee (BG)		
A. Name		
B. E-mail ID		
C. Address		
D. Phone No. / Mobile No.		

# 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),	
shall unless repugnant to the context or administrators and assignees, having award at	imited, hereinafter called the "Owner" which expression meaning thereof include its successors, executor ded to M/s
repugnant to the context or meaning thereo assignees having our office atunconditional guarantee and do hereby und demur, reservation, contest, recourse, protectall monies payable by the CONTRACTOR to any of the terms and conditions of the said	eferred to as the BANK which expression shall, unless of, include its successors, administrators, executors and the standard stan
this guarantee, from time to time to vary th	thout affecting in any way the liability of the BANK under amount or to extend the time for performance of the sall not be released from its liability under these presents.

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.

by any exercise of the Owner of the liberty with reference to the matter aforesaid.

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 quarantee that OWNER may have in relation to the CONTRACTOR's liabilities towards the said milestone payment. The amount under the Bank Guarantee is payable forthwith without any delay by Bank upon the written demand raised by TFL. Any dispute arising out of or in relation to the said Bank Guarantee shall be subject to the exclusive jurisdiction of courts at New Delhi. Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Contractor up to a total amount of \_\_\_\_\_\_(amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Contractor to be in default under the contract and without caveat or argument, any sum or sums within the limits of (amount of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein. Notwithstanding anything contained hereinabove, our liability under this guarantee is restricted to and it will remain in force upto and including \_\_\_\_\_ (this date shall be initially 15 months from date of FOA) and shall be extended from time to time for such periods as may be advised by M/s on whose behalf this guarantee has been given. We have power to issue this guarantee in your favour under Memorandum and Articles of Association and the undersigned has full power to do so under the Power of Attorney/ resolution of the Board of Directors dated...... accorded to him by the BANK. Notwithstanding anything contained herein: 9. a) The Bank's liability under this Guarantee shall not exceed (currency in figures) (currency in words only) b) This Guarantee shall remain in force upto (this date shall be initially 15 months from date of FOA) and any extension(s) thereof; and 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......day of......20 .....

The right of the OWNER to recover the outstanding sum upto Rs...... from the BANK in the

Signed by
(Person duly authorised by Bank)
Place:
WITNESS:  1(Signature)(Printed Name(Designation)
2(Signature)(Printed Name(Designation)
(Common Seal)

# FORMAT OF LETTER OF NO DEVIATIONS (ON BIDDER'S LETTERHEAD)

(NIT NO: PNMM/PC-183/E-4013/NCB DATED 10.03.2022)

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 :		

<sup>\*</sup>Here fill in the name of bidder.

<sup>\*\*</sup>The Letter of *No Deviation* must be signed by the person (s) authorized to sign as per POA.

#### F-20 POWER OF ATTORNEY (POA) (To be submitted on the Non-Judicial stamp paper / Company's Letter Head)

TENDER NO:
Description of work:
Name of Bidder:
"The undersigned (Name of LEGAL PERSON, i.e. CEO/C&MD/Company Secretary/Partners) is lawfully authorized to issue this POA* on behalf of the company M/s (Name of bidder) whose registered address is and does hereby appoint Mr./Ms (name of authorized person signing the biddocument) (Designation) of M/s
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.
<ul> <li>a) In case of Proprietorship: By Proprietor</li> <li>b) In case of Partnership: by all Partners or Managing Partner.</li> <li>c) In case of Limited Liability Partnership: by any bidder's employee authorized in terms of Deed of LLP.</li> <li>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.</li> </ul>
SIGNATURE OF THE LEGAL PERSON
(Name of person with Company seal)
SIGNATURE OF THE AUTHORIZED PERSON (FOR SIGNING THE BID)
(Signature) Name of person: E-mail id: DSC (Digital Signature Certificate) No.:

#### <u>F-21</u>

### 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 TALC	HER FERTILIZERS LIMIT	ED						
SUB: LOA NO: <b>Dear Sir</b> ,								
We	(lnfirm that E-Invoice provis	Name of the Supplier ion as per the GST Lav		actor/	'Service	Provid	er/ Cons	sultant)
(i)	Applicable to us		[	]				
(ii)	Not Applicable to us		[	]				
(Supp above	lier/Contractor/Service Fe).	Provider/ Consultant	is to	tick	approp	riate op	ption (√	or X)
requireme be proces input tax Provider/ ( obligated invoice(s) SGST/UT adjusting a	ame is applicable to us, we not sof GST Laws. If the in sed for payment by TFL credit is not available to Consultant (both for E-invor liable to pay or reim and shall be entitled GST or IGST) or Input Tagagainst any amounts paid Consultant under this cont	avoice issued without for as no ITC is allowed TFL for any reason avoicing cases and non-burse GST (CGST & to deduct / setoff / ax Credit amount toget or becomes payable is	ollowing on suc attribut E-invo SGST recov ther wi	g this ch invable icing //UTC er so th pe e to t	process /oices. \( \) to Supple cases), GST or uch GS enalties	s, such We also plier/Col then T IGST) ST amo and inte	invoice of confirm of confirm of confirm of confirmed count (CG) erest, if a	can-not that If Service not be in the GST & any, by
Place:		[Signature of Authoriz	zed Sig	ınato	ry of Bio	lder]		
Date:		Name: Designation: Bidder Name: Seal:						

#### Form F-22

## <u>UNDERTAKING REGARDING SUBMISSION OF CONTRACT PERFORMANCE SECURITY</u> (CPS)/ SECURITY DEPOSIT (SD) WITHIN STIPULATED TIME LINE

#### (to be submitted on letter head of bidder)

10,	
M/s Talcher Fertilizers Limited	
SUB:	
TENDER NO:	
Dear Sir,	
	clearly understood the requirement of Contract Performance SD) specified in the tender document.
	of award of contract / order, we will submit Contract Performance (SD) within 30 days from the date of issuance of Fax of
Place:	[Signature of Authorized Signatory of Bidder]
Date:	Name:
	Designation:
	Bidder Name:
	Seal:

## PROFORMA FOR CONTRACT AGREEMENT (To be executed on non-judicial stamp paper of appropriate value)

DLOA No dated
TFL's PAN No
Contract Agreement for the work of of TALCHER FERTILIZERS LIMITED made on between (Name and Address), hereinafter called the "CONTRACTOR" (which term shall unless excluded by or repugnant to the subject or context include its successors and permitted assignees) of the one part and TALCHER FERTILIZERS LIMITED hereinafter called the "EMPLOYER" (which term shall, unless excluded by or repugnant to the subject or context include its successors and assignees) of the other part.

#### WHEREAS

- A. The EMPLOYER being desirous of having provided and executed certain work mentioned, enumerated or referred to in the Tender Documents including Letter Inviting Tender, General Tender Notice, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings, Plans, Time Schedule of completion of jobs, Schedule of Rates, Agreed Variations, other documents has called for Tender.
- B. The CONTRACTOR has inspected the SITE and surroundings of WORK specified in the Tender Documents and has satisfied himself by careful examination before submitting his tender as to the nature of the surface, strata, soil, sub-soil and ground, the form and nature of site and local conditions, the quantities, nature and magnitude of the work, the availability of labour and materials necessary for the execution of work, the means of access to SITE, the supply of power and water thereto and the accommodation he may require and has made local and independent enquiries and obtained complete information as to the matters and thing referred to, or implied in the tender documents or having any connection therewith and has considered the nature and extent of all probable and possible situations, delays, hindrances or interferences to or with the execution and completion of the work to be carried out under the CONTRACT, and has examined and considered all other matters, conditions and things and probable and possible contingencies, and generally all matters incidental thereto and ancillary thereof affecting the execution and completion of the WORK and which might have influenced him in making his tender.
  - C. The Tender Documents including the Notice Letter Inviting Tender, General Conditions of Contract, Special Conditions of Contract, Schedule of Rates, General Obligations, SPECIFICATIONS, DRAWINGS, PLANS, Time Schedule for completion of Jobs, Letter of Acceptance of Tender and any statement of agreed variations with its enclosures copies of which are hereto annexed form part of this CONTRACT though separately set out herein and are included in the expression "CONTRACT" wherever herein used.

#### AND WHEREAS

The EMPLOYER accepted the Tender of the CONTRACTOR for the provision and the execution of the said WORK at the rates stated in the schedule of quantities of the work and finally approved by EMPLOYER (hereinafter called the "Schedule of Rates") upon the terms and subject to the conditions of CONTRACT.

NOW THIS AGREEMENT WITNESSETH AND IT IS HEREBY AGREED AND DECLARED AS FOLLOWS:-

- 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.
- 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.

#### AND

3. In consideration of the due provision, execution and completion of the said WORK the CONTRACTOR does hereby agree to pay such sums as may be due to the EMPLOYER for the services rendered by the EMPLOYER to the CONTRACTOR, such as power supply, water supply and others as set for in the said CONTRACT and such other sums as may become payable to the EMPLOYER towards the controlled items of consumable materials or towards loss, damage to the EMPLOYER'S equipment, materials construction plant and machinery, such payments to be made at such time and in such manner as is provided in the CONTRACT.

It is specifically and distinctly understood and agreed between the EMPLOYER and the CONTRACTOR that the CONTRACTOR shall have no right, title or interest in the SITE made available by the EMPLOYER for execution of the works or in the building, structures or work executed on the said SITE by the CONTRACTOR or in the goods, articles, materials etc., brought on the said SITE (unless the same specifically belongs to the CONTRACTOR) and the CONTRACTOR shall not have or deemed to have any lien whatsoever charge for unpaid bills will not be entitled to assume or retain possession or control of the SITE or structures and the EMPLOYER shall have an absolute and unfettered right to take full possession of SITE and to remove the CONTRACTOR, their servants, agents and materials belonging to the CONTRACTOR and lying on the SITE.

The CONTRACTOR shall be allowed to enter upon the SITE for execution of the WORK only as a licensee simpliciter and shall not have any claim, right, title or interest in the SITE or the structures erected thereon and the EMPLOYER shall be entitled to terminate such license at any time without assigning any reason.

The materials including sand, gravel, stone, loose, earth, rock etc., dug up or excavated from the said SITE shall, unless otherwise expressly agreed under this CONTRACT, exclusively belong to the EMPLOYER and the CONTRACTOR shall have no right to claim over the same and such excavation and materials should be disposed off on account of the EMPLOYER according to the instruction in writing issued from time to time by the ENGINEER-IN-CHARGE.

In Witness whereof the parties have executed these presents in the day and the year first above written.

Signed and Delivered for and on on behalf of EMPLOYER

Signed and Delivered for and on behalf of the CONTRACTOR.

TALCHER FERTILIZERS LIMITED

NAME OF CONTRACTOR

Date :	Date :
Place:	Place:
IN PRESENCE OF TWO WITNESSES	
1	1



## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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# SECTION - IV

### **GENERAL CONDITIONS OF CONTRACT**



## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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#### **CONTENT**

	CONTENT
SL. NO.	DESCRIPTION
1.0	DEFINITION OF TERMS
2.0	CONTRACT CONFIRMATION
3.0	MODIFICATIONS IN CONTRACT
4.0	USE OF CONTRACT DOCUMENTS AND INFORMATION
5.0	PRICES, TAXES & DUTIES AND OTHER LEVIES
6.0	INCOME TAX
7.0	PATENT INFRINGEMENT AND INDEMNIFICATION
8.0	CONTRACT PERFORMANCE SECURITY (CPS)
9.0	DELETED
10.0	SIGINING OF CONTRACT
11.0	DELETED
12.0	ASSIGNMENT OR SUBLETTING OF CONTRACT AND SUB-CONTRACTING
13.0	STANDARDS
14.0	INSTRUCTIONS, DIRECTIONS
15.0	DELETED
16.0	TIME SCHEDULE, AND PROGRESS REPORTING
17.0	CONTRACTOR TO INFORM HIMSELF FULLY
18.0	SUITABILITY OF PLANT FOR INTENDED PURPOSES
19.0	FEES FOR ROYALTIES AND PATENT RIGHTS
20.0	ACTS OF PARLIAMENT, LOCAL AND OTHER AUTHORITIES REGULATIONS AND BYELAWS
21.0	TIME - PROJECT SCHEDULE
22.0	CONTRACT PRICE
23.0	DEDUCTIONS FROM CONTRACT PRICE
24.0	DELETED
25.0	DELETED
26.0	TAXES APPLICABLE TO CONTRACTOR'S MANPOWER, TURNOVER, EQUIPMENT, ETC
27.0	PACKING, FORWARDING AND SHIPMENT
28.0	INSURANCE
29.0	DELETED
30.0	LIABILITY FOR ACCIDENTS AND DAMAGES
31.0	DELETED
32.0	DELETED
33.0	TIME EXTENSION OF CONTRACT
34.0	TERMINATION OF CONTRACT
35.0	FORCE MAJEURE
36.0	NO WAIVER OF RIGHTS
37.0	BANKRUPTCY AND LIQUIDATION OF CONTRACTOR OR BUSINESS UNDER RECEIVERSHIP
38.0	CERTIFICATE NOT TO AFFECT RIGHT OF OWNER AND LIABILITY OF CONTRACTOR
39.0	SETTLEMENT OF DISPUTES
40.0	ARBITRATION
41.0	GOVERNING LAWS , LANGUAGE AND MEASURES



## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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SI NO	DESCRIPTION
SL. NO.	DESCRIPTION  DEL FACE OF INFORMATION
42.0	RELEASE OF INFORMATION
43.0	COMPLETION OF CONTRACT
44.0	ENFORCEMENT OF TERMS
45.0	OWNER'S DECISION
46.0	CO-OPERATION
47.0	SUSPENSION OF WORK.
48.0	REPLACEMENT OF PARTS AND MATERIALS (DEFECTIVE/ DAMAGED/ LOST DURING TRANSIT/ERECTION AND COMMISSIONING)
49.0	DEFENCE OF SUITS
50.0	CONTRACTOR'S RESPONSIBILITIES
51.0	PROGRESS REPORTS AND PHOTOGRAPHS
52.0	DELETED
53.0	SECRECY
54.0	CORRESPONDENCE
55.0	MATERIALS AND EQUIPMENTS
56.0	MEASUREMENT, CERTIFYING INSPECTION & PAYMENTS
57.0	UNDER GROUND OBSTRUCTIONS
58.0	REGISTRATION TO THE CONTRACTOR WITH STATUARY AUTHORITIES
59.0	STATUARY OBLIGATIONS
60.0	UTILISATION OF LOCAL RESOURCES
61.0	FUEL REQUIREMENT OF WORKERS
62.0	SURPLUS MATERIAL
63.0	CO-ORDINATION WITH OTHER AGENCIES
64.0	ERECTION OF EQUIPMENT
65.0	ELECTRICAL CONTRACTOR LICENCE
66.0	RENT & ROYALTIES
67.0	GOVT. OF INDIA NOT LIABLE
68.0	SITE CLEANING
69.0	ACCESS TO SITE
70.0	INDEPENDENT CONTRACTOR
71.0	PAYMENT TO THE SUB – CONTRACTOR
72.0	ORDER OF WORKS / PERMISSION / RIGHT OF ENTRY / CARE OF EXISTING SERVICES
73.0	GIFTS, COMMISSIONS,ETC
74.0	LABOUR LAWS-PF, EPF AND ESI
75.0	GENERAL PROVISIONS
76.0	IMPLEMENTATION OF APPRENTICES ACT 1961
77.0	CHANGE IN CONSTITUTION
78.0	ACCESS BY ROAD
79.0	MEMBERS OF THE OWNER NOT INDIVIDUALLY LIABLE
80.0	OWNER NOT BOUND BY PERSONAL REPRESENTATIONS
81.0	LAND FOR CONTRACTOR'S FIELD OFFICE, GODOWN AND WORKSHOP
82.0	ROUNDING-OFF OF AMOUNTS
83.0	DELETED

#### **INSTRUMENT AIR & PLANT AIR SYSTEM**

## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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SL. NO.	DESCRIPTION
84.0	WORK IN MONSOON AND DEWATERING
85.0	GENERAL CONDITIONS FOR CONSTRUCTION AND ERECTION WORK
86.0	ACTION WHERE NO SPECIFICATION IS ISSUED
87.0	DELETED
88.0	DELETED
89.0	CARE OF WORKS
90.0	FIELD MANAGEMENT & CONTROLLING/COORDINATING AUTHORITY
91.0	LOCAL CONDITIONS
92.0	SPECIAL CONDITIONS OF CONTRACT
93.0	POWER OF ENTRY
94.0	LIENS

#### **INSTRUMENT AIR & PLANT AIR SYSTEM**

## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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#### 1.0 DEFINITION OF TERMS AND INTERPRETATION

In the **CONTRACT**, unless the context otherwise requires, the following expressions shall have the following meanings. The singular shall include the plural and the plural include the singular except where the context otherwise requires and the words 'he', 'him', and 'his' shall be taken to mean 'she', 'her' and 'hers' where appropriate.

- 1. 'APPROVAL' shall mean and include the written approval by the OWNER of documents, drawing or other particulars in relation to this CONTRACT.
- 2. 'BATTERY LIMIT' shall mean the outer limits of boundaries of the areas within which the Plants and associated facilities shall be located.
- 3. 'BID' shall mean the proposal/document that the BIDDER submits in the requested and specified form in response to this NIT.
- 4. 'BIDDER' shall mean the Sole Bidder who shall submit or who have submitted the Bid.
- 'CHANGE ORDER / AMENDMENT TO ORDER' means an order given in writing by the OWNER to effect additions to or deletion or alteration to the original CONTRACT.
- 6. 'CODES' shall mean the following, including the latest amendments, and/or replacements, if any:
  - a) All relevant Indian Acts, and Rules and Regulations made there under;
  - b) ASME Codes
  - c) IBR Codes
  - d) AIEE Codes
  - e) American Society of Testing of Materials (ASTM) Codes
  - f) Other internationally applicable standards and/or Regulations the subject matter of the CONTRACT.
  - g) Indian Employees Provident Fund Act,
  - h) Pollution Control norms of INDIA
  - i) Contract Labour
  - j) Minimum Wages Act
  - k) Any other labour laws of INDIA applicable during execution of contract.
  - I) Any other codes/standards specified in the contract documents.
- 7. 'COMMERCIAL USE' shall mean that use of the PLANT which the CONTRACT contemplates or of which it is commercially capable.
- 8. 'COMMISSIONING' shall be as defined in Section-VI of Technical Part.
- 9. 'CONSULTANT/PROJECT MANAGEMENT CONSULTANT (PMC)' shall mean PROJECTS & DEVELOPMENT INDIA LIMITED, who are the consulting engineer to the OWNER for this project and having registered office at PDIL Bhawan, A-14, Sector-1, Noida 201301, Uttar Pradesh.

#### **INSTRUMENT AIR & PLANT AIR SYSTEM**

## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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 'CONTRACT' shall mean the Agreement between the OWNER and the CONTRACTOR for the execution of the works including therein all contract documents.

- 11. 'CONTRACTOR' shall mean the successful Bidder whose bid has been accepted by the OWNER and who has been selected by the OWNER for the award of Works and shall include his heirs, legal representatives, successors and permitted assigns.
- 12. 'SCHEDULED/CONTRACTUAL COMPLETION PERIOD' shall mean the time period mentioned in the tender document by which CONTRACT shall be completed, including any time extension granted in writing by OWNER through a CHANGE ORDER/AMENDMENT. Time extensions, if any, shall be without prejudice to other terms and conditions of tender, unless as otherwise stated in CHANGE ORDER/AMENDMENT.
- 13. 'CONTRACTOR'S EQUIPMENT' means all equipment, construction plant, vehicles, temporary facilities, material, tools or things brought on to the Site by or on behalf of the Contractor for carrying out the Works but not for permanent incorporation in the Plant.
- 14. 'CONTRACTOR'S SOFTWARE' means standard Software owned by the CONTRACTOR.
- 15. 'CONTRACTOR'S WORKS' OR 'MANUFACTURER'S WORKS' shall mean the place or places of work used by the CONTRACTOR/SUB-CONTRACTOR/SUB-VENDOR or their collaborator(s) for the manufacture of EQUIPMENT or performance of WORKS.
- 16. 'COST' means the cost incurred by the Contractor in carrying out any of his obligations under the Contract, and 'Costs' shall be construed accordingly.
- 17. 'DAY' shall mean a day of 24 hours from midnight to midnight irrespective of the number of hours worked in that day.
  - "WORKING DAY" means any day which is not declared to be holiday or rest day by the OWNER.
- 18. 'DEEMED ACCEPTANCE' shall be as defined in SPECIAL CONDITIONS OF CONTRACT.
- 19. 'DEFECT' means any work done or any Material or the Plant or any part of it which does not comply with the CONTRACT.
- 20. 'DEFECT LIABILITY PERIOD' shall be as defined in SPECIAL CONDITIONS OF CONTRACT.
- 21. 'DOCUMENT(S)/DOCUMENTATION' means any relevant documents in paper or electronic form, including drawings, technical software, images, designs, manuals or records.

#### **INSTRUMENT AIR & PLANT AIR SYSTEM**

## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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22. 'DRAWINGS' or 'PLAN' shall mean all

- a) Drawings furnished by the OWNER as a basis for proposals;
- b) Supplementary drawings furnished by the OWNER to clarify and to define in greater detail the intent of the CONTRACT;
- c) DRAWINGS submitted by the CONTRACTOR with his proposal provided such drawings are acceptable to the OWNER.
- d) DRAWING furnished by the OWNER to the CONTRACTOR during the progress of the works; and
- e) Engineering data and DRAWINGS submitted by the CONTRACTOR during the progress of the work provided such drawings are acceptable to the OWNER.
- 23. DLOA shall mean DETAILED LETTER OF ACCEPTANCE which shall be issued to successful bidder.
- 24. 'ENGINEER'S INSTRUCTIONS' shall mean any drawings and/or instructions in writing, details, directions and explanations issued by the OWNER from time to time to the CONTRACTOR/ SUB-CONTRACTOR for carrying out the WORK during the COMPLETION PERIOD
- 25. ENGINEER IN CHARGE" shall mean the person designated from time to time by the OWNER and shall include those who are expressly authorized by him to act for and on his behalf for operation of this CONTRACT.
- 26. 'EQUIPMENT' OR 'STORES' shall mean the equipment, machinery and structure of any kind which the CONTRACTOR is obliged to design, supply, deliver, unload, store at site, erect, set to work and test under the CONTRACT.
- 27. 'FINAL ACCEPTANCE' shall mean that date when all of the conditions set forth in Clause 19 of SPECIAL CONDITIONS OF CONTRACT have been satisfied, all liabilities and obligations under this CONTRACT have been discharged, except those specially to be continued or performed after FINAL ACCEPTANCE.
- 28. 'FINAL ACCEPTANCE CERTIFICATE' shall mean that certificate issued by the ENGINEER-IN-CHARGE or OWNER to the CONTRACTOR subject to clause 19 of SPECIAL CONDITIONS OF CONTRACT at the end of the DEFECTS LIABILITY PERIOD.
- 29. 'FINAL COMPLETION' shall mean the completion of guarantee tests and handing over of the PLANTS and facilities to OWNER.
- 30. FINAL PROPOSAL means the Offer/Bid submitted by the Bidder against this tender including it's Amendments/Corrigendum/Addendum/etc.
- 31. 'FORCE MAJEURE' has the meaning stated in Sub-clause 35.0 of GCC.
- 32. 'FOA' means FAX OF ACCEPTANCE, which shall be issued to successful bidder.
- 33. GCC' or GENERAL CONDITIONS OF THE CONTRACT shall mean all the

#### **INSTRUMENT AIR & PLANT AIR SYSTEM**

## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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terms and conditions forming part of this agreement as defined in this Section.

- 34. 'INSPECTOR' shall mean the duly authorised representative of the OWNER for stage wise or final inspection of WORKS or of EQUIPMENT or MATERIALS to be supplied under the CONTRACT.
- 35. 'LEGISLATION' means all applicable laws, directives, codes, statutes, rules, ordinances, approvals, licences, decrees, authorizations, by-laws, regulations, standards and any other requirement of any governmental authority or agency whether international national, state, municipal, local or other government subdivision, having the force of law in any place where the WORKS or any part of the WORKS are being carried out.
- 36. 'MANUFACTURER' shall mean a person or firm who is the producer and supplier of material and/ or designer and/or fabricator of equipment to either the OWNER, the CONTRACTOR or both under the CONTRACT.
- 37. 'MATERIALS' means machinery, plant and other items of equipment and materials intended to form part of the PLANT and other things needed for its operation, to be supplied by the CONTRACTOR.
- 38. "MECHANICAL COMPLETION" shall be as defined in SPECIAL CONDITIONS OF CONTRACT.
- 'MONTH' shall mean the calendar month.
- 'NOTICE IN WRITING', 'WRITTEN NOTICE' shall mean a notice in written, typed or printed characters sent (unless delivered personally or otherwise proved to have been received) by registered post/ Speed Post to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post it would have been delivered. Fax with Post copy confirmation.
- 41. 'OTHER CONTRACTOR/OTHERS' shall mean any person(s) having a contract with the OWNER to design, supply, erect, set to work, or do any other thing to or in connection with any other plant and shall include their, heirs, legal representatives, successors and permitted assigns.
- 'OWNER' shall mean M/s TALCHER FERTILIZERS LIMITED having its registered office at Plot 2/H, Kalpana Area Nagar, Khordha, Bhubaneshwar and Project office at GAIL Training Institute, PARC Building, Sector 16A, Film City, Noida 201301 Uttar Pradesh and shall include their, heirs, legal representatives, successors and permitted assigns.
- 43. 'PERFORMANCE & GUARANTEE TESTS RUN (PGTR)' shall be as defined in SPECIAL CONDITIONS OF CONTRACT.
- 44. 'PLANT' shall be as defined in the SPECIAL CONDITIONS OF CONTRACT.
- 45. 'PRELIMINARY ACCEPTANCE' shall be as defined in the SPECIAL CONDITIONS OF CONTRACT.

#### **INSTRUMENT AIR & PLANT AIR SYSTEM**

## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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- 46. 'PRELIMINARY ACCEPTANCE CERTIFICATE' shall be as defined in the SPECIAL CONDITIONS OF CONTRACT.
- 47. "PRE-COMMISSIONING" shall be as defined in the SPECIAL CONDITIONS OF CONTRACT.
- 48. 'PROJECT' shall mean the Project specified in the Technical specification.
- 49. 'SCC' or SPECIAL CONDITIONS OF THE CONTRACT shall mean all the terms and conditions forming part of the CONTRACT as stipulated elsewhere in the tender document.
- 'SITE' shall mean and include the land and other places on, into or through which the EQUIPMENT and related facilities shall be erected and any adjacent land, paths, streets or reservoirs which may be allocated or used by the OWNER or CONTRACTOR in the performance of the CONTRACT.
- 51. 'SOFTWARE' means all forms of software and firmware and their documentation.
- 52. 'SPECIFICATION' shall mean collectively all the terms and stipulations in the Technical Specifications, schedules, detailed descriptions, statement of Technical Data, performance characteristics, standards & codes etc., and subsequent addenda issued thereto before the date of closing of bid and all written agreements made or to be made pertaining to the method and manner of performing the Work or to the quantities and the qualities of the materials to be furnished under this CONTRACT.
- 53. 'SUB-CONTRACTOR/SUB-VENDOR' shall mean any person or persons, or firm(s) including his/their, heirs, legal representatives, successors and permitted assigns selected by the CONTRACTOR with prior written approval of the OWNER for undertaking any part of the Works under the CONTRACT or to whom any part of the CONTRACT is sublet by the CONTRACTOR with the consent in writing of the OWNER.
- 54. 'TAKING OVER' AND 'TAKEN OVER' shall mean OWNER taking possession of and use of the PLANT.
- 55. 'TEMPORARY WORKS' means all temporary works and structures of every kind constructed at the Site and required for the provision and construction of the PLANT.
- 56. 'THIRD PARTY SOFTWARE' means standard Software which is owned by a third party.
- 57. 'TOTAL LSTK PRICE/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, if any.
- 58. 'WEEK' shall mean continuous period of 7 (Seven) DAYS.
- 59. WORK' OR 'WORKS' means the design, engineering and other services to be

#### **INSTRUMENT AIR & PLANT AIR SYSTEM**

## TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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provided by the Contractor including, but not limited to, the provision and construction of the PLANT and any Temporary Works and the subsequent dismantling or removal of the Temporary Works when no longer required, and any other works to be carried out by the CONTRACTOR in accordance with the CONTRACT.

- 60. 'WRITING' shall include any manuscript, typewritten or printed statement, under or over signature and/or seal as the case may be.
- 61. 'NOTICE INVITING TENDER (NIT)/ BIDDING DOCUMENT' means Complete Bidding Document as originally issued and any Addendum /Corrigendum/ Amendment(s) issued thereafter.
- 62. 'MUTUALLY AGREED DAMAGES' (MAD) shall be as defined in SPECIAL CONDITIONS OF CONTRACT.

#### 2.0 CONTRACT DOCUMENTS

The term 'Contract Documents' shall mean and include the following documents which shall constitute the Contract and shall be deemed to form an integral part of the Contract:

- a) Contract Agreement
- b) Detailed Letter of Acceptance (DLOA) and all Annexures
- c) FAX of Acceptance (FOA)
- d) Agreed variations, if any
- e) Schedule of Rates
- f) Corrigendum/Addendum/Amendment to tender
- g) Complete Original Tender Document with all enclosures
- h) Integrity Pact (IP) signed between the Owner and the Bidder/Contractor

The above documents are intended to be correlative, complementary and mutually explanatory. The Contract shall be read as a whole.

#### 2.1 INTERPRETATION OF CONTRACT DOCUMENTS

- 2.1.1 Notwithstanding the sub-division of the CONTRACT document into these separate documents and/or volumes and/or heads, every part of each separate section/volume/head 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.
- 2.1.2 If in respect of any commercial term or condition, if any provision in the GENERAL CONDITIONS OF CONTRACT is repugnant to or at variance with any provision(s) of the SPECIAL CONDITIONS OF CONTRACT, the provision(s) of the SPECIAL CONDITIONS OF CONTRACT shall be deemed to override the provision(s) of GENERAL CONDITIONS OF CONTRACT, but only to the extent that such repugnancy in the GENERAL CONDITIONS OF CONTRACT cannot be reconciled with the SPECIAL CONDITIONS OF CONTRACT.



### TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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- 2.1.3 Without prejudice to the provisions of the GENERAL CONDITIONS OF CONTRACT, whenever in the Bidding documents it is mentioned or stated that the CONTRACTOR shall perform certain work or provide certain facilities, it is understood that the CONTRACTOR shall do so at his own cost and the TOTAL CONTRACT PRICE shall be deemed to have included the cost of such performance and/or provision, as the case may be.
- 2.1.4 The MATERIALS, design and workmanship shall satisfy the applicable relevant Indian standards, the job specifications contained herein and the codes referred to by expression or implication. 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/specification/code of practice for detailed specifications covering any part of the work covered in this tender, the instructions/directions agreed between OWNER and CONTRACTOR based on good international engineering practice shall be binding on the CONTRACTOR.
- 2.1.5 The documents forming the Contract are to be read together and interpreted as mutually explanatory of one another. If there is a direct inconsistency in specific obligation(s), then for the purposes of interpretation, and unless otherwise provided in the Contract, the priority of the Contract Documents shall be in accordance with following sequence:
  - i. The Contract Agreement
  - ii. Detailed Letter of Acceptance (DLOA) along with its enclosures
  - iii. Fax of Acceptance (FOA)
  - iv. Schedule of Rates (SOR)
  - v. Scope of Works/ Job Specifications (specific to particular job only, wherever provided)
  - vi. Drawings
  - vii. Special Conditions of Contract (SCC)
  - viii. Technical Specifications (wherever applicable)
  - ix. Instructions to Bidders (ITB)
  - x. General Conditions of Contract (GCC)
  - xi. Other Documents

Any amendment / Corrigendum / Addendum to tender issued by PMC/Owner shall take precedence over respective clauses of the original tender document and its annexures.

Similarly, any amendment / change order issued by Owner upon signing of formal Contract shall take precedence over respective clauses of the formal Contract and its annexures

2.1.6 Should there be any doubt or ambiguity in the interpretation of the CONTRACT documents or contradiction therein or should there be any discernable error or omission in any CONTRACT document, the CONTRACTOR shall, prior to commencing the relative work or supply, as the case may be, apply in writing to the Engineer-In-Charge for his decision for resolution of the doubt, ambiguity or contradiction or correction of the error or making good the omission, as the case may be. Should the CONTRACTOR fail to apply to the ENGINEER-IN-CHARGE for his decision as aforesaid prior to commencing the relative work or supply, the CONTRACTOR shall perform the said work or make the said



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supply, as the case may be, at his own risk, and the provisions of NIT shall apply to any such work performed or supply made by the CONTRACTOR.

- 2.1.7 Notwithstanding anything provided in Clause 2.1.6 hereof above, either the CONTRACTOR or any representative of the OWNER or CONSULTANT may, at any time prior to or during the execution of the work or supply of any material or any part thereof (if the CONTRACTOR has failed to make an application as provided for in Clause 2.1.6), apply to the ENGINEER-IN-CHARGE in writing for his decision in resolution of any doubt, ambiguity or contradiction or for the correction of any error or for making good the omission as the case may be.
- 2.1.8 The decision of the ENGINEER-IN-CHARGE on any application under Clause 2.1.6 or Clause 2.1.7 hereof shall be in writing and shall be final and binding upon the CONTRACTOR and shall form part of the CONTRACT documents, with the intent that the CONTRACT documents shall be read as though the said decision is and was at all times incorporated therein. It is clarified that in case the Contractor disagrees with the decision of the ENGINEER-IN-CHARGE, the dispute shall be settled as per the provisions of Clause 39.0 of GCC.
- 2.2 Any work or supply shown, indicated or included in any description of the work, plans, drawings, Specifications and/or Price Schedule or other Contract or Bid documents shall be deemed to form part of the WORK and/or supply contracted for, as the case may be, notwithstanding failure to show, indicate or include such work or supply in any other or others among the documents aforesaid with the intent that the indication or inclusion of the work or supply within any one of the said documents shall be deemed to be a sufficient indication or inclusion of the work or supply, as the case may be, within the work and supply covered by the CONTRACT.
- 2.3 No verbal agreement, assurance, representation or understanding given by any employee or officer of the OWNER or so understood by the CONTRACTOR, whether given or understood before or after the execution of the contract, shall any-wise bind the OWNER or alter the CONTRACT documents unless specifically given in writing and signed by the OWNER or by the ENGINEER-IN-CHARGE on behalf of the OWNER and issue the amendment of the relative term(s).
- Clause headings given in this or any other contract documents are intended only as a general guide for convenience in reading and segregating the general subject of the various Clauses, but do not form part of the contract documents, with the intent that the Clause headings shall not govern the meaning or import of the Clauses there under appearing or confine or otherwise affect the interpretation thereof.

#### 3.0 MODIFICATIONS IN CONTRACT

3.1 All modifications leading to changes in the CONTRACT with respect to technical or commercial aspects including terms of completion period shall be considered valid only when accepted in writing by OWNER and CONTRACTOR by issuing amendment to the CONTRACT. Issuance of acceptance or otherwise in such cases shall not be any ground for extension of agreed completion date (except in cases where completion period itself is revised by OWNER) and also shall not affect the performance of CONTRACT in any manner except to the extent mutually agreed to, through a modification to CONTRACT. The PARTIES shall have the right to modify or amend the CONTRACT subject to an

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adjustment in the CONTRACT PRICE and/ or COMPLETION DATE in accordance with the applicable provision of the CONTRACT, if any, and subject to mutual agreement.

3.2 OWNER shall not be bound by any printed conditions or provisions in the CONTRACT-OR's bid forms or acknowledgement of CONTRACT, packing list and other documents which support to impose any condition at variance with or supplemental to CONTRACT

#### 4.0 USE OF CONTRACT DOCUMENTS AND INFORMATION

- 4.1 The CONTRACTOR shall not, without the OWNER's prior written consent, disclose the CONTRACT or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the OWNER in connection therewith, to any person other than a person employed by the CONTRACTOR in the performance of the CONTRACT. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purpose of such performance.
- 4.2 The CONTRACTOR shall not without the OWNER's prior written consent, make use of any document or information enumerated in Clause 6.1 except for purpose of performing the CONTRACT.
- 4.3 Any document other than CONTRACT, itself, enumerated in Clause 6.1 shall remain the property of the OWNER and shall be returned (all copies) to the OWNER on completion of the CONTRACTOR's performance under the CONTRACT if so required by the OWNER.

#### 5.0 PRICES, TAXES AND DUTIES AND OTHER LEVIES

The following provisions are in addition to Clause 13 of "Instruction to Bidders" (Section-III)

The prices shall include all duties, taxes and levies etc. including but not limited to customs duty, GST on imports, any tax / duty/ levy as per applicable GST laws, personnel and corporate tax as applicable.

The Bidders are to quote firm prices. In respect of both direct transaction between OWNER and the Bidder and Bought Out Items to be dispatched directly from the subvendor's works to Owner's site, the payment towards all applicable Indian Taxes and duties like Custom Duty, GST and other tax/duty/levy, will be made by OWNER in Indian rupees at actuals limited to the amount indicated in the Bid.

In case of Bought out items to be dispatched directly from sub-vendor's works to Owner's site, the CONTRACTOR shall ensure that his sub-vendors raise tax invoice under the provisions of GST Law, billed to the CONTRACTOR and shipped to Owner's site. The CONTRACTOR shall further ensure that he raises his corresponding tax invoices under the provision of GST Law in the name of OWNER during transit of the Material before the delivery of Material is taken by OWNER.

- 5.1 Except as specifically provided to the contrary in the SPECIAL CONDITIONS OF CONTRACT:
  - The CONTRACTOR shall, within the price of materials and scope of supply, be liable to pay and bear any and all duties, taxes, levies and cesses lawfully

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payable on any goods, equipment or materials imported into India or within any local limits for permanent incorporation in the work(s), and on materials sold and supplied to the OWNER pursuant to the CONTRACT.

- (ii) The CONTRACTOR shall within the price of services and scope of services be responsible to pay on behalf of the OWNER any and all duties, taxes, levies and cesses including education cess etc. lawfully payable on any goods or equipment imported into India or within any local limits for use in the performance of the work(s), and on services performed pursuant to the CONTRACT.
- (iii) The CONTRACTOR shall be liable for and shall pay any and all Indian fees, taxes, duties, levies and cesses including education cess etc., assessable against CONTRACTOR in respect of or pursuance to the CONTRACT. However, GST payment by the CONTRACTOR to the Tax Authority shall be made by the Owner to the CONTRACTOR at actual limited to the Amount indicated in the Bid.
- (iii) In addition, the CONTRACTOR shall be responsible for payment of all Indian duties, levies, and taxes etc., assessable against the CONTRACTOR or CONTRACTOR's employees or SUB-CONTRACTOR'S whether corporate or personal or applicable in respect of property.
- (iv) CONTRACTOR should comply with the provisions of e-way bill notified by appropriate authorities from time to time. The existing provisions of road permit will continue till such time if applicable.
- (v) There will be no materials under the scope of Contract which will be consigned to Owner, unless otherwise specifically mentioned elsewhere in the tender. The Owner will not issue / provide Road permits/e-way bill to the Contactor except in respect of material directly purchased by the Owner.

#### 5.2 **TAX INDEMNITY**

It will be the duty of the CONTRACTOR to duly observe and perform all laws, rules, regulations, orders and formalities applicable under GST and Customs Duty on the manufacture, sale, import and/or supply of any material to OWNER and/or applicable on the services performed by the CONTRACTOR pursuant hereto. The CONTRACTOR shall keep the OWNER indemnified for and against any and all claims, demands, prosecutions, penalties, damages, demurrages and/or other levies whatsoever made or levied by the Court or Customs Authorities with respect to any alleged breach, evasion or infraction of such duties, taxes, charges or levies or any breach or infraction of such laws, rules, regulations, orders or formalities concerning the same and from the consequence thereof.

5.3 The CONTRACTOR confirms that, it has included all taxes, duties, levies etc., as applicable at prevailing rates, in its TOTAL CONTRACT PRICE as quoted in Schedule of Rate. In case, CONTRACTOR has not included any such taxes, duties, levies etc., at all and/or at prevailing rates and CONTRACTOR has to pay such taxes, duties, levies etc., OWNER shall not be liable for payment of such liabilities and/or OWNER shall not reimburse such taxes, duties, levies etc. to CONTRACTOR.



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5.4 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.

- Any other taxes / duties in relation to this CONTRACT, which in terms of relevant legislation is the liability of CONTRACTOR, is discharged by OWNER, would be recovered from the CONTRACTOR from any subsequent payment due to the CONTRACTOR.
- 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.

#### 6.0 **INCOME TAX**

- 6.1 CONTRACT PRICE shall be inclusive of any and all Indian Income Tax payable in India. OWNER shall deduct Indian Income Tax as per rates prescribed for such contracts from time to time, from the payments due to CONTRACTOR and issue Tax Deducted at Source (TDS) certificate to CONTRACTOR. It will the responsibility of the CONTRACTOR to file proper income tax return and pay taxes thereon if any, or claim refund thereof if any. The CONTRACTOR shall give OWNER all necessary documents relating to its income tax assessments and to keep the OWNER informed about their assessments.
- Personal income tax payable, if any, in respect of salary and perquisites of CONTRACTOR's personnel / SUB-CONTRACTOR's personnel in India shall be payable by the individual so deputed by CONTRACTOR or SUB-CONTRACTOR. It is the responsibility of the individual or CONTRACTOR to file proper income tax return and pay taxes thereon if any, or claim refund thereof if any. The CONTRACTOR shall give OWNER all necessary documents relating to income tax assessments of its personnel and to keep the OWNER informed about their assessments.

#### 7.0 PATENT INFRINGEMENT AND INDEMNIFICATION (WHEREVER APPLICABLE)

#### 7.1 **PATENT INFRINGEMENT**

7.1.1 CONTRACTOR shall at all times, indemnify and keep indemnified OWNER against all claims or suits and defend, at its own cost, any suit or action brought against OWNER and hold OWNER free and harmless against all costs of such claims or suits which may be made against OWNER in respect of any infringement of any rights protected by patent, copyright, trademarks, and trade secrets to the extent that such claim, suit, or action is a result of the use of CONTRACTOR's Technical Information for the construction, maintenance, and operation of PLANT and the use of CONTRACTOR's



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and/or any other process licenser's processes used in PLANT. OWNER shall pass on all claims made against it to CONTRACTOR for settlement.

- 7.1.2 CONTRACTOR declares that to the best of its knowledge and belief the use of CONTRACTOR's Technical Information for the construction, maintenance, and operation of PLANT and the use of CONTRACTOR's processes used in PLANT will not infringe any valid patent rights of a third party. However, if at any time such infringement arises, CONTRACTOR agrees to keep OWNER indemnified and harmless against such claims and costs thereof and make arrangements that will allow OWNER to continue the operation of PLANT.
- 7.1.3 OWNER shall promptly advise CONTRACTOR in writing of any claim of infringement or any action for infringement of patents brought against it by a third party and based upon the use of CONTRACTOR's Technical Information. If such use is in accordance with instructions given in writing by CONTRACTOR, CONTRACTOR shall undertake the defence, or assist OWNER in the defence, of the claim or suit up to final judgment or settlement.
- 7.1.4 CONTRACTOR shall undertake the defence on behalf of OWNER and shall have sole charge and direction of the defence, and shall bear all costs related thereto. CONTRACTOR shall further hold OWNER harmless from any damages or other sums that may become payable by OWNER under a final judgment or settlement. However, OWNER shall render to CONTRACTOR all reasonable assistance that may be required by CONTRACTOR in the defence, and shall have the right to be represented therein by advisory counsel of its own selection and at its own expense.
- 7.1.5 In addition to the measures specified in Clause7.1.4, CONTRACTOR may further, at its option, however, in reasonable consultation with OWNER, seek to abate the alleged infringement by modification of PLANT or its operation without adversely affecting the performance and/or secure for OWNER immunity from suit for infringement. In such case, CONTRACTOR shall bear/ reimburse OWNER for all costs related to said modification and to said immunity.
- 7.1.6 In the event that OWNER is legally restrained from operating PLANT on account of any infringement action or suit, CONTRACTOR shall take all possible actions to allow OWNER to operate and use PLANT.
- 7.1.7 Neither CONTRACTOR nor OWNER shall settle or compromise any suit or action without the written consent of the other if settlement or compromise obliges the other to make any payment or part with any property or assume any obligations or surrender any rights or to be subjected to any injunction by reason of such settlement or compromise.

#### 7.2 **INDEMNITIES**

#### 7.2.1 **INDEMNIFICATION FOR LIABILITIES**

#### 7.2.1. CONTRACTOR Indemnification for Liabilities

To the fullest extent permitted by Law, CONTRACTOR assumes liability for and agrees to indemnify, protect, save and hold harmless OWNER from and against any and all Liabilities (including, any strict liability), arising out of acts or omissions of CONTRACTOR

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or its personnel or its agents in the performance of its obligations under the CONTRACT causing bodily injury, sickness, disease or death, damage to or loss of any property, and whether or not involving damage to WORKS or SITE that may be imposed on, suffered or incurred by or asserted against OWNER and in any way relating to or arising out of (i) WORK, any EQUIPMENT (ii) the presence, discharge, treatment, storage, transportation, disposal, escape or release of any Hazardous Substance, or the threat thereof, at, to or from SITE after commencement of work (any hazardous substance already existing at SITE before commencement of WORK excluded)(iii) The performance of WORK, or as a result of personal injuries (including wrongful death); (iv) the violation by CONTRACTOR or any SUB-CONTRACTOR/VENDOR of any Government Approval or applicable Law breach **CONTRACT** relating WORK of with (v) any CONTRACTOR/VENDOR, provided, however, that CONTRACTOR shall not be required under this Clause to indemnify OWNER for any liability arising out of or resulting from events or circumstances occurring or existing after PRELIMINARY ACCEPTANCE OF PLANT except where the liability arises from an act or omission of CONTRACTOR or any SUB-CONTRACTOR/VENDOR or any other Person directly or indirectly employed by either of them or anyone for whose acts either of them may be liable that was a contributory cause of such liability.

#### 7.2.2 **CONTRACTOR Indemnification for Taxes**

It is specifically understood that CONTRACTOR hereby accepts and assumes exclusive liability for and save and hold OWNER harmless from and against of all Taxes arising from the performance of WORK, and all such Taxes shall be deemed to be included in CONTRACT PRICE.

#### 7.2.3 Indemnification by SUB-CONTRACTOR/VENDOR

CONTRACTOR shall obtain from each SUB-CONTRACTOR/VENDOR, which is an affiliate, and shall use all reasonable efforts to obtain from each SUB-CONTRACTOR/VENDOR, an indemnification materially similar in form and substance to Clause-7.1 and Clause-7.2.2 of which the OWNER shall be named as beneficiary.

#### 7.2.4 Payment of Amounts under this Clause

Except to the extent covered by insurance, all amounts payable and due by CONTRACTOR to OWNER under this Clause shall be deducted from CONTRACT PRICE or any other amounts owed by OWNER to CONTRACTOR here under. If such amounts payable by OWNER to CONTRACTOR are less than the amounts payable and due by CONTRACTOR under this Clause, CONTRACTOR shall be liable to OWNER for such excess and shall pay such amount to OWNER immediately upon demand.

#### 7.2.5 **Permits and Certificates**

CONTRACTOR shall procure, at its expense, all necessary permits, certificates and licences required by virtue of all applicable laws, regulations, ordinances and other rules in force at the place where any of the works is to be performed, and CONTRACTOR further agrees to hold OWNER harmless from liability or penalty which might be imposed by reason of any asserted or established violation of such laws, regulations, ordinances or other rule. OWNER shall provide the necessary permits for CONTRACTOR's personnel to undertake any work in India in connection with CONTRACT.

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#### 7.2.6 Mechanics Lien

CONTRACTOR agrees to indemnify and hold harmless OWNER against all labourer's material, man's and/or mechanic's liens arising from its work, and shall keep the premises of OWNER free from all such claims, liens and encumbrances.

#### 8.0 CONTRACT PERFORMANCE SECURITY (CPS)

- 8.1 The proceeds of **CPS** shall be appropriated by the OWNER as compensation for any loss resulting from the CONTRACTOR's failure to complete their obligations under the CONTRACT without prejudice to any of the rights or remedies the OWNER may be entitled to as per terms and conditions of the CONTRACT.
- 8.2 The CONTRACTOR shall extend the validity of the **CPS** suitably if it is required due to delay in COMPLETION of the PLANT at it's own cost. The CPS shall be suitably extended in event of repair/replacement of equipment or any part thereof during DEFECT LIABILITY PERIOD to take care of extended warranty period of repair/replacement. The CPS will be discharged by the OWNER after the CONTRACTOR's performance obligation including any warranty obligation under the CONTRACT. For any component replaced during DEFECT LIABILITY PERIOD, the component should work satisfactorily for a period of 12 months from the date of replacement

The CPS shall be retained by OWNER during the currency of CONTRACT as indicated above or till settlement of all the accounts thereof, whichever is later. In case of any dispute or differences not settled within the validity of CPS, contractor shall arrange to get the CPS extended for the period asked for by OWNER. In case CPS is not extended as asked, OWNER shall have the sole discretion to 'call in' the bank to pay the whole or part of the amount of bank guarantee/CPS. The above deposit shall be deemed to be security for the faithful performance of the CONTRACT and for the purpose of section 74 of the Indian Contract Act, 1872 and for the extension of that section, the CPS shall deemed to be the bond given by the CONTRACTOR for the performance of essential duty. In the event of breach of any of the terms and conditions of the contract, OWNER shall have the right to draw from the CPS whole or part of the value of CPS. The amount so drawn shall not in any way affect any remedy to which OWNER may otherwise be entitled or any liability incurred by contractor under the contract or any law for the time being in force relating thereto or bearing here upon. This CPS shall be refunded 3 months after expiry of Defect Liability Period. It shall be lawful for OWNER if any differences or dispute is likely to arise to defer payment of the CPS or any portion thereof which may be due for release until such differences and dispute has been finally settled or adjusted. CPS amount shall not bear any interest.

#### NOTE:

In case CPS is submitted by way of Bank Guarantee, the non-judicial Stamp paper of appropriate value only or equivalent document value shall have to be purchased in the name of the bank executing the bank guarantee and not in the name of the CONTRACTOR.

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#### 8.3 Rights of the OWNER to forfeit CPS:

- i) Whenever any claim against the CONTRACTOR for the payment of a sum of money arises out or under the CONTRACT, the OWNER shall be entitled to recover such sum by appropriating in part or whole the CPS 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 OWNER on demand any balance remaining due.
- ii) All compensation or other sums of money payable by the CONTRACTOR to the OWNER under terms of this CONTRACT may be deducted from or paid by the encashment or sale of a sufficient part of his CPS or from any sums which may be due or may become due to the CONTRACTOR by the OWNER of any account whatsoever and in the event of his Rights of the OWNER to forfeit CPS.

#### 9.0 DELETED

#### 10.0 SIGNING OF CONTRACT

- 10.1 All documents as per Clause 2.0 of GCC shall be included in the DLOA.
- 10.2 Every page of the DLOA &CONTRACT agreement shall be initialled by the authorised representatives of OWNER and CONTRACTOR under the Seal of their respective Companies.
- 10.3 The CONTRACTOR shall present the above CONTRACT AGREEMENT so prepared in two Sets alongwith proper Power of Attorney and other requisite material on the day of signing the agreement.
- 10.4 Notwithstanding anything mentioned in any other clause, any conditions imposed from time to time by Government of India shall be followed by the CONTRACTOR.

#### **11.0** Deleted

#### 12.0 ASSIGNMENT OR SUBLETTING OF CONTRACT AND SUB-CONTRACTING

- 12.1 No part of the CONTRACT nor any share or interest therein shall in any manner or degree be transferred, assigned or sublet by the CONTRACTOR directly or indirectly to any person, firm or corporation whatsoever without the consent in writing, of the ENGINEER/EMPLOYER except as provided for in the succeeding sub-clause.
  - i. SUB-CONTRACTS FOR TEMPORARY WORKS ETC.:

The EMPLOYER may give written consent to Sub- contract for the execution of any part of the WORK at the site, being entered in to by CONTRACTOR provided each individual Sub- contract is submitted to the ENGINEER-IN-CHARGE before being entered into and is approved by him.

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#### ii. LIST OF SUB-CONTRACTORS TO BE SUPPLIED

At the commencement of every month the CONTRACTOR shall furnish to the ENGINEER-IN-CHARGE list of all SUB-CONTRACTORS or other persons or firms engaged by the CONTRACTOR and working at the SITE during the previous month with particulars of the general nature of the Sub-contract 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 Sub-contracts, 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

#### 12.2 DELETED

12.3 Sub-Contracting for WORKS (to be read in conjunction with clause regarding subcontractors/Sub-vendors sharing land border with India as per Annexure-VII of tender document).

#### 12.3.1 **General**

All vendors, suppliers, consultants and SUB-CONTRACTORS/SUB-VENDORS providing equipment, materials, construction equipment, or services to CONTRACTOR under a SUBCONTRACT, purchase order or similar purchase form or arrangement with CONTRACTOR for the performance of the WORK under this CONTRACT are herein referred as "SUB-CONTRACTORS"/ "SUB-VENDORS", and any such SUB-CONTRACTS, purchase orders or similar purchase forms or arrangement entered into by or on behalf of CONTRACTOR with SUB CONTRACTORS/SUB-VENDORS are herein



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referred to as "SUB-CONTRACTS" provided that none of OWNER's CONTRACTOR'S or SUB-CONTRACTOR'S/ SUB-VENDOR'S shall be deemed to be a SUB-CONTRACTOR/ SUB-VENDOR under the CONTRACTOR. The CONTRACTOR shall be obligated to select SUB-CONTRACTORS/ SUB-VENDORS it retains in connection with the performance by CONTRACTOR of the WORK from the SUB-CONTRACTOR'S/ SUB-VENDOR'S list which would be finalised and approved by the OWNER. OWNER and CONTRACTOR may by mutual agreement add to or delete from such list from time to time and approve any successor or replacement of any person listed on such list or any other vendor, supplier, material-man, consultant or SUB-CONTRACTOR/SUB-

#### 12.3.2 Approval of SUB-CONTRACTOR/SUB-VENDOR

VENDOR.

- 12.3.2.1 The vendor list for procurement of EQUIPMENT and the list of SUB-CONTRACTOR/SUB-VENDOR shall be as attached in the Section VI of NIT. Any changes to such list of SUB-CONTRACTOR/SUB-VENDOR shall require the prior approval of OWNER. CONTRACTOR shall provide name, address, fax number and name of contact person of major SUB-CONTRACTORS/SUB-VENDORS for use in future, to OWNER.SUB-CONTRACTOR/SUB-VENDOR as per agreed Vendor list are not subject to approval.
- 12.3.2.1.1 Under normal circumstance a CONTRACTOR shall not be allowed to source any equipment/machinery from the vendors other than the Owner's approved vendor list. However, in exceptional circumstance the CONTRACTOR may suggest additional vendors meeting the following requirement for the approval of Owner.
  - a. The CONTRACTOR should specify, while pre-qualifying the Vendors, that during the past 7 years the Vendor should have supplied at least two similar plant equipments or machinery. The CONTRACTOR should satisfy themselves that sufficient documentary proof is submitted by the Vendors in support of this criterion. However, in case of critical equipment, in addition to above criterion, the Vendor should also be prequalified by Process Licensor.
  - b. The CONTRACTOR would be ultimately responsible for verifying the credentials, the quality of the equipment, machinery and timely supply.
- 12.3.2.2 The review, approval and consent by OWNER as to the agreed SUB-CONTRACTOR's/VENDOR List or as to CONTRACTOR's entering into any SUB-CONTRACT / PURCHASE ORDER 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.
- 12.3.2.3 (a) CONTRACTOR shall provide to OWNER such information concerning the SUB-CONTRACTORS as OWNER may from time to time reasonably request and shall ensure that each SUB-CONTRACT contains provisions in all material respects not less stringent than the provisions of the CONTRACT and shall include terms and provisions required to be included pursuant to the CONTRACT. In the event of termination of the CONTRACT under Clause 34.0 herein, CONTRACTOR shall forthwith deliver to OWNER a copy of each SUBCONTRACT.
  - (b) CONTRACTOR shall supervise and direct the work of all SUB-CONTRACTORS/SUB-VENDORS and shall be responsible for all design,

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engineering, procurement, manufacturing, transportation, delivery, fabrication, construction, commissioning, start-up and testing means, erection, operation, maintenance, repair, methods, techniques, sequences and procedures of, and for co-coordinating the work of SUB-CONTRACTORS/ SUB-VENDORS.

- (c) 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/SUB-VENDORS 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.
- (d) CONTRACTOR shall require all SUB-CONTRACTORS/SUB-VENDORS to perform the SUB-CONTRACTS in accordance with the relevant requirements of the CONTRACT, all APPLICABLE LAWS and APPLICABLE PERMITS, Prudent Utility Practice, Good Engineering Practices, the requirements of the NIT, and all Warranties of SUB-CONTRACTORS/SUB-VENDORS and Manufacturers and all insurance policies relating to the PLANT or the WORK.
- (e) CONTRACTOR shall be solely responsible for paying each SUB-CONTRACTOR/SUB-VENDOR 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 services, 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.
- (f) In performing the duties incidental to its responsibilities hereunder, CONTRACTOR shall issue to the SUB-CONTRACTORS/SUB-VENDORS such directives and impose such restrictions as may be required to obtain such compliance herewith and with the terms of the SUB-CONTRACTS.

#### 12.3.2.4 SUB-CONTRACTOR/VENDOR AND MANUFACTURER WARRANTIES

- (a) CONTRACTOR shall ensure that all equipment and other items used in connection with the performance of the WORK or incorporated in the PLANT (other than minor items) will be purchased in compliance with CONTRACT Technical Specifications and requirements in order to allow the Plant to achieve the Guarantee and Warrantee as provided for in the CONTRACT, unless otherwise agreed with OWNER.Any residual warranty from subcontractor/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.

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- (c) Nothing in this clause shall derogate from the obligations of CONTRACTOR to provide the Guarantees and Warranties described in and to comply with the provisions hereinabove.
- (d) CONTRACTOR shall, based on its past professional judgement enforce all guarantees and warranties provided hereunder to the fullest extent thereof till such time they are transferred to the OWNER pursuant to sub-clause (g) below.
- (e) Upon the expiration or termination of any of the guarantees or warranties provided by CONTRACTOR pursuant to the CONTRACT, the CONTRACTOR shall assign, and hereby assigns, effective as of such date, or otherwise make available, to OWNER all of CONTRACTOR's rights under all such SUBCONTRACTOR's residual Guarantees and warrantee as per 12.3.2.4(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.
- CONTRACTOR shall require all SUB-CONTRACTORS/SUB-VENDORS (g) 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 SUBwhich the releasing 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 and against **CONTRACTOR** and all underwriters, other 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.

#### 12.3.2.5 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.



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- 12.3.3 All WORK performed or EQUIPMENT supplied by SUB-CONTRACTOR/ SUB-VENDOR shall be pursuant to an appropriate SUB-CONTRACT, PURCHASE ORDER or similar agreement which shall, as appropriate, contain provisions that:
- 12.3.3.1 Preserve and protect all the rights of OWNER here under for WORK to be performed or EQUIPMENT to be supplied under PURCHASE ORDER or SUB-CONTRACT.
- 12.3.3.2 Require that such WORK be performed or EQUIPMENT be fabricated, supplied and installed in strict accordance with the applicable requirements of this CONTRACT.
- 12.3.3.3 Obligate such SUB-CONTRACTOR/SUB-VENDOR to consent to and be bound by those obligations under this CONTRACT which by their terms are intended to also obligate such SUB-CONTRACTOR/VENDOR, including the provisions of this Clause.
- 12.3.3.4 Require such SUB-CONTRACTOR/SUB-VENDOR to provide and maintain adequate insurance consistent with requirements for companies of similar size and performing similar services. Permit the assignment of such SUB-CONTRACT/PURCHASE ORDER by CONTRACTOR to OWNER.

#### 12.3.3 **CONTRACTOR RESPONSIBLE FOR WORK**

12.3.4.1 CONTRACTOR is responsible for WORK, and that the performance thereof conforms in all respects to the requirements of this CONTRACT, regardless of any failure of any SUB-CONTRACTOR/VENDOR to perform or any disagreement between any SUB-CONTRACTOR/VENDOR or between any SUB-CONTRACTOR/VENDOR and CONTRACTOR. CONTRACTOR shall furnish such information relative to its SUB-CONTRACTOR/VENDOR (including copies of unpaid SUB-CONTRACT or PURCHASE ORDER) as OWNER may request.

#### 12.3.5 **DAMAGES**

It is within the discretion of Contractor, that CONTRACTOR shall agree to hold all SUB-CONTRACTOR/VENDOR, including all persons directly or indirectly employed by them, responsible for any damages due to breach of CONTRACT caused by them or any negligent act and to diligently endeavour to effect recoveries in such damages..

#### 13.0 STANDARDS

The goods and services supplied under this CONTRACT shall conform to the standards mentioned in the technical specifications and when no applicable standard is mentioned, CONTRACTOR to follow best engineering practices.

#### 14.0 INSTRUCTIONS, DIRECTIONS

- 14.1 The materials described in CONTRACT are to be supplied according to the standards, data sheets, tables, specifications and drawings attached hereto and/or enclosed with the CONTRACT itself and according to all conditions both general and specific enclosed with the CONTRACT, unless any or all of them shall have been modified or cancelled in writing as a whole or in part.
  - A) All instructions and orders to CONTRACTOR shall, except what is herein provided, be given by OWNER/ CONSULTANT.

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B) All the work shall be carried out under the direction of OWNER and according to the CONTRACT requirements.

- All communications including technical/ commercial clarifications and/ or comments shall bear reference to the CONTRACT.
- D) Invoice for payment against CONTRACT shall be addressed to OWNER.
- E) The CONTRACT/DLOA number shall be shown on all invoices communications, packing lists, containers and bills of lading etc.

#### 15.0 DELETED

#### 16.0 TIME SCHEDULE AND PROGRESS REPORTING

#### 16.1 Time Schedule Network/Bar Chart

- 16.1.1 Together with the CONTRACT confirmation, CONTRACTOR shall submit to OWNER, his time schedule regarding the documentation, supply and manufacture of equipment and materials as well as information of his SUBCONTRACTS to be placed with third parties, including the dates on which CONTRACTOR intends to issue such SUB CONTRACTS. A complete activity-wise time schedule shall be furnished by the CONTRACTOR within 30 days from the date of issuance of FOA.
- 16.1.2 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 raw materials, manufacturing, testing, delivery, erection & commissioning.
- 16.1.3 The original issue and subsequent revisions of CONTRACTOR's time schedule and/or SUB-CONTRACTORS' time schedules shall be sent in two copies to OWNER.
- The time schedule network/bar chart shall be updated at least every month using the latest 'Project Management software', i.e. Primavera (latest version), acceptable to the OWNER.

#### 16.2 PROGRESS TREND CHART/MONTHLY REPORT

- 16.2.1 CONTRACTOR shall report monthly to OWNER of the execution of CONTRACT and achievement of targets set out in time bar chart, in a monthly progress report on 7<sup>th</sup> working *day* of every Month.
- 16.2.2 The progress will be expressed in percentages shown in the progress trend chart.
- 16.2.3 The first issue of the progress trend chart will be forwarded together with the time bar chart along with CONTRACT confirmation.
- 16.2.4 The monthly reporting will bear the updating of the progress trend chart.
- 16.2.5 OWNER or his representatives shall have the right to inspect CONTRACTOR's premises to evaluate the actual progress of work on the basis of CONTRACTOR's time schedule documentation.
- 16.2.6 Irrespective of such inspection, CONTRACTOR shall advise OWNER at the earliest possible date of any anticipated delay in the programme indicating the reasons thereof and corrective measures proposed thereto.
- 16.2.7 The time for completion and phased time schedule shall be subject to and in accordance with the provision of Sub-Clauses 16.2.8 and 16.2.9 below.
- 16.2.8 Neither OWNER nor CONTRACTOR shall be considered in default in performance of their obligations if such performance is prevented or delayed by FORCE MAJEURE conditions as stated in Clause 35.0.



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- 16.2.9 Should the CONTRACTOR's preparation for the commencement of the work or any portion of it or its subsequent rate of progress be from any cause whatsoever, so slow and reasons for delay solely attributed to the contractor, the CONTRACTOR will not be able to complete the work or any portion thereof within the stipulated time for completion, the provisions of Clause 34 of GCC shall apply.
- 16.2.10 In the event that the delay is caused by a delay in the delivery of a sub-contracted EQUIPMENT, CONTRACTOR shall be responsible for such delay and submit details together with copies of the appropriate orders and agreements with SUB-CONTRACTOR/vendor.

#### 17.0 CONTRACTOR TO INFORM HIMSELF FULLY

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 offer and his offer 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 offer. 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. CONTRACTOR 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 OWNER in duplicate, before submission of tender. The



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OWNER may provide such clarification as may be necessary in writing to CONTRACT, such clarifications as provided by OWNER shall form part of CONTRACT DOCUMENTS.

No verbal agreement or inference from conversation with any effect or employee of the OWNER 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

#### 18.0 SUITABILITY OF PLANT FOR INTENDED PURPOSE

- 18.1 The CONTRACTOR warrants that the PLANT will be suitable in all respects for the purpose mentioned or inherent in the specification and as defined in the CONTRACT.
- 18.2 Without limiting the generality of the foregoing clause, the CONTRACTOR shall ensure before complying with any direction, that compliance by the CONTRACTOR with that direction will not render the plant unsuitable in any respect for the aforesaid purposes or otherwise prevent the CONTRACTOR from carrying out the CONTRACT in accordance with the terms thereof.
- 18.3 The CONTRACTOR shall give notice to the OWNER within Twenty one (21) days after receipt of any requirement or direction which he considers will render the plant unsuitable in any respect or is not in accordance with the meaning and intent of the CONTRACT OR otherwise prevent the CONTRACTOR from carrying out the CONTRACT or as aforesaid and submit to the OWNER a proposal or proposals for modifying the requirement or direction. Failure to file an objection within the allotted time will be considered as acceptance of the OWNER's decision and the decision shall become final and binding.

#### 19.0 FEES FOR ROYALITIES AND PATENT RIGHTS (WHEREVER APPLICABLE)

#### 19.1 Payment Due to be Included in CONTRACT PRICE

- All payments for royalties, patent rights and fees due to or payable for or in connection with any matter or thing used or required to be used in performance of the CONTRACT or to be supplied under the CONTRACT, whether payable in one sum or by instalments or otherwise, shall be included by the CONTRACTOR in the prices named in the CONTRACT and shall be paid by CONTRACTOR to whom such payments may be due or payable.
- 19.1.2 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,



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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 OWNER 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 OWNER 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 OWNER of any equipment, machinery, materials, process, methods to be supplied hereunder. The CONTRACTOR agrees to and does hereby grant to OWNER, together with the right to extend the same to any of the subsidiaries of the OWNER 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.

#### 19.2 Payment to the CONTRACTOR by OWNER

19.2.1 Final payment to the CONTRACTOR by the OWNER will not be made while any such suit or claim remains unsettled. In the event any apparatus or equipment or any part thereof furnished by the CONTRACTOR is in such suit or proceedings, held to constitute infringement, and its use is enjoined, the CONTRACTOR shall, at his option, and at his own expense, either procure for the OWNER the right to continue use of the said apparatus, equipment or part thereof, replace it with non-infringing apparatus or equipment or modify it, so that it becomes non-infringing.

### 20.0 ACTS OF PARLIAMENT, LOCAL AND OTHER AUTHORITIES REGULATIONS AND BYE-LAWS

#### 20.1 Complying With Regulations

- 20.1.1 Throughout the execution of the WORK, the CONTRACTOR shall comply with the requirements of all applicable laws and regulations, bye-laws or orders made there under and to the requirements of public, municipal and other authorities in any way affecting or applicable to the work. The OWNER shall, when requested by the CONTRACTOR, give all reasonable assistance to the CONTRACTOR in obtaining information concerning local conditions.
- 20.1.2 Before making any departure from the specification or drawings which may be necessary to conform to such requirements, the CONTRACTOR shall give the OWNER written notice specifying the departure proposed to be made and the reason for making it and applying for instructions thereon. If the CONTRACTOR does not receive such instructions within thirty (30) days, he shall conform to those requirements and inform the OWNER accordingly.

#### 20.2 Notices and Fees

The CONTRACTOR shall give all notices required to be given by the Acts, regulations, bye-laws, orders and requirements referred to in sub-clause 20.1 of this clause and shall pay all fees payable in connection herewith.

Any additional fee becoming applicable due to any change of Acts, regulations, by-laws, orders and requirements after date of submission of FINAL PROPOSAL shall be borne by OWNER in accordance with SCC clause 3.0.



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#### 21.0 TIME- PROJECT SCHEDULE

- 21.1 Without prejudice to anything contained in the CONTRACT, the time and the date of completion of the works as stipulated in the CONTRACT shall be deemed to be of the utmost importance. The CONTRACTOR shall so organise his resources and perform his work so as to complete it within the completion period.
- The contractor shall submit the Primavera Level 4 schedule within thirty (30) days from date of issuance of FOA.

The Primavera Level 4 schedule shall be for OWNER's review and be based on a level 2 schedule as attachment to the CONTRACT. Such level 2 schedule shall show the execution periods for (i) engineering, (ii) procurement & delivery of equipment and materials, (iii) & erection (iv) Mechanical Completion and (v) commissioning, testing.

CONTRACTOR shall be contractually obliged to issue a Primavera Level 4 schedule provided that such schedule shall not (i) accelerate the OWNER obligations (to be agreed upon prior to Contract award) (ii) change the GUARANTEED COMPLETION DATE.

21.3 The above Primavera Level 4 schedule shall be periodically reviewed and reports shall be submitted by the CONTRACTOR as directed by the OWNER.

#### 22.0 CONTRACT PRICE

- 22.1 CONTRACT PRICE is inclusive of the cost/fees of CONTRACTOR's obligations as given below briefly but not limited to the following:
  - a. Detailed Engineering
  - b. Basic Engineering
  - c. Supply of all <del>Plant</del>, Equipment, Bulk Materials, Chemicals & Lubricants and consumables
  - d. 2 months vendor supervision assistance.
  - e. Supply of spares
  - f. All applicable taxes and duties including GST, Indian Income Tax, etc.
  - g. Forwarding charges, if applicable
  - h. Freight up to SITE including taxes
  - i. Unloading, storage at Site, Site Assembly, Erection, Pre-Commissioning and Commissioning until Preliminary Acceptance of Plant.
  - j. Insurance
  - k. Inspection and expediting charges
  - I. Project management and overheads,
  - m. Guarantee test runs and handing over of PLANT to OWNER.
  - n. All other costs, expenses and outgoings of the CONTRACTOR not otherwise expressly set forth herein necessary, required or incidental to the full, complete and proper performance and discharge of the CONTRACTOR's obligations under and in accordance with the CONTRACT including completion of the PLANT in all respects and overheads of the CONTRACTOR.



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- 22.2 OWNER shall pay to CONTRACTOR a lump-sum fixed CONTRACT PRICE for the due and faithful performance of CONTRACTOR's obligations under the CONTRACT. CONTRACT PRICE provided for in this Clause covers entire consideration payable to CONTRACTOR for all obligations of CONTRACTOR.
- 22.3 CONTRACT PRICE is inclusive of cost of all travel, accommodation, living costs and all other expenses of management and personnel of CONTRACTOR, SUB-CONTRACTOR, VENDOR for travelling to and from plant SITE and other places/countries as may be necessary for the proper performance of CONTRACTOR's responsibilities under CONTRACT and shall also include all costs and expenses incurred in attending such meetings in connection with CONTRACT as OWNER may reasonably require.
- 22.4 CONTRACT PRICE is inclusive of cost of all CONTRACTOR's EQUIPMENT, materials, services, etc. required to complete WORK under CONTRACT.
- All taxes, duties, licence fees and other such levies as may be applied to the CONTRACT, including Custom Duty, all applicable taxes & duties under GST, Corporate income tax in respect of the performance of the CONTRACT as well as income tax on the personnel deputed by the CONTRACTOR to India in connection with the CONTRACT shall be to the account of the CONTRACTOR.

#### 23.0 DEDUCTIONS FROM CONTRACT PRICE

All costs, damages or expenses which the OWNER may have paid for which, under the CONTRACT, the CONTRACTOR is liable, will be claimed by the OWNER. All such claims shall be billed by the OWNER to the CONTRACTOR regularly as and when they fall due. Such claims shall be paid by the CONTRACTOR within fifteen days of the receipt of the corresponding bills and if not paid by the CONTRACTOR within the said period, the OWNER may then deduct the amount from any bill due or becoming due by him to the CONTRACTOR under the CONTRACT or may be recovered by action of law or otherwise, if the CONTRACTOR fails to satisfy the OWNER of such claims.

- 24.0 Deleted
- 25.0 Deleted
- 26.0 TAXES APPLICABLE TO CONTRACTOR'S MANPOWER, TURNOVER, EQUIPMENT, ETC.
- The CONTRACTOR shall be liable and pay all taxes, duties, levies, lawfully assessed against the OWNER or the CONTRACTOR in pursuance of the CONTRACT. The CONTRACTOR shall be solely responsible for all taxes that may be levied on the CONTRACTOR's turnover & profit or on the earnings of any of his employees or personnel engaged by him and shall hold the OWNER indemnified and harmless against any claims that may be made against the OWNER in this behalf. The OWNER does not undertake any responsibility whatsoever regarding any taxes levied on CONTRACTOR and/or his personnel by Centre/State/Local Authorities. The Taxes shall be deducted where the said provisions shall be applicable and/or obligatory on the part of the OWNER.
- 26.2 For CONTRACTORS who have to bring equipment and material from outside Odisha, will have to obtain necessary registrations and take appropriate steps as required under Odisha State Laws. Further, form 38 / E-Waybill / Road Permit shall be issued by the



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CONTRACTOR in such cases, wherever applicable. Necessary statutory registrations as required shall be done by CONTRACTOR in this regard.

26.3 CONTRACTOR is responsible for obtaining Customs clearance permit for temporary importation on re-export basis of CONTRACTOR'S EQUIPMENT, tools and tackles etc. If any duties, taxes and expenses are payable on this, the same will be to CONTRACTOR'S account.

#### 27.0 PACKING, FORWARDING AND SHIPMENT

- 27.1 The CONTRACTOR shall give complete despatch information concerning the weight, size, content of each package including any other information the OWNER may require.
- The CONTRACTOR, wherever applicable shall after proper painting, pack and crate all equipment in such a manner as to protect it from deterioration and damage during rail and road transportation to the site and storage at the site till the time of erection. The CONTRACTOR shall be held responsible for all damages due to improper packing.
- 27.3 The CONTRACTOR shall notify the OWNER of the date of each shipment from his works, and the expected date for arrival at the site for the information of the OWNER. The CONTRACTOR will be responsible for arranging any requirement of over-dimensional, special rail/road wagon/trailer for transporting.
- 27.4 The CONTRACTOR shall also give all shipping information concerning the weight, size and content of each package including any other information the OWNER may require. The size of the largest packages being considered as over dimensional consignments shall be as per the latest guidelines.
- The CONTRACTOR shall prepare detailed packing lists of all packages and containers, bundles and loose materials forming each and every consignment despatched to the site. The CONTRACTOR shall further be responsible for making all necessary arrangements for loading, unloading and other handling, right from works till the SITE and also till the EQUIPMENT is erected, tested and commissioned.

OWNER shall ensure availability of Foundation and other required utilities for readiness of the system. Major equipments and vessels of the Package system shall be supplied at site and to be installed to avoid storage at site. However minor equipments (piping/valves/fittings/instrumentation system etc) shall be preserved by Contractor at site.

#### 28.0 INSURANCE

- 28.1 CONTRACTOR shall take in the joint name of CONTRACTOR and OWNER comprehensive transit insurance for imported and indigenous goods. Transit-cum-Storage-Erection insurance or its equivalents and third party liability insurance policies shall be taken with reputed underwriters to cover ALL RISK whatsoever during the whole period starting with dispatch of GOODS from CONTRACTOR's warehouses/ Exworks in foreign country to CIF port of shipment for imported GOODS and EXW at Contractor's works for indigenous GOODS and shall further cover for performing services in India for transportation, loading, unloading, assembly, erection, testing COMMISSIONING of PLANT till care and custody is transferred to OWNER.
- 28.1.1 Contractor shall take Public Liability (Third Party) Insurance cover of 10% of TOTAL CONTRACT PRICE.



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- 28.1.2 Contractor shall ensure that in addition to "Erection All risk policy", the coverage in respect of workmen compensation, ESI/Health Insurance, Professional Indemnity (with the amount of minimum excess) has been appropriately taken.
- 28.2 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.
- 28.3 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 andOWNER's acceptance shall not be unreasonably withheld. However, irrespective of such acceptance, the responsibility to maintain adequate insurance coverage at all times including third party liability during the period of contract shall be as of CONTRACTOR alone. The contractor's failure in this regard shall not relieve him of any of his contractual responsibilities and obligations. The insurance covers to be taken by the CONTRACTOR, shall be in the joint names of OWNER and the CONTRACTOR. The CONTRACTOR shall, however, be authorised to deal directly with insurance company or companies and shall be responsible in regard to maintenance of all insurance covers.
- All insurance other than marine insurance for transportation outside India is to be covered from IRDA approved insurance company registered in India. There should be a single cover for marine cum inland transit, storage and erection upto PRELIMINARY ACCEPTANCE OF PLANT.

However adequacy, credibility and maintenance of Insurance policies is sole responsibility of CONTRACTOR and CONTRACTOR shall keep the OWNER indemnified against any such failure.

All insurance covers shall be taken by CONTRACTOR in joint name of CONTRACTOR and OWNER.

Alternatively, the CONTRACTOR has the option to take separate Insurances as

- 1. Marine Cargo Insurance for transit of all imported and indigenous goods from Ex -Works at CONTRACTOR'S/SUB-CONTRACTOR's works to Site.
- 2. Erection and All Risk (EAR) Insurance
- 3. Third Party Liability Insurance

Marine Cargo Insurance and Third Party Liability Insurance can be a part of Global Policy of the CONTRACTOR. However certificate of endorsement in favour of OWNER shall be provided by the CONTRACTOR from the insurance company. These two global policies of Marine Cargo Insurance and Third Party Liability Insurance shall be counter guaranteed by Indian Insurance Company. However, Erection and All Risk (EAR) is to be covered from Insurance Company registered in India and shall be separate dedicated policies for OWNER.



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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 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

The perils required to be covered under the insurance shall include, but not be limited to fire and allied risks, miscellaneous accidents (erection risks) workman compensation risks, loss or damage in transit, theft, pilferage, riot and strikes and malicious damages, civil commotion, weather conditions, accidents of all kinds, war risks (during ocean transportation only) etc. The scope of such insurance shall be adequate to cover the replacement/reinstatement cost of the equipment for all risks till the equipment is taken over by the OWNER. The insurance policies to be taken should be on replacement value basis and/or incorporating escalation clause. Notwithstanding the extent of insurance cover and the amount of claim available from the underwriters, the CONTRACTOR shall be liable to make good the full replacement/rectification of all equipment/materials and to ensure their availability as per project requirements without additional financial liability to the OWNER.

keep the OWNER indemnified against any such failure.

The workman compensation policy taken by the SUB-CONTRACTOR of the CONTRACTOR shall be passed on to the OWNER.

Insurance policies is the sole responsibility of CONTRACTOR and CONTRACTOR shall

- 28.7 CONTRACTOR shall at its own cost and initiative at all times upto the successful completion of PRELIMINARY ACCEPTANCE, take out and maintain all insurable liability, including but not limited to third Party insurance and liabilities under the Motor Vehicles Act, Worker's Compensation Act, Fatal Accidents Act, Personal Injuries Insurance Act, Emergency Risk Insurance Act and/or other Industrial Legislation from time to time in force in India with Insurance Company(ies), such policy(ies) shall not be of lesser limits hereunder specified with reference to the matters hereunder specified, namely:
  - Workmen's Compensation Insurance to the limit to which compensation may be payable under Indian laws.
- All cost on account of insurance liabilities covered under the CONTRACT will be to the CONTRACTOR'S account and will be included in the CONTRACT PRICE. The CONTRACTOR, while arranging the insurance, shall ensure to obtain all discounts on premium, which may be available for higher volume or for reason of financing arrangement of the project.
- 28.9 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

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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.

However, OWNER should have first right over the claim amount in case payment for the "equipment damaged" has already been paid to the CONTRACTOR

- The CONTRACTOR shall be fully responsible for pursuing and settling all claims with the underwriters within stipulated timelines. In the event of accident, injury, damage or loss likely to form a claim under the above insurance policies, the CONTRACTOR shall as quickly as possible but not later than the claim period submit such details as are necessary for settling such claims by underwriters and shall also provide information and assistance necessary to settle the claim. The CONTRACTOR shall also keep OWNER fully informed about progress of each such case.
- 28.11 All charges on account of insurance shall be included in TOTAL LSTK PRICE/TOTAL CONTRACT PRICE.
- 29.0 Deleted

#### 30.0 LIABILITY FOR ACCIDENTS AND DAMAGES

30.1 Under the CONTRACT, the CONTRACTOR shall be responsible for loss or damage to the PLANT and provide new equipment and machineries in lieu of equipment/machineries lost/damaged beyond repairs, free of cost until the PLANT is handed over after successful completion of performance guarantee test run.

Notwithstanding the provisions in the CONTRACT, the CONTRACTOR shall not be responsible for any loss or damage to the PLANT or any part thereof if and to the extent that such loss or damage is not covered by insurance coverage such as War risk, provided the same is general exclusion of the policy of the EAR insurance. War Risks shall mean any of the following events occurring within India:

War, hostilities, warlike operations (whether a state of war be declared or not), invasion, act of foreign enemy, civil war, rebellion, terrorism, revolution, insurrection, mutiny, usurpation of civil or military government, conspiracy, riot, civil commotion, mine, bomb, shell, grenade or other projectile, missile, munitions or explosive of war.

The CONTRACTOR shall indemnify the OWNER in respect of all damage or injury to any person or to any property (other than property forming part of the Work) and against all actions, suits, claims, demands, costs, charges and expenses arising in connection therewith which shall have been occasioned by the negligence of the CONTRACTOR or any SUB-CONTRACTOR, or by defective design (other than a design made, furnished or specified by the OWNER and which the CONTRACTOR has disclaimed responsibility in writing within a reasonable time after receipt of the OWNER's instructions) material or workmanship, any breach of the CONTRACTOR's obligations.

#### 31.0 Deleted



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32.0 Deleted

#### 33.0 TIME EXTENSION OF CONTRACT

- 33.1 The CONTRACTOR shall promptly notify the ENGINEER-IN-CHARGE any event or conditions which might delay the completion of erection work in accordance with the approved schedule and the steps being taken to remedy such situation.
- If the Work is delayed at any time in the commencement or during the progress of the WORK by any act, delay or neglect solely attributable to OWNER or his employees, or by any other contractor utilised by the OWNER or by FORCE MAJEURE conditions, the time of completion shall be extended by OWNER (without levy of Mutually Agreed Damages) in writing for a reasonable period as may be mutually agreed upon, at the time of closure of contract. The CONTRACTOR shall, immediately on occurrence of such special circumstances but not later than 14 working days, bring to the knowledge of OWNER through written application for any such delay as mentioned above.
- 33.3 OWNER shall have the right to suspend the WORK in whole or in part for such time as may be necessary in order that WORKS shall be well and properly executed. In such events, suitable extension of time shall be granted to CONTRACTOR. However, should the cumulative period of suspension exceed 45 days during the scheduled duration of CONTRACT, the CONTRACTOR shall be compensated as mutually agreed in addition to extension of time, provided the suspension is caused due to reasons not attributable to CONTRACTOR.

#### 34.0 TERMINATION OF CONTRACT

#### 34.1 Termination due to Legal Incapacity

If the CONTRACTOR goes into liquidation or has an administrator order made against him or carries on his business or any part of it under an administrator or receiver or manager for the benefit of the creditors or any of them, without prejudice to any other rights or remedies, the OWNER may forthwith by notice in writing terminate the CONTRACT.

#### 34.2 Termination due to Default by CONTRACTOR

- 34.2.1 If the CONTRACTOR is in default in that he:
  - (a) Neglects to execute the work or part of the work; or
  - (b) without reasonable cause, suspends or abandons the carrying out the works, either partly or wholly, before their completion; or
  - (c) Fails to proceed regularly and diligently with the works; or
  - (d) Defaults in the performance or observance of any conditions or terms of the CONTRACT or neglects to carry out any order, instruction, direction or determination which the OWNER is empowered to give or make under the CONTRACT and which is given or made in writing to the CONTRACTOR.

then, without prejudice to any other rights or remedies which the OWNER may possess, the OWNER may, by notice in writing (which shall specify with reasonable particularity the neglect, default or refusal on the part of the CONTRACTOR) require the CONTRACTOR:

- i) to put forward his proposals for
  - a) Rectifying such neglect, default or refusal as the case may be and
  - b) Commence and diligently pursue the rectification of the default.



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34.2.2 If within 30 days after the posting of the notice addressed to the CONTRACTOR, the CONTRACTOR fails to comply with the notice or if in the opinion of the OWNER, the CONTRACTOR's reasons or proposals are not satisfactory, then the OWNER, without prejudice to any other rights that he may have under the CONTRACT against the CONTRACTOR, may either:

- a) 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 OWNER on that behalf, whereupon the CONTRACTOR shall stop forthwith any of the CONTRACTOR's work then in progress, except such WORK as the OWNER may, in writing, require to be done to safeguard any property or WORK, or installations from damage, and the OWNER, 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 OWNER for any excess cost occasioned by such work having to be so taken over and completed by the OWNER over and above the cost at the rates specified in the schedule of quantities and rate/prices.
- b) WITHOUT DETERMINING THE CONTRACT, 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 OWNER 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 OWNER.

In such events of Clause 34.2.2 (a) or (b) above.

- (i) 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 OWNER to recover from the CONTRACTOR the excess cost referred to in the sub-clause aforesaid, the OWNER shall also have the right of taking possession and utilising 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.
- (ii) 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 OWNER 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 OWNER under the terms of the CONTRACT authorised or required to be reserved or retained by the OWNER.
- (iii) Before determining the CONTRACT as per Clause 34.2.2 (a) or (b) provided in the judgement of the OWNER, 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 OWNER may issue Notice in writing calling the CONTRACTOR to cure the default within such time specified in the Notice.
- (iv) The OWNER shall also have the right to proceed or take action as per 34.2.2 (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

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- voluntary liquidation, provided that in the said events it shall not be necessary for the OWNER to give any prior notice to the CONTRACTOR.
- (v) Termination of the CONTRACT as provided for in sub- clause 34.2.2(a) above shall not prejudice or affect their rights of the OWNER which may have accrued upto the date of such termination.
- In case of termination of CONTRACT herein set forth (under clause 34.2) 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 Limited (TFL) or any of it's JV partners against any type of tender nor their offer will be considered by TFL or any of it's JV partners against any ongoing tender (s) where contract between TFL/it's JV partners and that particular CONTRACTOR (as a bidder) has not been finalized],for a period of three years from the date of termination by TFL to such CONTRACTOR.

#### 34.3 **Duration of suspension of payment due to CONTRACTOR:**

Owner shall have right to suspend making any payments to the contractor for the portion of WORK having a bearing with CONTRACTOR's default during the period of rectification of the defaults.

#### 34.4 Work taken out of the hands of the CONTRACTOR

#### 34.4.1 Employment of other contractors:

If the OWNER takes action under sub-clause 34.2.2, he may complete the work or any part of it by contracting with or employing any other contractor to execute further and complete work or any part of it and to provide all equipment, materials and labour as may be necessary for such further execution and completion. If practicable the further execution and completion shall be carried out in accordance with the specification and at prices obtained under competitive conditions.

The OWNER may also take possession of and permit such person or persons to use for the purposes of the CONTRACT only such materials, tools and equipment and all other things on or about the SITE which are the property of the CONTRACTOR as are requisite and necessary for such further execution and completion, and the CONTRACTOR shall have no right to any compensation or allowance in respect thereof.

On the completion of such work, all tools and equipment and the surplus of the materials so taken possession of shall be handed over to the CONTRACTOR but without payment or allowance for the fair wear and tear they may have sustained in the meantime, provided that if there by a deficiency as referred to in sub clause 34.4.2 of this clause, and if the CONTRACTOR fails to make good such deficiency such of the tools, equipment and materials as are necessary to make good the deficiency may be sold and a sufficient part of the monies received retained by the OWNER and applied in payment of such deficiency.

#### In addition the OWNER shall be entitled:

 To take possession of and remove from the CONTRACTOR's premises within a reasonable period anything (including but without limiting the generality thereof any design, drawings, specification, material or other goods) the property which is vested in the OWNER pursuant to the CONTRACT;

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- b) To full particulars of any sub-contract made by the CONTRACTOR with any person for the execution of any portion of the WORKS and to peruse and copy any instrument (including but without limiting the generality thereof any agreement, letter or other paper) relating to any such SUB-CONTRACT made by the CONTRACTOR with any person for the execution of any portion of the WORKS.
- c) To pursue and copy any standard working drawing or other drawing or data necessary in the opinion of the OWNER for completion of the WORKS and the property which is not vested to the OWNER pursuant to the CONTRACT provided that the OWNER shall in no case make use of any copy made pursuant to sub paragraphs (b) or (c) hereof other than for the purpose of completing the WORKS and that on the fulfilment of the whole of the obligations of the CONTRACTOR under the CONTRACT the OWNER shall return to the CONTRACTOR any such copy.

The CONTRACTOR shall offer to the OWNER all rights of access and all reasonable facilities to enable the OWNER to remove any such thing or pursue or copy any such instrument, drawing or data and shall supply such particulars on request by the OWNER in that behalf.

For the purposes of sub-clause 34.4.2the cost incurred by the OWNER in and about for such removal, perusal or copying or obtaining such particulars shall be deemed to be part of the cost of carrying out that portion of the work taken out of the CONTRACTOR's hands.

#### 34.4.2 Extra cost to the OWNER of completing work for deduction:

On completing the terminated portion of WORK as provided under Article 34.4.1 the OWNER shall ascertain the reasonable and direct costs based on the documentary evidence of the cost incurred but such amount shall not include any extra cost due to departures from the specification unless such departures were necessitated by the CONTRACTOR's default. Should the amount so ascertained be greater than the CONTRACT PRICE which would have been paid to the CONTRACTOR, if the whole of the Work had been carried out by him, the difference between the two amounts shall be deducted from any monies which may then be or thereafter become due to the CONTRACTOR or which may have been deposited by him as security under the CONTRACT, and if such monies be less than the amounts to be deducted the deficiency shall be paid by the CONTRACTOR to the OWNER and which may be recovered as provided in sub clause 34.4.1 of this clause or by way of arbitration, jurisdiction or both, such payment of excess amount shall be independent of penalty for delay if the completion of work is delayed.

#### 34.5 **Preservation of rights of the OWNER**

No action taken by the OWNER under sub clause 34.3 and 34.4 of this clause shall vitiate the CONTRACT or shall operate to the prejudice of the right of the OWNER to recover from the CONTRACTOR or to deduct from any monies which may be or may become due to the CONTRACTOR all sums of money which may be or may become due to the OWNER under the CONTRACT as damages, penalties or otherwise.

34.6 Should the OWNER decide to terminate the CONTRACT under sub clause 34.2.2(b) of this clause, he may do so under notice in writing as from the date of such notice, and

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the termination shall be without prejudice to any right that may have occurred to the OWNER or to the CONTRACTOR under the CONTRACT.

#### 34.7 Termination of Contract on Account of OWNER's Convenience

- 34.7.1 The OWNER, may, by 30 days written notice send to the CONTRACTOR, terminate the CONTRACT, in whole or in part, at any time for his convenience. The notice of termination shall specify that termination is for the OWNER's convenience, the extent to which performance of work under the CONTRACT is terminated and the date upon which such termination becomes effective.
- 34.7.2. Upon receipt of the notice of termination under GCC Clause 34.7.1, the CONTRACTOR shall either immediately or upon the date specified in the notice of termination.
  - (a) cease all further work, except for such work as the OWNER may specify in the notice of termination for the sole purpose of protecting that part of the Facilities already executed, or any work required to leave the Site in a clean and safe condition.
  - (b) terminate all subcontracts, except those to be assigned to the OWNER pursuant to paragraph (d)(ii) below.
  - (c) remove all CONTRACTOR's Equipment from the Site, repatriate the CONTRACTOR's and its SUB-CONTRACTORs' personnel from the Site, remove from the Site any wreckage, rubbish and debris of any kind, and leave the whole of the Site in a clean and safe condition.
  - (d) In addition, the CONTRACTOR, subject to the payment specified in GCC Clause 34.7.2.1, shall
    - (i) deliver to the OWNER the parts of the PLANT executed by the CONTRACTOR up to the date of Termination.
    - (ii) to the extent legally possible, assign to the OWNER all right, title and benefit of the CONTRACTOR to the PLANT and Equipment as at the date of termination, and, as may be required by the OWNER, in any subcontracts concluded between the CONTRACTOR and its SUB-CONTRACTORs.
    - (iii) deliver to the OWNER all non-proprietary drawings, specifications and other documents prepared by the CONTRACTOR or its Sub-CONTRACTORs as at the date of termination in connection with the PLANT.
- 34.7.2.1 In the event of termination of the Contract under GCC Clause 34.7.1, the OWNER shall pay to the CONTRACTOR the following amounts:
  - (a) the Contract Price, properly attributable to the parts of the PLANT executed by the CONTRACTOR as of the date of termination
  - (b) the costs reasonably incurred by the CONTRACTOR in the removal of the CONTRACTOR's Equipment from the Site and in the repatriation of the CONTRACTOR's and its SUB-CONTRACTOR's personnel

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- (c) any amounts to be paid by the CONTRACTOR to its SUB-CONTRACTORs or Vendors in connection with the termination of any subcontracts or supply agreement, including any cancellation charges
- (d) costs incurred by the CONTRACTOR in protecting the PLANT and leaving the Site in a clean and safe condition pursuant to paragraph (a) of GCC Clause 34.7.2

#### 34.7.3 **Termination for Insolvency**

OWNER may at any time terminate CONTRACT giving written notice to CONTRACTOR, if CONTRACTOR becomes bankrupt or otherwise insolvent, provided that such termination will not prejudice or affect any right of action or remedy which has occurred or will accrue thereafter to OWNER.

If the Contract is terminated under GCC Sub-Clauses 34.7.3, the OWNER shall pay to the CONTRACTOR all payments specified in GCC Sub-Clause 34.7.2 as reasonable compensation for all loss or damage sustained by the CONTRACTOR arising out of, in connection with or in consequence of such termination.

#### 34.7.4 Termination by CONTRACTOR due to default of OWNER

If the OWNER has failed to pay the CONTRACTOR any sum due under the Contract within the specified period or commits a substantial breach of the CONTRACT, the CONTRACTOR may give a notice to the OWNER that requires payment of such sum or specifies the breach and requires the OWNER to remedy the same, as the case may be. If the OWNER fails to pay such sum or fails to remedy the breach or take steps to remedy the breach within thirty (30) days after receipt of the CONTRACTOR's notice then the CONTRACTOR may give a notice to the OWNER thereof, and if the OWNER has failed to pay the outstanding sum or to remedy the breach within thirty (30) days of such notice, the CONTRACTOR may by a further notice to the OWNER, terminate the CONTRACT.

If the CONTRACT is terminated under GCC Clause 34.7.4, the OWNER shall pay to the CONTRACTOR all payments specified in GCC Clause 34.7.2 as reasonable compensation for all loss or damage sustained by the CONTRACTOR arising out of, in connection with or in consequence of such termination.

#### 34.8 **Surviving Obligations**

Termination of this CONTRACT (a) shall not relieve CONTRACTOR of its obligations with respect to the confidentiality as set forth in this CONTRACT, (b) shall not relieve CONTRACTOR of any obligation hereunder which expressly or by implication survives termination hereof, and (c) except as otherwise provided in any provision of this CONTRACT expressly limiting the liability of CONTRACTOR, shall not relieve CONTRACTOR of any obligations or liabilities for loss or damage to the other Party arising out of or caused by acts or omissions of CONTRACTOR prior to the effectiveness of such termination or arising out of such termination, and shall not relieve CONTRACTOR of its obligations as to portions of SERVICES already performed or of obligations assumed by CONTRACTOR prior to the date of termination, except as otherwise agreed by OWNER in writing.

34.8.1 Termination of this CONTRACT (a) shall not relieve OWNER of its obligations with respect to the confidentiality as set forth in this CONTRACT, (b) shall not relieve OWNER of any obligation hereunder which expressly or by implication survives termination hereof, and (c) shall not relieve OWNER of any obligations or liabilities for loss or damage to the other Party arising out of or caused by acts or omissions of OWNER prior to the effectiveness of such termination or arising out of such termination.

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#### 35.0 **FORCE MAJEURE**

35.1 CONDITIONS FOR FORCE MAJEURE: 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 Majeure shall upon notification to the other party be suspended for the period during which Force Majeure conditions lasts. The cost and loss sustained by the either party shall be borne by the respective parties. The term "Force Majeure" 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 OWNER 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 120 (one hundred and twenty) 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 Majeure shall then stand extended by the period for which such conditions lasts..

#### **OUTBREAK OF WAR**

- (i) 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 OWNER shall be entitled, at any time after such outbreak 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.
- (ii) 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
- If the CONTRACTOR suffers delay in the due execution of the contractual obligations due to delays caused by Force Majeure as defined above, the agreed time of completion of job covered by this CONTRACT or the obligation of the CONTRACTOR shall be extended by a period of time on account of force majeure conditions, provided that on the occurrence of any such contingency, the CONTRACTOR within120 hours reports to the OWNER in writing, the cause of delay and likely duration of cause of delay with requisite documentary evidence.
- 35.3 If the works to be executed by the CONTRACTOR are suspended by Force Majeure conditions lasting for more than 2 (two) months, the OWNER shall have the option to terminate the CONTRACT or re-negotiate the contract provisions.



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- 35.4 CONTRACTOR and OWNER shall endeavour to prevent, overcome or remove the causes of FORCE MAJEURE.
- No ground for exemption can be invoked if CONTRACTOR has failed to give timely notice by registered letter/ Speed-Post/Courier/Email/Hand Delivery and subsequently supported it by documentary evidence.
- 35.6 Delay or non-performance by a party hereto caused by the occurrence of any event of FORCE MAJEURE shall not:
  - (a) Constitute a default or breach of the CONTRACT,

Or

- (b) Give rise to any claim for damages or additional cost or expense occasioned thereby, if such delay or non-performance is caused by the occurrence of any event of FORCE MAJEURE. FORCE MAJEURE conditions are not payable under any circumstances.
- 35.7 Force Majeure is no one's fault, therefore each party should bear its own cost and a provision to terminate the CONTRACT in case of Force Majeure extending beyond six (06) months is provided. Should OWNER wish the CONTRACTOR to continue further, both parties may sit together and mutually agree on the future course failing which Parties will have the right to terminate. Such termination shall not be considered as Termination for Owner's Convenience. However, outstanding invoices, payment for supplies made and payment to the work already performed will be paid by OWNER on such termination.

Contractor shall have the right to take action to mitigate the impact of the prolonged Force Majeure event in mutual consent with Owner. For instance, Contractor shall have the right to demobilize Contractor's equipment and personnel from the Plant.

#### 36.0 NO WAIVER OF RIGHTS

Neither the inspection by the OWNER or any of their officials, employees, or agents nor any order by the OWNER for payment of money or any payment for or acceptance of, the whole or any part of the WORKS by the OWNER nor any extension of time, nor any possession taken by the OWNER shall operate as a waiver of any provision of the CONTRACT, or of any power herein reserved to the owner 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.

### 37.0 BANKRUPTCY AND LIQUIDATION OF CONTRACTOR OR BUSINESS UNDER RECEIVERSHIP

If the CONTRACTOR becomes insolvent or bankrupt, or has a receiving order made against him, or 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 reconstruction or carry on his business under a receiver for the benefit of his credit, the CONTRACTOR shall within fourteen (14) days notify the OWNER accordingly. On the occurrence of any of the happenings stated in the first sentence of this clause, the OWNER shall be at liberty to:

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- a) Determine the CONTRACT forthwith by notice in writing to the CONTRACTOR
  or to the receiver or liquidator or to any person in whom the CONTRACT may
  have become vested, and act in the manner provided in clause 34.1
  (proceedings or default) or,
- b) Give to such receiver liquidator or other person in writing the option for a period of one month of carrying out the WORK subject to his providing a guarantee for the due and faithful performance of the CONTRACT upto the CONTRACT value of the work for the time being remaining unexecuted and subject to his taking all reasonable steps to prevent stoppage of the work. In the event of stoppage of the work, the period of the option under this clause shall be fourteen (14) days only.

### 38.0 CERTIFICATE NOT TO AFFECT RIGHT OF OWNER AND LIABILITY OF CONTRACTOR

No interim payment certificate of the OWNER nor any sum paid on account by the OWNER nor any extension of time for execution of the WORKS granted by the OWNER shall affect or prejudice the rights of the OWNER 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 furnished and no certificate shall create liability on the OWNER to pay for alterations, amendments, variations, or additional works not ordered, in writing, by the OWNER or discharge the liability of the CONTRACTOR for the payment of damages whether due certified or not or any sum against the payment of which he is bound to indemnify the OWNER and the Consultant nor shall any such certificate nor the acceptance by him of any sum paid on account or otherwise affect or prejudice the rights of the CONTRACTOR against the OWNER.

#### 39.0 SETTLEMENT OF DISPUTES

- 39.1 Except as otherwise specifically provided in the CONTRACT, all disputes concerning questions of fact arising under the CONTRACT shall be considered by the OWNER subject to a written appeal by CONTRACTOR to the OWNER.
- Any disputes or differences including those considered as such by only of the parties arising out of or in connection with the CONTRACT shall be to be extent possible settled amicably between the parties.
- 39.3 If, after 60DAYs from the commencement of such informal negotiations, OWNER and CONTRACTOR are unable to resolve amicably the dispute, either party may require that the dispute be referred for resolution to the arbitration as described under clause 40 below.

#### 40.0 ARBITRATION

- 40.1 Refer clause no. 45 of Section-III of NIT.
- **40.2** Continuation of Work and payments during Arbitration

WORK shall be continued by CONTRACTOR during the arbitration proceedings unless the matter itself is the subject of Arbitration or unless the matter itself is such that WORK cannot practically be continued until the decision of the arbitrator is obtained and CONTRACTOR shall remain liable and bound in all respects under the Contract. Except as otherwise expressly provided in CONTRACT, no payment due and payable by

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OWNER shall be withheld on account of such arbitration proceedings unless it is the subject matter or one of the subject matters.

#### 41.0 GOVERNING LAWS, LANGUAGE AND MEASURES

- 41.1 CONTRACT shall be governed and construed according to the Indian Law as in force and shall be subject to the jurisdiction of the Court in Delhi.All disputes arising during the execution of the CONTRACT shall be resolved as per Clause no. 39.0 (Settlement of Dispute) & 40.0 (Arbitration) of GCC and thereafter in accordance with said law.
- The governing language for all communication, notices, Technical Information, etc. pertaining to CONTRACT shall be English. Any literature, correspondence, documents, etc., shall be considered only if its accompanied by English translation. For the purpose of interpretation English translation shall govern and be binding on all parties.
- 41.3 The metric system of measurement shall be used exclusively in the CONTRACT.

#### 42.0 RELEASE OF INFORMATION

The CONTRACTOR shall not communicate or use in advertising, publicity, sales releases or in any other medium, photographs or other reproduction of the WORKS under this CONTRACT or descriptions of the SITE, dimensions, quantity, quality or other information, concerning the work unless prior written permission has been obtained from the OWNER. Notwithstanding the above, CONTRACTOR is entitled, under intimation to OWNER, to make such public Announcements, as it may be bound to in compliance with the Law, the Rules and any Governmental Agency or Stock Exchange Regulation the CONTRACTOR is subjected to.

#### 43.0 COMPLETION OF CONTRACT

Unless otherwise terminated under the provisions of any other relevant clause, this CONTRACT shall be deemed to have been completed at the expiry of the DEFECT LIABILITY PERIOD.

#### 44.0 ENFORCEMENT OF TERMS

The failure of either party to enforce at any time any of the provisions of this CONTRACT or any rights in respect thereto or to exercise any option herein provided, shall in no way be construed to be a waiver of such provisions, rights or options or in any way affect the validity of the CONTRACT. The exercise by either party of any of its rights herein shall not preclude or prejudice either party from exercising the same or any other right provided in the contract.

#### 45.0 OWNER'S DECISION

- In respect of all matters which are left to the decision of the OWNER/ENGINEER-IN-CHARGE including the granting or withholding of the certificates, the OWNER/ENGINEER-IN-CHARGE shall, if required to do so, by the CONTRACTOR, give in writing a decision thereon.
- In each case involving a financial commitment, the written APPROVAL of the owner alone shall be binding.

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In matters of difference of opinion on a decision passed by the OWNER/ENGINEER-IN-CHARGE to the CONTRACTOR, stipulations of Clause 39.0 of GCC shall govern.

#### 46.0 CO-OPERATION

#### 46.1 **CO-OPERATION WITH OWNER**

The CONTRACTOR and OWNER shall co-operate with each other in the discharge of their respective obligation under the CONTRACT with the aim of satisfactory completing the PLANT and the WORKS in accordance with the CONTRACT.

- The parties shall deal fairly, openly and in good faith with each other. Subject to Clause 53 (Secrecy) of GCC, each party shall disclose information which the other might reasonably need in order to exercise its rights and to perform its obligations under the CONTRACT. In particular, each party shall promptly disclose full information to the other concerning any matter which will or may prevent the Plant and Works being completed in accordance with the CONTRACT. The parties shall work together in a manner consistent with their respective obligations under the CONTRACT to resolve or mitigate any such problem.
- 46.1.2 OWNER shall be at liberty to object with reasonably valid reasons to employment of any person at SITE and the objection shall be communicated in writing and CONTRACTOR shall make immediate arrangements for removal of such person.

#### 46.2 COOPERATION WITH OTHER CONTRACTORS

The CONTRACTOR shall not object to the execution of the work by other contractors or tradesmen engaged by OWNER and offer them every facility for the execution of their several works simultaneously with CONTRACTOR's work, provided however that CONTRACTOR'S WORK is not hampered by such co-operation. CONTRACTOR shall at all times provide sufficient fencing, notice boards, lighting and watchmen to protect and warn the public and guard the works and in default thereof, OWNER may provide such facilities at CONTRACTOR's cost, if such failure is attributable to CONTRACTOR.

The CONTRACTOR shall agree cooperate **OWNER** to with the OTHERCONTRACTORs and exchange with them such technical information, provided that such CONTRACTOR is bound towards CONTRACTOR on confidentiality and limited use obligations not less stringent than those accepted by OWNER under the CONTRACT and shall not be a competitor of CONTRACTOR as is necessary to obtain the most efficient and economical design and to avoid unnecessary duplication of efforts. The OWNER shall be provided with three (3) copies of all correspondence addressed by the CONTRACTOR to other SUB-CONTRACTORS in respect of such exchange of technical information.

#### 47.0 SUSPENSION OF WORKS

(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

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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 ONTRACTOR 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.

### 48.0 REPLACEMENT OF PARTS AND MATERIALS (DEFECTIVE/DAMAGED/LOST DURING TRANSIT/ERECTION AND COMMISSIONING)

- 48.1 If during the progress of the WORK, the OWNER shall decide and inform in writing to the CONTRACTOR that the CONTRACTOR has manufactured any plant or part of the plant in an unsound or imperfect manner or has furnished any plant inferior to the quality specified, the CONTRACTOR on receiving details of such defects or deficiencies shall at his own expense, within seven (7) days of his receiving the notice or otherwise within such time as may be reasonably necessary for making it good, proceed to alter, reconstruct or remove such work and furnish fresh equipment upto the standards of the specifications. In case the CONTRACTOR fails to do so, the OWNER may, on giving the CONTRACTOR seven (7) days notice in writing of his intentions to do so, proceed to remove the portion of the works so complained of and at the risk &cost of the CONTRACTOR, perform all such work or furnish all such equipment provided that nothing in this clause shall be deemed to deprive the OWNER of or affect any rights under the CONTRACT which the OWNER may otherwise have in respect of such defects and deficiencies.
- The CONTRACTOR's full and extreme liability under this clause shall be satisfied by the payments to the OWNER of the extra cost, of such replacement procured including erection as provided for in the CONTRACT, such extra cost being the ascertained difference between the price paid by the OWNER for such replacements and the CONTRACT price portion for such defective plants and repayments of any sum/ paid by the OWNER to the CONTRACTOR in respect of such defective plant.
- 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 delays and without waiting for realisation of cost of damages from the insurance company, appointed by him for this purpose. This will not alter the time schedule in any way.

#### 49.0 DEFENCE OF SUITS

49.1 If any action in Court is brought against the OWNER or an officer or agent of the OWNER for the failure omission or neglect on the part of the CONTRACTOR to perform any acts, matters, covenants or things under the CONTRACT, or for damage or injury caused by the alleged omission or negligence on the part of the CONTRACTOR, his agents representatives or his SUB-CONTRACTORS or in connection with any claim based on lawful demands of SUB-CONTRACTORs, workmen, suppliers or employees, the CONTRACTOR shall in all such cases indemnify and keep the owner and/ or his

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representative harmless from all losses damages, expenses or decrees arising out of such action.

49.2 If any action in court referred to in Clause 49.1 of GCC above is brought against OWNER or an officer or agent of OWNER, OWNER shall promptly give the CONTRACTOR notice thereof and CONTRACTOR may at its own expense and in OWNER's name, conduct such proceedings or claim for the settlement of any such proceedings or claim. If CONTRACTOR fails to notify OWNER within twenty-eight (28) days after receipt of such notice that it intends to conduct any such proceedings or claim, then the OWNER shall have full power and right at his discretion to defend or comprise any suit or pay claim or demand brought or made against him as aforesaid whether pending or threatened as he may consider necessary or desirable and shall be entitled to recover from the CONTRACTOR all sums of money including the amount of damages and compensation and all legal costs, charges and expenses in connection with any compromise or award which shall not be called into question by the CONTRACTOR and shall be final and binding upon him provided however that, unless CONTRACTOR has so failed to notify OWNER within the twenty-eight (28) days period, OWNER shall make no admission which may be prejudicial to the defence of any such proceedings or claim.

#### 50.0 CONTRACTOR'S RESPONSIBILITIES

- In consideration of payment by the OWNER, the CONTRACTOR shall regularly and diligently carry out and complete the WORKS in accordance with the CONTRACT.
- All work carried out by the CONTRACTOR shall be carried out with sound workmanship and materials, safety and in accordance with the Contract requirements.
- 50.3 The CONTRACTOR shall set out the PLANT by reference to points, lines and levels of reference as defined in the approved SPECIFICATION.
- The PLANT/WORKS as completed by the CONTRACTOR shall in every respect comply with the requirements defined in the Specification or any other provision of the CONTRACT.
- If at any time during the performance of the CONTRACT, the CONTRACTOR is of the opinion that a change to the WORKS or the design or method of operation of the PLANT
  - a. is necessary to eliminate a potential defect in the PLANT or a specific hazard to any person or party in the performance of the WORKS or in the operation of the PLANT which has occurred or would otherwise occur' or
  - b. would improve operating or life cycle costs of the PLANT; or
  - c. would otherwise be beneficial to the OWNER:

the CONTRACTOR shall bring the matter to the attention of the ENGINEER-IN-CHARGE stating the reasons for his opinion and where appropriate, submit his proposals for a Variation in accordance with Clause 3 of SPECIAL CONDITIONSOF CONTRACT.

50.6 The CONTRACTOR shall at all times have and maintain adequate resources available for the proper and timely execution of the WORKS, including financial resources, and

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competent, appropriately experienced and physically capable staff and labour whether employed by the CONTRACTOR, any SUB-CONTRACTOR or third parties.

50.7 The CONTRACTOR shall provide and maintain records as specified in the CONTRACT.

Unless otherwise agreed, the CONTRACTOR shall, at intervals of not more than one calendar month, report to the ENGINEER-IN-CHARGE on the progress of the WORKS, supporting his reports with appropriate documentation including any revisions to the approved programme.

The CONTRACTOR shall maintain and cause SUB-CONTRACTORs to maintain, a quality assurance system as specified in the CONTRACT. The existence of such a quality assurance system shall not relieve the CONTRACTOR from any of his other duties, obligations or liabilities under the CONTRACT. The CONTRACTOR shall also prepare and implement a validation plan, if such a requirement is specified in the CONTRACT.

#### 51.0 PROGRESS REPORTS AND PHOTOGRAPHS

- The CONTRACTOR shall furnish soft copy of progress photographs of the work done in his shop/site. Photographs shall be taken when and where indicated by the ENGINEER-IN-CHARGE. Photographs, if required shall be approximately 8 inches by 10 inches in size, including a margin on one 10 inch side for binding. Each photograph shall contain the date, the name of the CONTRACTOR and the title of the view taken. (technical to check, whether to be shifted to SCC)
- Required number of monthly progress reports, in prescribed proforma, shall be submitted by the CONTRACTOR to the ENGINEER-IN-CHARGE for review. These shall detail the status of design, procurement of raw materials and bought outs, approval of the CONTRACTOR's drawings, manufacture of the equipment, statutory approvals taken, inspection of equipment/material, completed despatches, materials received at site, damages, if any, during transit, actions taken or replacement of damaged equipment, progress of erection work and programme of work for succeeding month and statement showing position of payment.

#### 52.0 **DELETED**

#### 53.0 **SECRECY**

The technical information, drawings, specifications and other related documents forming part of the NIT or the CONTRACT or such of those materials prepared during the execution of the project including photographs, micro-films, design, calculations etc. are the property of the OWNER and shall not be used for any other purpose, except for execution of contract. All rights, including rights in the event of grant of a patent and registration of designs are reserved. The technical information, drawings, specifications, records and other documents shall not be copied, transcribed, traced or reproduced in any other form or otherwise in whole and/or duplicated, modified, divulged and/or disclosed to a third party nor misused in any other form whatsoever, without the OWNER's previous consent in writing except to the extent required for the execution of this CONTRACT. Such technical information, drawings specifications and other related documents furnished shall be returned to the OWNER with all approved copies and duplicates, if any, immediately after they have been used for the agreed purposes.



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For avoidance of any doubt it may be clarified that this clause relate to documents prepared by OWNER or is a property of OWNER.

In the event of any breach of this provision, the CONTRACTOR shall indemnify the OWNER from any loss, cost or damage or any other claim whatsoever from any parties claiming from or through them in respect of such breach.

All intellectual property rights in documents and calculations prepared by CONTRACTOR shall at all times exclusively vest with CONTRACTOR and be used by OWNER in accordance with the CONTRACT.

#### 53.2 Records of Contract Documents

- 53.2.1 The CONTRACTOR shall at all times make and keep sufficient copies of the DRAWINGS, Specifications and CONTRACT documents for him to fulfil his duties under the CONTRACT.
- The CONTRACTOR shall keep at site atleast three copies of each and every Drawing, Specification and CONTRACT document and these copies shall be available at all times for use by the OWNER and EIC and by any other person authorized by the OWNER who needs to know about the PROJECT.

#### 54.0 CORRESPONDENCE

- All correspondences from the CONTRACTOR to the OWNER shall be as per the correspondence distribution schedule. All communications including clarifications and/or comments shall be addressed to OWNER/PMC and shall always bear reference of DLOA No.
- 54.2 Any notice to the CONTRACTOR under the terms of the CONTRACT shall be served by registered e-mail, Speed Post or courier.
- 54.3 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.
- A notice shall be effective when delivered or on date of the notice, whichever is later.

#### 55.0 MATERIALS AND EQUIPMENT

#### 55.1 Materials

55.1.1 CONTRACTOR shall supply all materials required for incorporation in the works, within the scope of work, necessary to establish, commission and operate the PLANT.

#### 55.1.2 **INVOICES**

CONTRACTOR's invoices shall be raised as per approved Billing Schedule.



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- (a) The CONTRACTOR's invoice shall be in the format with all the requisite information as prescribed under GST Laws.
- (b) Before raising GST invoices, CONTRACTOR shall coordinate with the OWNER with respect to address and GSTIN number on which such invoices have to be raised
- 55.1.3 The CONTRACTOR shall be responsible at his own cost and initiative within the scope of WORK, to take delivery of the materials from the port of delivery in India in respect of imported materials and from the factory or ware-house or other place(s) of delivery in respect of indigenous materials and to transport these to the CONTRACTOR's stockpiles, godowns or other places of storage approved by the ENGINEER-IN-CHARGE, and to transport the same from said godowns or place(s) of storage to the work site for installation in the permanent WORKS.
- 55.1.4 The work of delivery and transportation of materials shall include (but not be limited to) the following:
  - i) Clearance of the goods through custom and port clearance including filling and/or filing of all custom manifests, bills of entry, and custom declarations and other documents as may be required for the clearance of the goods from customs or port authorities.
  - ii) Stevedoring, clearing, forwarding and handling services as required for clearing, forwarding and handling imported and indigenous materials and consignments including payment at CONTRACTOR's cost of any demurrage, wharfage, port charges, siding charges, retention charges, detention charges or other charges whatsoever and howsoever designated or levied by any railway, air-port, ship and/or other authorities for or in connection with the loading, unloading or detention of any materials or vessels or other means of transport beyond the free period or unloading, clearance, retention or detention or loading, as the case may be, provided by the relevant authority(ies) or carrier(s) in this behalf.
  - All works and operations necessary to lift and to remove the material from port, ware-house, 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.
  - iv) Supply, procurement, mobilization, and deployment of all labour thereof, equipment & machinery necessary for lifting, loading, handling, removing, transporting, unloading, stacking or securing the materials.
  - v) Transit and storage insurance of all materials for the full replacement value thereof delivered at site.
  - vi) All acts, deeds, matters or things required to fulfil all local, municipal and other statutory authorities with respect to the transportation of any materials through or into any State, municipal, local or other barriers or limits or for the import of the materials or any of them within the limits of such barrier, including payment of octroi or other local toll, terminal and/or entry or other taxes payable on the passage or entry of the materials through or within any local limits, for which purpose the OWNER shall give the CONTRACTOR and/or CONTRACTOR's designate(s) any and all authority(ies) as may be reasonably required in this behalf.
  - vii) All other acts, deeds, matters and things whatsoever ancillary, auxiliary or incidental to the above including but not limited to the grading of the site and/or creation of temporary approaches and ramps etc. as may be required.



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#### 55.2 **GENERAL PROVISION WITH REGARD TO MATERIALS**

- 55.2.1 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 55.1 and associated clauses thereunder in respect of materials:
  - The CONTRACTOR shall be taking delivery, ensure compliance of any condition applicable for delivery 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 thereof
  - 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 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).
  - 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, 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.
  - v) The CONTRACTOR shall take out, at his own cost and keep in force at all times, during transit, handling, storage and erection, till the period as defined in the SPECIAL CONDITIONS OF CONTRACT (SCC), all the Insurance policy(ies) with Insurance Company(ies) 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



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CONTRACTOR. In case of any 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 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.
  - Notwithstanding anything herein provided, the CONTRACTOR shall be and a) 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 anywise absolve the CONTRACTOR from his full liability up to and until expiry of Defect Liability Period defined in the contract. Further, as provided in respect of the works, the work(s) and all materials incorporated therein shall be and remain at the risk 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. The insurance policies for above risks shall constitute merely an additional security and not a substitution of liability.
  - It shall be the exclusive responsibility of the CONTRACTOR to lodge and pursue b) any or all claims in respect of the insurance covers as above.
  - 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.

#### 55.3.0 **BILL OF MATERIALS**

- 55.3.1 The CONTRACTOR shall furnish to the OWNER a detailed "Bill of Materials (BOM)" specifying the materials, which on preliminary determination made by CONTRACTOR, will be required to be incorporated in the permanent works in order to establish the WORK/ Unit and to operate the PLANT/Unit, including construction materials.
- 55.3.2 Each item entered in the Bill of Materials shall be priced. The Bill of Materials and said price break-up therein are intended only to form a basis for the purpose of calculating on account payments and for calculating payments due to the CONTRACTOR under Clause 34.0 of GCC upon cancellation of contract, and for no other purpose.
- The OWNER shall review or cause to be reviewed the prima facie adequacy, sufficiency, 55.3.3 validity and/or suitability of the materials listed in the Bill of Materials for the works for which they are intended and of the prices indicated in the Bill of Materials in respect thereof. Such review shall be performed in conjunction with the design, engineering, specification and other technical reviews to be done by the OWNER and all provisions applicable thereto with reference to critical drawings shall be applicable to the review of the Bill of Materials.



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The priced Bill of Materials shall constitute the Bill of Materials envisaged in the contract documents. However, the CONTRACTOR shall have full responsibility under the CONTRACT to sell and supply to the OWNER all materials required for the permanent incorporation in the works and which are required to establish, commission and operate the PLANT/ Unit in accordance with the CONTRACT and the specifications, complete in all respects including spares, tools, tackles and testing equipment, so far as included within the scope of supply, whether or not any particular material is actually included within or omitted in the Bill of Materials and whether or not the price thereof is included in the price indicated in the Bill of Materials and whether or not the price thereof is in conformity with the price thereof indicated in the Bill of Materials. The review and approval of the Bill of Materials and the prices therein are intended only for the satisfaction of the OWNER that the priced Bill of Materials, prima-facie covers the materials required to be supplied by the CONTRACTOR within the scope of supply.

#### 55.4 **SUPPLY OF MATERIALS**

- 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.
- 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.
- 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.
- 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 anywise 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.
- 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 recover the delay, but without prejudice to any other rights, discount or remedy available to the OWNER in respect of such delay or failure.

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#### 55.4.6 **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 ENGINEER-IN-CHARGE / 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/ENGINEER-IN-CHARGE's approval.

#### 55.5.0 CERTIFICATE OF VERIFICATION AND GOOD CONDITION

- 55.5.1 The CONTRACTOR shall, before supply of material covered within the scope of supply, at his own risks, costs and initiative, undertake or cause to be undertaken all tests, analysis and inspections as shall be required to be undertaken with regard to the materials under the specifications and any codes, practices, orders and instructions with respect thereto and shall cause the results thereof to be recorded, reported or certified, as the case may be, and shall not offer for delivery or deliver any material(s) which has/have not passed such tests/analysis or inspection and which are not accompanied by the tests results, reports and/or certificates in this behalf provided in the applicable specifications, code(s) and/or practices.
- On arrival of the material at site the CONTRACTOR shall give written notice thereof to the ENGINEER-IN-CHARGE or Inspection Agency notified by the OWNER in this behalf, to inspect the materials, and shall keep in readiness for inspection, the materials and the relevant tests results, reports and certificates hereto.
- Notwithstanding any other provisions in the contract documents for analysis or tests of materials and in addition thereto, the CONTRACTOR shall, if so required by the ENGINEER-IN-CHARGE or Inspection Agency in writing at his own risks and costs, analyse, test, prove and weigh all materials (including materials incorporated in the works) required to be analysed, tested, proved and/or weighed by the ENGINEER-IN-CHARGE or Inspection Agency in this behalf and shall have such analysis or tests conducted by the agency(ies), or authority(ies) if any specified by the ENGINEER-IN-CHARGE or Inspection Agency. The CONTRACTOR shall provide all equipment, labour, materials and other things whatsoever required for testing, preparation of the samples, measurement of work and/or proof of weighment of the materials as directed by the ENGINEER-IN-CHARGE or Inspection Agency.
- If on Inspection or proof, analysis or tests as aforesaid the ENGINEER-IN-CHARGE or Inspection Agency nominated by the OWNER in this behalf is prima facie satisfied that the material received is in conformity with the material requirements of the Bill of Materials and description given in the shipping documents and in the CONTRACTOR's invoices in this behalf and that the test reports/results/certificates given in respect thereof are prima facie in conformity with the relevant result/reports/certificates required in respect thereof in terms of the specifications and/or relevant codes and practices, and that the material appears to be prima facie in good order and condition, the ENGINEER-IN-CHARGE shall issue to CONTRACTOR, a Certificate of Verification and Good Condition in respect of such material, and this shall constitute the Certificate of Verification and Good Condition elsewhere envisaged in the CONTRACT documents. Should the ENGINEER-IN-CHARGE not issue said Certificate within 5 working days following the conformity of the aforementioned requirements, the Certificate of Verification and Good Condition shall be deemed issued.
- 55.5.5 Such certificate is only intended to satisfy the OWNER that prima facie the material supplied by the CONTRACTOR is in order and shall not anywise absolve the



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CONTRACTOR of his/its full responsibility under the CONTRACT in relation thereto, including in relation to,—fulfilment and/or performance of works or other guarantees envisaged in the CONTRACT.

55.5.6 Notwithstanding that any area(s) or source(s) has/have been suggested by the OWNER to the CONTRACTOR from which any material for incorporation in the WORKS can be obtained, the CONTRACTOR shall independently satisfy himself of the suitability, accessibility and sufficiency of the source(s) of supply suggested by the OWNER and suitability of the material available from such source(s) with the intent that any suggestion as aforesaid shall not anywise relieve the CONTRACTOR of his full liability in respect of the suitability and quality of the material(s) obtained from said source(s) and the CONTRACTOR shall obtain material(s) there from and incorporate the same within the permanent works entirely at his own risks and costs in all respects, with the intent that any such suggestion by the OWNER shall only be by way of assistance to the CONTRACTOR and shall not entail any legal responsibility or liability upon the OWNER.

#### 55.6.0 MATERIALS WITHIN THE CONTRACTOR'S SCOPE OF SUPPLY

The OWNER does not warrant or undertake the provisions of any materials and the CONTRACTOR shall not imply, by conduct, expression or assurance or by any other means, any promise or obligation on the part of the OWNER in his respect understood by the CONTRACTOR.

#### 55.7.0 **Deleted**

#### 55.8 PACKING AND FORWARDING

- The CONTRACTOR shall, wherever applicable, after proper painting, pack and crate all items in such a manner so as to protect them from deterioration and damage during rail and road transportation to the site and during storage at the site till the time of erection. Without prejudice to any other liabilities or obligations of the CONTRACTOR, the CONTRACTOR shall be responsible for all damage(s) due to improper packing.
- The CONTRACTOR shall notify OWNER/ ENGINEER-IN-CHARGE the expected date of arrival materials at the site for the information of OWNER/ ENGINEER-IN-CHARGE.
- The CONTRACTOR's notification shall also give all shipping information concerning the weight, size and content of each packing and such other information as the OWNER/ ENGINEER-IN-CHARGE EIC may require.
- The following documents shall be sent to the OWNER/ EIC in three copies:
- a) Signed Invoice(s)
- b) Delivery Challan
- c) Packing list.
- d) Manufacturer's certificate of inspection for shipment duly approved by the CONTRACTOR in one original and one photocopy
- e) Third Party Inspection Release Note clearly indicating that material has been inspected and accepted as per QAP approved by OWNER or TPI waiver certificate issued by OWNER.
- f) Railway Receipt/LR
- g) Intimation to Insurance Company for arranging Transit Insurance
- h) Guarantee certificate (wherever applicable)

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i) Operation & Maintenance manual (wherever applicable)

#### 55.9 Assembly Marks and Name Plates

- All component/parts of EQUIPMENT shall be indelibly hard marked with identification marks, comprising EQUIPMENT, part numbers, and CONTRACT number/PO number which shall also be shown on drawing to facilitate speedy identification, assembling or dismantling.
- On each EQUIPMENT, a nameplate indicating basic details, pressure rating, wherever applicable, code number of EQUIPMENT, electrical characteristics in case of electrical EQUIPMENT, name of instrument with tag no., manufacturer's name shall be fixed at proper place.
- For packages where marking is not possible at least two metallic nameplates must be affixed. Marking on the plates will be by means of engraving or indelible paint and will include the information listed above.

#### 55.10 **Despatch/Shipping notice**

CONTRACTOR shall notify OWNER by E-mail for its information the expected date of delivery of a consignment, date of readiness of EQUIPMENT for shipment, total gross weight and total volume with dimensions.

- 55.11 Heavy Lift Consignment (HLC) or Over Dimensional Consignments (ODC).
- 55.11.1 CONTRACTOR shall follow the guidelines of Ministry of Road transport and Highways (MORTH) India, for the shipping/transportation of all packages/consignments. The CONTRACTOR shall be responsible to comply with rules relating to E-way Bills and other related provisions under the GST laws for movement of packages/consignments.
- 55.11.2 CONTRACTOR shall make his own arrangements for movement of all consignments including ODC/HLC.
- CONTRACTOR confirms that it has surveyed the route for transportation of ODC/HLC items of EQUIPMENT and CONTRACTOR further confirms that it has included all cost of repairs of road, civil works, strengthening of bridges, culverts, widening of roads, etc. as required for transportation of ODC/HLC items of EQUIPMENT in its CONTRACT PRICE. OWNER shall not be responsible for repairs of road, civil works, strengthening of bridges, culverts, widening of roads, etc. as required for the transportation of ODC/HLC items of EQUIPMENT and shall not be liable to reimburse the cost of such repairs of road, civil works, strengthening of bridges, culverts, widening of roads, etc. to CONTRACTOR.

#### 55.12 **Marking**

- 55.12.1 CONTRACTOR shall mark the following on packing three sides i.e. two sides faced and cover (Top) EQUIPMENT with indelible paint in conspicuous printed letters not less than 5 cm. in size in English:
  - A. For Imported EQUIPMENT



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	a) CONTRACT /PO NO. : b) Equipment Description and Item Nos.:	
	c) Package : of	
	d) Gross / Net Weight (Kgs.) :	
	e) Dimension L x W x H cms. :	
	f) WARNING MARKS (FRAGILE, ATTENTION, TOP, KEEP DRY ETC.)	
	g) Forwarding No. :	
	h) Part shipment/full shipment/final shipment :	
	i) Each package shall bear a symbol contained in the package as follows:	
	'A' Storage in a closed storehouse.	
	'B' Storage under a shed.	
	'C' Storage in the open.	
55.12.2	Depending on the characteristics of the contents in the packages, the packages have to be marked with appropriate international marking ("HANDLE WITH CARE"; "THIS SIDE UP"; "SLING MARK"; ETC.) and other indications necessary for correct handling such as Centre of Gravity and points of slinging (in case of heavy loads).	
55.12.3	For packages where marking is not possible, at least two metallic nameplates must be affixed. Marking on the plates will be by means of engraving or indelible paint and will include the information listed above.	
55.12.4	All corners of the packages shall be painted with indelible 'Blue' paint at least 125 mm in depth for easy identification/location of the packages for clearance and handling at the port.	
55.13	Packing List	
55.13.1	CONTRACTOR will include in each package an item-wise packing List, Invoice No. and associated drawings.	
55.13.2	The packing list and any other documents shall be put in a closed polyethylene envelope and included in each package.	
55.13.3	A second copy of the packing list shall be placed in a polyethylene envelope on the outside of the each package by means of metallic plate marked "Documents". As regards columns, exchangers and similar equipment, the envelope shall be placed in a nozzle being identified by an arrow, in indelible paint, followed by the word "Document".	
55.13.4	Shipping documents must always be presented in the number of copies indicated in this CONTRACT.	

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#### 55.14 Shipping Arrangements and Forwarding of Documents

CONTRACTOR shall avoid the use of over aged vessels for the shipment of the imported EQUIPMENT under this CONTRACT and if so used, the cost of additional insurance, if any, shall be borne by CONTRACTOR.

- 55.15 **Despatch/Shipment Notice for Insurance.**
- 55.15.1 CONTRACTOR shall send intimations of despatches indicating items despatched, quantity, value, weight and carrier particulars directly through fax to the insurance company fixed by CONTRACTOR.
- 55.15.2 Insurance for transit risks and other risks shall be covered by CONTRACTOR.

#### 55.16 UTILITIES AND CONSUMABLES ETC.

Subject to any other provision to the contrary in the CONTRACT, the CONTRACTOR shall be and remain at all times exclusively responsible within the scope of work to provide all utilities, consumables, permits, licenses, easementsand facilities and other items and things whatsoever required for or in connection with the WORK, including but not limited to those indicated by expression or implication in the bid documents and/or other CONTRACT documents or howsoever otherwise as shall be or may from time to time be necessary for or in connection with the WORK.

#### 56.0 MEASUREMENTS, CERTIFYING INSPECTIONS AND PAYMENTS

#### 56.1 Final Measurements:

- Within 15 (fifteen) days from the date of certification of works completed /milestone achieved in respect of the WORKS or of any portion of the WORKS, section, group or job site, as the case may be, measurements for the works covered by such certification shall be jointly taken by the ENGINEER-IN-CHARGE and the CONTRACTOR as herein provided.
- If the CONTRACTOR fails to apply to the ENGINEER-IN-CHARGE for measurements within15 (fifteen) days from the date of certification of works completed/ milestone achieved as specified in Clause 56.1.1, the ENGINEER-IN-CHARGE shall notify the CONTRACTOR in writing of the date(s) for measurements, and require the CONTRACTOR to be present on date(s) so notified.

#### 56.2 Mode of Measurement

- All measurements shall be recorded in the metric system, and shall be taken in accordance with the procedures set forth or provided for in the Schedule of Rates, Specifications and other CONTRACT Documents.
- Where the mode of measurement is not provided for in the Contract Documents in respect of any item of work, it shall be measured in accordance with the Indian Standard Specification No. 1200 (latest edition) and in the event of such item not being covered by Indian Standard Specifications, it shall be measured in accordance with the method of measurement in this behalf specified by the ENGINEER-IN-CHARGE, whose decision in this regard shall be final and binding upon the CONTRACTOR. If the Contractor disagrees with the decision of the ENGINEER-IN-CHARGE, the dispute shall be settled as per the provisions of Clause 39.0 of GCC.



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- All measurements shall be taken jointly by the ENGINEER-IN-CHARGE and the CONTRACTOR or their respective representatives. The CONTRACTOR or his authorized representative shall be entitled to remain present at all times when joint measurements are being taken.
- Despite due intimation, if the CONTRACTOR omits or fails to be present to witness joint measurements, the measurements shall be taken in the presence of the ENGINEER-IN-CHARGE and the measurements so recorded and signed by the ENGINEER-IN-CHARGE as correct, shall be final and binding upon the Parties.
- 56.2.5 Except in cases covered by Clause 56.2.4, in all other cases measurements shall be signed and dated on each page by the CONTRACTOR / CONTRACT MANAGER and ENGINEER-IN-CHARGE or his representative. If the CONTRACTOR objects to any of the measurements recorded, including the mode of measurement, such objection shall be noted in the measurement book against the item objected to and such note shall be dated and authenticated by the CONTRACTOR / CONTRACT MANAGER and ENGINEER-IN-CHARGE or his representative. In the absence of any objection noted as aforesaid, the CONTRACTOR shall be deemed to have accepted the relative measurements as entered in the Measurement Book / Sheets and shall be barred from raising any objection at a later date in respect of any measurements recorded in the Measurement Book.
- All objections noted in the Measurement Book in terms of Clause 56.2.5 shall be considered and decided within 15 days by the ENGINEER-IN-CHARGE. The decision of the ENGINEER-IN-CHARGE relative thereto (whether on the correct measurement to be adopted or on the mode of measurement to be adopted)shall be final and binding upon the Parties. If the Contractor disagrees with the decision of the ENGINEER-IN-CHARGE, the dispute shall be settled as per the provisions of Clause 39.0 of GCC.
- 56.2.7 The measurement as finally recorded in terms of Clause 56.2.4 or Clause 56.2.5 or 56.2.6, as applicable, shall be the Final Measurement.

#### 56.3 CERTIFYING INSPECTIONS

All provisions referred to in Clauses 56.1 to 56.2, in respect of Mode of Measurement, shall apply to all inspections required to be made in order to qualify the CONTRACTOR for any payment(s) under the CONTRACT and any reference in the said clauses to measurements shall, for the purpose of this clause, be deemed to be a reference to certifying inspections and any reference therein to the measurement book shall, for the purpose of this clause, be deemed to be a reference to the certifying inspection book.

#### **56.4.0** Deleted

#### 56.5.0 PRICE SCHEDULE

- The remuneration determined due to the CONTRACTOR as provided for in Clause 56.4.1 hereof shall constitute the entirety of the remuneration and entitlement of the CONTRACTOR in respect of the WORK under the CONTRACT, and no further or other payment whatsoever shall be or become due or payable to the CONTRACTOR under the CONTRACT.
- Without prejudice to the generality of the provisions of Clause 56.5.1 hereof, the TOTAL LSTK PRICE shall be deemed to include and cover (unless otherwise expressly specified to the contrary in any CONTRACT document(s)):
  - (i) All costs, expenses, outgoings and liabilities of every nature and description whatsoever and all risks whatsoever (foreseen or unforeseen, including force majeure) to be taken or which may occur in or relative to execution, completion, testing, commissioning and/or handling over the WORKS to the OWNER and/or in or relative to acquisition, loading, unloading, transportation, storing, working

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upon, using, converting fabricating, or erecting any item, equipment, system, material or component in or relative to the WORKS, and the CONTRACTOR shall be deemed to have known the nature, scope, magnitude and the extent of the works and items, MATERIALS, EQUIPMENT, and components required for the proper and complete execution of the Works though the CONTRACT documents may not fully and precisely set out, describe or specify them, and the generality hereof shall not be deemed to be anywise limited, restricted or abridged because in certain cases the CONTRACT documents or any of them shall or may and/or in other cases they shall or may not expressly state that the CONTRACTOR shall do or perform any particular labour or service or because in certain cases the CONTRACT documents state that a particular work, operation, supply, labour or service shall be performed/made by the CONTRACTOR at his own cost or without additional payment, compensation or charge or without entitlement of claim against the OWNER or words to similar effect, and in other cases they do not, or because in certain cases it is stated that the same are included in or covered by the Price Schedule and in other cases it is not so stated.

- (ii) The cost of all construction and related vessels, craft, vehicles, movements, plant, equipment, distribution of water and power, construction of temporary roads and access, temporary works, pumps, wiring, pipes, scaffolding, piling, shuttering and other materials, supervision, labour, insurance, fuel, stores, spares, supplies, appliances and materials, items, articles and things whatsoever (foreseen of unforeseen) by expression or implication to be supplied, provided or arranged in or relative to or in connection with the performance and/or execution of the WORKS and/or related or incidental thereto, complete in every respect in accordance with the CONTRACT document, and the plans, drawing, designs, orders and/or instructions;
- (iii) The cost of mobilisation including but not limited to mobilisation of vehicles, movements, machinery, equipment, gear, tools, tackle, consumables and other items and goods and personnel necessary for or to perform the WORKS contemplated under the CONTRACT, preparation and erection of work yards and other work places and facilities necessary for or to perform the WORKS contemplated under the CONTRACT and/or to supply the material included within the scope of supplies including all work, labour, inputs, goods, EQUIPMENT, and other items and things whatsoever necessary for the performance of the WORKS, dismantling and/or removal of the same and restoration of the site, lifting the materials and transporting them to CONTRACTOR's stock piles/work yard, job sites and loading, stacking and/or storing the same.
- (iv) The costs and risks of all rents, royalties, licenses, permits, permission and other fees, duties, penalties, levies, and damages whatsoever payable for or in respect of any protected or patented goods, materials, equipment or processes employed in or relative to the works and of all rents, royalties, licenses, permits, permissions and any other fee, duty, penalty, levy, loss or damages payable on the excavation, removal or transportation of any material or acquisition or use of any right of way or other right, licenses, permit, privilege, permission or uses required for or relative to the performance of the WORK.
- (v) The cost of all taxes and duties within the scope of work, all customs and import duties, Indian Income Tax, applicable GST, quay, warfare, demurrage, detention and landing charges and all other duties, taxes, fees, charges, levies, and/or cesses whatsoever imposed or to be imposed by the Central Government or State Government or Municipal or Local Bodies or other Authorities whatsoever and payable on any materials supplied and/or on works performed without any

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entitlement to the CONTRACTOR for any exemption, remission, refund or reduction thereof

- (vi) The cost of all indemnities under the CONTRACT, and insurance premia on insurance required in terms of the CONTRACT documents or otherwise under any law, rule or regulation, and the cost of all risks whatsoever (foreseen and unforeseen) including but not limited to risks of delay or extension of time or reduction or increase in the work or scope of work and/or cancellation of CONTRACT, and/or accident, strike, civil commotion, war, strike, labour trouble, third party breach, fire, lighting, inclement weather, storm, tempest, flood, earthquake and other acts of God, Government regulation or imposition or restriction, dislocation of road, rail, sea, air and other transport, access or facility, flooding of site and/or access roads and approaches thereto, suspension of work, sabotage and other cause whatsoever.
- (vii) The cost of all inspections, tests and certificates relative thereto including third party tests and/or inspections where necessary, and of items, instruments, plant and/or tools and appliances required to conduct such inspection and tests.
- (viii) The cost of all materials supplied and/or intended for incorporation in the WORKS supplied within the scope of work, delivery thereof to the job site, loading, transportation and unloading thereof, waste on materials, and return of empties and surpluses.
- (ix) The cost of all escalations (foreseen and unforeseen) including but not limited to increase in Government taxes and duties (beyond contractual completion period and any extension hereof due to reasons attributable to CONTRACTOR), labor costs and material costs and other inputs whatsoever..
- (x) All supervision charges, establishment's overheads, finance charges and other costs and expenses and charges to the CONTRACTOR, and the CONTRACTOR's profit of and relative to the WORK and/or supply.
- (xi) The cost of all deductions, reductions, discounts, adjustments and withholdings whatsoever under or in connection with the CONTRACT.
- (xii) The cost 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 OWNER 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.

#### 56.6.0 **Deleted**

#### 56.7.0 **Deleted**

#### 56.8.0 CLAIMS BY THE CONTRACTOR

No claim(s) shall on any account be made by the CONTRACTOR after submission of the Final Bill, with the intent that the Final Bill prepared by the CONTRACTOR shall reflect any and all claims whatsoever of the CONTRACTOR against the OWNER arising out of or in connection with the CONTRACT or any supply made or work performed by the CONTRACTOR there under or in relation thereto, and notwithstanding any enabling provision in any law or CONTRACT and notwithstanding any claim that the CONTRACTOR could have with respect thereto, the CONTRACTOR hereby waives and relinquishes any and all such claims not included in the Final Bill and absolves and discharges the OWNER from and against the same, even if in not including the same as aforesaid, the CONTRACTOR shall have acted under a mistake of law or of fact, or shall claim to have acted under economic compulsion or necessity.



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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.

#### 56.9 DISCHARGE OF OWNER'S LIABILITY

- The acceptance by the CONTRACTOR of any amount paid by the OWNER to 56.9.1 CONTRACTOR in respect of the Final Bill of the CONTRACTOR in settlement of all said dues to the CONTRACTOR under the Final Bill shall, without prejudice to the claims of the CONTRACTOR included in the Final Bill in accordance with the provisions of clause 56.4.2 of GCC, be deemed to be in full and final settlement of all such dues to the CONTRACTOR notwithstanding any qualifying remarks, protest or condition imposed or purported to be imposed by the CONTRACTOR related to the acceptance of such payment, with the intent that upon acceptance by the CONTRACTOR of any payment made as aforesaid, the CONTRACT (including the arbitration clause) shall stand discharged and extinguished insofar as relates to and/or concerns the entitlements of the CONTRACTOR under the CONTRACT except for the CONTRACTOR's right, if any, to receive payment in respect of his notified claims included in his Final Bill and the right to receive payment of the unadjusted balance of the Contract Performance Security in accordance with the provisions of Clause 56.10.3 on successful completion of the DEFECT LIABILITY PERIOD. However, nothing herein stated shall affect the CONTRACTOR's undischarged liabilities and obligations under the CONTRACT.
- The acceptance by the CONTRACTOR of any amount paid by the OWNER to the CONTRACTOR in respect of the notified claims of the CONTRACTOR included in the Final Bill, in settlement of the claims of the CONTRACTOR, shall be deemed to be in full and final settlement of all claims of the CONTRACTOR and, the CONTRACT shall stand discharged and extinguished insofar as relates to and/or concerns the claims of the CONTRACTOR except for the CONTRACTOR's rights to receive payments of the unadjusted balance, if any, of the Contract Performance Security in accordance with clause 56.10.3.0 hereof on successful completion of the DEFECT LIABILITY PERIOD. However, nothing herein stated shall affect the CONTRACTOR's undischarged liabilities and obligations under the CONTRACT.
- Notwithstanding anything provided in Clause 56.9.1 and/or Clause 56.9.2, the CONTRACTOR shall be and remain liable for defects in terms of DEFECT LIABILITY PERIOD and associated clause thereunder and for any indemnity to the OWNER in terms of Clause 56.10.2 and shall be and remain entitled to receive the unadjusted balance of the Contract Performance Security remaining in the hands of the OWNER in terms of Clause 56.10.3 and associated clauses thereunder.

#### 56.10.0 Deleted

#### 56.11 CLAIMS OF OWNER

The release/payment of any unadjusted balance of the Contract Performance Security (furnished in the form of a Bank Guarantee or otherwise) by the OWNER to the CONTRACTOR as aforesaid or otherwise shall not be deemed or treated as a waiver of any right(s) or claim(s) of the OWNER existing before the issuance of the FINAL ACCEPTANCE CERTIFICATE or shall not stop or prevent the OWNER from thereafter making or enforcing any claim or any rights existing before the issuance of the FINAL

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ACCEPTANCE CERTIFICATE against the CONTRACTOR with the intent that the claims of the OWNER, against the CONTRACTOR shall continue to survive and shall not get extinguished notwithstanding the issue of FINAL ACCEPTANCE CERTIFICATE and/or the release of Contract Performance Security to the CONTRACTOR.

#### 57.0 UNDERGROUND OBSTRUCTIONS

The soil investigation report furnished in the NIT is indicative only and is enclosed purely for information/guidance purpose to the bidders. The contractor shall carry out its own detailed soil investigation for the proposed plant. Design of the foundation system of the plant shall be based, only on the site specific report. Nothing extra shall be paid in case of any variation arising out of the soil report conducted by the bidders and the data given in the tender. In the event, CONTRACTOR encounters any underground obstructions, the same shall be removed by CONTRACTOR without any extra cost implications to the OWNER.

In the event, CONTRACTOR encounters any underground obstruction which entails cost implication to the CONTRACTOR, the OWNER shall consider to compensate the CONTRACTOR reasonable cost compensation and/or time extension, depending on merit of the case after mutual discussion. The decision of the ENGINEER-IN-CHARGE in this regard shall be in writing and shall be final and binding upon the CONTRACTOR. It is clarified that in case the CONTRACTOR disagrees with the decision of ENGINEER-IN-CHARGE, the dispute shall be settled as per the provision of clause 39 of GCC.

#### 57.1 ARTICLES OF VALUE FOUND:

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 OWNER 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 OWNER.

#### 58.0 REGISTRATION OF THE CONTRACTOR WITH STATUTORY AUTHORITIES

Within 30 days of execution of the CONTRACT, the CONTRACTOR shall, insofar as necessary, register itself at their own cost with the applicable statutory authorities as required under the rules and regulations governing in India. The CONTRACT PRICE shall be deemed to include all costs towards the same. A copy of all documents related to all such registration shall be submitted to OWNER for record.

#### 59.0 STATUTORY OBLIGATIONS

59.1 CONTRACTOR shall comply with the requirements of statutory provisions and shall be solely responsible for fulfilment of all legal obligations under Contract Labour (Regulation and Abolition) Act, Inter-state Migrant Workmen (Registration of Employment and Condition of Service) Act, Payment of Wages Act, Workmen Compensation Act, Factories Act, Employees Provident Fund and Misc. Provisions Act, Payment of Bonus Act, Payment of Gratuity Act, Industrial Disputes Act and all other applicable Industrial/Labour enactment and Rules made there under as applicable from time to time. In case OWNER incurs any liability towards payment of any kind whatsoever, due to non-fulfilment of statutory provisions under any industrial/labour law by CONTRACTOR, the same shall be made good by CONTRACTOR.



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- 59.2 SUB-CONTRACTOR engaged by CONTRACTOR for performing civil and erection work/other jobs at SITE shall have PF Code No. in its name issued by Regional Provident Fund Commissioner (RPFC).
- 59.3 The CONTRACTOR shall ensure that the SUB-CONTRACTOR shall comply with the Statutory Requirements, as applicable, for the execution of this CONTRACT.

#### 60.0 UTILISATION OF LOCAL RESOURCES

- The CONTRACTOR shall ascertain the availability of local SUB-CONTRACTORS and skilled/unskilled manpower and engage them to the extent possible for performance of the WORKS.
- The CONTRACTOR shall not recruit personnel of any category from among those who are already employed by the other agencies working at the site, but shall make maximum use of local labour available.

#### 61.0 FUEL REQUIREMENT OF WORKERS

The CONTRACTOR shall be responsible to arrange for the fuel requirement of his workers and staff without resorting to cutting of trees and shrubs. Cutting of trees and shrubs is strictly prohibited for this purpose. The CONTRACTOR shall abide by the conditions put forth by the Environmental Clearance for the SITE as regards to construction workers.

#### 62.0 SURPLUS MATERIAL

Notwithstanding anything provided elsewhere, all surplus materials shall be dealt as follows:

- Any balance Indigenous/imported surplus MATERIALS including scrap shall belong to the CONTRACTOR upon completion of the WORKS and will be allowed to be taken back by CONTRACTOR after compliance of statutory formalities.
- For taking out balance indigenous/imported surplus MATERIALS as mentioned above upon the completion of the project, the CONTRACTOR shall have to furnish proof of entry and ownership of such MATERIALS inside the SITE, certification of ENGINEER-IN-CHARGE and OWNER in this regard.
- Following clause will apply only in case of applicability of concessional custom duty (presently, there is no applicability of concessional custom duty):

All imported surplus materials other than CONSTRUCTION EQUIPMENT which is brought to the SITE shall be the OWNER's property and shall be returned by the CONTRACTOR to the OWNER's designated stores. All such materials shall be subject to reconciliation and a proper accounting procedure shall be developed and strictly followed by the CONTRACTOR recorded in the inspection reports, proforma of which will be approved by the ENGINEER-IN-CHARGE. These reports shall form part of the completion DOCUMENTS. Inspection and acceptance of the WORK shall not relieve the CONTRACTOR from any of his responsibilities under this CONTRACT. However, indigenous Surplus Material as certified by the OWNER will be allowed to be taken back by Contractor after compliance of statutory formalities.



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#### 63.0 COORDINATION WITH OTHER AGENCIES

- 63.1 CONTRACTOR shall be responsible for proper coordination with other agencies operating at the site so that WORK may be carried out concurrently, without any hindrance to others. The ENGINEER-IN-CHARGE shall resolve disputes, if any, in this regard, and his decision shall be final and binding on the CONTRACTOR.
- If and when required for the coordination of the WORKS with other agencies involved at SITE, the CONTRACTOR shall within the scope of work, re-route and/or prepare approaches and working areas as may be necessary.

#### 64.0 ERECTION OF EQUIPMENT

All erection shall be carried out by deploying a crane(s) of suitable capacity. Erection by derrick shall not be permissible. The CONTRACTOR shall submit erection schemes for erection of critical equipment to ENGINEER-IN-CHARGE for his APPROVAL. No EQUIPMENT shall be erected in the absence of an approved erection scheme for such EQUIPMENT.

The quoted rates of the CONTRACTOR shall be deemed to include load testing of the crane as required to establish the lifting capacity of the crane.

#### 65.0 ELECTRICAL CONTRACTOR'S LICENCE

- 65.1 The CONTRACTOR or its nominated SUB-CONTRACTOR(s), as the case may be, shall have a valid electrical contractor's license for working in the State in which the job site is located. The CONTRACTOR shall furnish a copy of the same to ENGINEER-IN-CHARGE before commencement of any electrical work or work pertaining to Electrical System.
- No electrical work or work pertaining to electrical system(s) shall be permitted to be executed without a valid Electrical Contractors License being produced by the CONTRACTOR or SUB-CONTRACTOR, as the case may be, intending to execute the WORK.

#### 66.0 RENTS & ROYALTIES

Unless otherwise specified, the CONTRACTOR shall pay all tonnage and other royalties, rents and other payments or compensation (if any) for getting stone, sand, gravel, clay, bricks or other materials required for the WORKS or any temporary works.

#### 67.0 GOVERNMENT OF INDIA NOT LIABLE

It is expressly understood and agreed by and between the CONTRACTOR and the OWNER that the OWNER 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 thereunder. It is expressly understood and agreed that the OWNER is an independent legal entity with power and authority to enter into contracts, solely in its own behalf under the applicable laws of India and general principles of Contract. The CONTRACTOR expressly agrees, acknowledges and understands that the OWNER 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, CONTRACTOR hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims or counter claims against the Government of India arising out of this CONTRACT and covenants not to sue the Government of India on

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any matter, claim, and cause of action or thing whatsoever arising of or under this CONTRACT.

#### 68.0 SITE CLEANING

The CONTRACTOR shall take care to keep clean the job site at all times for easy access to the job site and also from the safety point of view in accordance with the CONTRACT requirements.

#### 69.0 ACCESS TO SITE

- The CONTRACTOR shall at his own cost and initiative arrange for and provide any access to the work area and stringing or other yards for labour, EQUIPMENT and MATERIAL as may be necessary for any cause in addition to the ingress and egress available. Any arrangements in respect thereof as may be entered into by the CONTRACTOR with any person interested in the land through which access is sought, shall be in writing and a copy of the writing (certified by or on behalf of the CONTRACTOR to be true copy thereof) shall forthwith be lodged with the OWNER. Such a writing shall specifically stipulate that the OWNER shall not be responsible for any claims under the CONTRACT or for any damage, loss or injury to the land or any material, item or thing thereon or in, and the CONTRACTOR shall keep the OWNER indemnified from and against any claim, action or proceedings in respect thereof.
- The CONTRACTOR shall at his own cost and initiative arrange for and obtain all necessary permissions, permits, consents and licenses as may be necessary to transport the MATERIALS, tools, EQUIPMENT, machinery and labour along or across any highway, roadway, or other way, or railway, tramway, bridge, dyke, dam or embankment, or lake, pond, canal, river, state terminal toll octroi, or other line, border or barrier. Traffic study if required, shall be carried out by CONTRACTOR independently without any liability on OWNER.

#### 70.0 INDEPENDENT CONTRACTOR

70.1 Neither CONTRACTOR nor any SUB-CONTRACTOR nor the employees, agents or representative of either shall be deemed to be employees, agents or representative of the OWNER in the performance of the CONTRACT.

#### 71.0 PAYEMENT TO THE SUB-CONTRACTOR

CONTRACTOR shall indemnify and hold harmless OWNER for any claim brought by SUBCONTRACTOR against OWNER in relation to CONTRACTOR's payment obligations for the relevant purchase orders and sub-contracts.

- 71.1 CONTRACTOR agrees that he shall furnish to OWNER, if requested, satisfactory evidence that all SUB-CONTRACTORS, including vendor to CONTRACTOR have been paid on the time and in full for work done or goods supplied, in connection with the performance of the WORK.
- 71.2 If evidence is not supplied, then the OWNER shall not be bound to make any further payment to CONTRACTOR for that part of work until it is paid by CONTRACTOR.
- 71.3 CONTRACTOR shall notify OWNER of any dispute of any kind between CONTRACTOR and any of his SUB-CONTRACTOR or vendors stating the nature of dispute, the amount of any payment which is being withheld by CONTRACTOR, the reasons thereof and the CONTRACTOR's plan to settle the dispute.

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# 72.0 ORDER OF WORKS / PERMISSION / RIGHT OF ENTRY / CARE OF EXISTING SERVICES

CONTRACTOR is required to submit to OWNER the various details with respect to their personnel(s) to be deputed for the execution of WORK such as name(s), nationality and passport details in case of Foreign Nationals (Passport No., Date of Issue, Date of Expiry etc.). These details are required for granting permission to enter and work in the existing fertilizer complex. The OWNER reserves the right to declare any person(s) as non grata. No claim whatsoever shall be entertained by OWNER on this account.

OWNER shall have the right to object to any Representative or personnel deputed to India by CONTRACTOR for execution of WORK or in connection with WORK, due to their misconduct or breach of law and regulation or who are found to be incompetent or negligent. CONTRACTOR shall remove such persons from SITE forthwith and take immediate action for replacement at no cost to OWNER.

# 73.0 GIFTS, COMMISSIONS, ETC.

Any gift, commission or advantage given, promised or offered by or on behalf of the CONTRACTOR or his partner, agent, officers, directors, employee or servant or anyone on his or their behalf in relation to the obtaining or to the execution of this or any other contract with the OWNER, shall in addition to any criminal liability which it may incur, subject the CONTRACTOR to the cancellation of this and all other contracts and also the payment of any loss or damage to the OWNER resulting from any cancellation. The OWNER shall then be entitled to deduct the amounts so payable from any monies otherwise due to the CONTRACTOR under the CONTRACT.

# 74.0 LABOUR LAWS- PF, EPF AND ESI

- 74.1 The CONTRACTOR shall obtain necessary license from the Licensing Authority under the Contract Labour (Regulation & Abolition) Act 1970 and the Central Rules framed there under and produce the same to the ENGINEER-IN-CHARGE before start of WORK.
- The CONTRACTOR shall not undertake or execute or permit any other agency or SUB-CONTRACTOR to undertake or execute any work on the CONTRACTOR'S behalf through contract labour except under and in accordance with the license issued in that behalf by the Licensing Officer or other authority prescribed under the Factories Act or the contract labour (Regulation & Abolition) Act 1970 or their applicable lay, rule or regulation, if applicable.
- 74.3 The provision of EPF & MP Act, 1952 and Rules scheme there under shall be applicable to the CONTRACTOR and the employees engaged by him for the WORK. The CONTRACTOR shall furnish the code number allotted by the RPFC Authority, to the ENGINEER-IN-CHARGE before commencing the WORK.
- 74.4 The CONTRACTOR shall be exclusively responsible for any delay in commencing the work on account of delay in obtaining a license under clause 74.1 above or in obtaining the code number under clause 74.3 above and the same shall not constitute a ground for extension of time for any purpose.
- The CONTRACTOR shall enforce the provisions of ESI Act and Scheme framed from time to time there under with regard to all his employees involved in the performance of the CONTRACT and shall deduct employee's contribution from the wages of each of the employees and shall deposit the same together with employer's contribution of such total wages payable to the employees in the appropriate account.
- 74.6 All liabilities like salaries, wages and other statutory obligations in respect of the persons engaged by the CONTRACTOR shall be borne by the CONTRACTOR during the period

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of agreement. In view of the provisions of the ESI Act, PF and EPF Act and other Acts, as may be applicable to OWNER, the CONTRACTOR shall take necessary steps to cover its employees under the said enactments and shall submit proof of such compliance to ENGINEER-IN-CHARGE periodically or at any date upon such request, as may be made by ENGINEER-IN-CHARGE to the CONTRACTOR. In the event of non-compliance with the statute or the provisions thereof, referred to above, it shall be open to OWNER to withhold such amount as in its opinion is due and payable by the CONTRACTOR in respect of its employees from and out of dues, payable by OWNER to the CONTRACTOR and such due shall be held by OWNER with it until proof is submitted by the CONTRACTOR to OWNER indicating compliance with such statutes within reasonable time, failing which OWNER shall deposit such amounts with the authorities concerned on behalf of the CONTRACTOR and inform the CONTRACTOR of such deposit or deposits.

### 75.0 GENERAL PROVISIONS

### 75.1 Confidential Information

### 75.1.1 Non-disclosure

Each party agrees to hold in confidence any information imparted to it or in the case of CONTRACTOR, to any of its SUB- CONTRACTOR / VENDOR, by the other Party which pertains to that other party's business activity in any manner, and which is not be subject of general public knowledge, including, without limitation, proprietary processes, technical information and know-how, information concerning other projects, management policies, economic policies, financial and other data and the like. The preceding non-disclosure requirements shall not apply to:

- Information furnished without restriction by the other Party prior to the date hereof
- ii) Information in the public domain; or
- iii) Information obtained by a Party from a third Person not under obligation of nondisclosure to the other party.
- (iv) Information required to be disclosed in pursuance of an order, judgement, decree of the Court, Tribunal or Statutory Authority.

# 75.1.2 **Disclosure to Govt. Agency**

Either Party may disclose any such information to the extent that such Party is required by any Government Agency to make such disclosure. In addition, OWNER may disclose such information to the extent that such disclosure is required by any Lender / Lender's Representative, etc. provided that such Lenders signed a confidentiality agreement containing confidentiality and limited use obligations not less stringent than those accepted by OWNER under the CONTRACT and License Agreement, if any and such parties are not competitor of CONTRACTOR or its Licensors.

75.1.3 Upon completion of the Works or in the event of termination pursuant to the provisions of the CONTRACT, CONTRACTOR shall immediately return to the OWNER all drawings, plans, specifications and other documents supplied to the CONTRACTOR by or on behalf of the OWNER or prepared by the CONTRACTOR solely for the purpose of the performance of the WORKS, including all copies made thereof by the CONTRACTOR.

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75.1.4 This clause shall survive and remain in full force for a period of ten years following the issue of FINAL ACCEPTANCE CERTIFICATE.

### 75.2 **Cut-Off Dates**

No claims or correspondence on claims on this CONTRACT shall be entertained by either parties after 6 months after expiry of the Contract Performance Security unless specified otherwise in CONTRACT.

# 75.3 Recovery of Sums / Dues

- All costs, damages or expenses which OWNER may have incurred, for which CONTRACTOR is liable under CONTRACT, shall be notified to CONTRACTOR and shall be recovered by OWNER from any payment due to or becoming due to CONTRACTOR under this CONTRACT or other CONTRACT and/or shall be recovered by action at law or otherwise. If the payment due to CONTRACTOR is not sufficient for recovery of the said sums/dues, CONTRACTOR shall pay immediately to OWNER such sums/dues or the balance sums/dues on demand.
- All MUTUALLY AGREED DAMAGES applicable and to be recovered from CONTRACTOR under CONTRACT, shall be recovered by OWNER from any payment due to or becoming due to CONTRACTOR under this CONTRACT or other CONTRACT and/or shall be recovered by action at law or otherwise. If the payment due to CONTRACTOR is not sufficient for recovery of the said MUTUALLY AGREED DAMAGES, CONTRACTOR shall pay immediately to OWNER such MUTUALLY AGREED DAMAGES. or the balance MAD on demand.
- 75.3.3 For avoidance of doubt all the rights and remedies of OWNER/CONTRACTOR and liabilities of the CONTRACTOR/OWNER as set out in the CONTRACT shall be to the exclusion of any other rights, remedies or liabilities available at law.

# 75.4 Payments etc. not to affect rights of OWNER

No sum paid on account by OWNER nor any extension of the date for completion granted by OWNER shall affect or prejudice the rights of OWNER against CONTRACTOR or relieve CONTRACTOR of its obligation for the faithful performance of CONTRACT.

# 75.5 Site Working and Safety Conditions

CONTRACTOR shall follow the SITE working and safety conditions enclosed as Section VI-13.

### 75.6 Miscellaneous

- 75.6.1 No CONTRACT or understanding in any way modifying the conditions of CONTRACT shall be binding upon either parties hereto unless made in writing and approved by both parties.
- 75.6.2 Without prejudice to FORCE MAJEURE, CONTRACTOR shall, during inclement weather, carry out WORK in accordance with CONTRACT and CONTRACTOR shall not be entitled to any additional payment over and above the CONTRACT PRICE payable under CONTRACT by reason of its being unable to carry out WORK owing to inclement weather.

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# 76.0 Implementation of Apprentices act 1961:

The CONTRACTOR shall comply with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued thereunder 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.

# 77.0 Change in constitution

Where the CONTRACTOR is a partnership firm, the prior approval of the OWNER 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 12 of GCC and the same action may be taken and the same consequence shall ensure as provided in the said clause.

# 78.0 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 OWNER.

# 79.0 Members of the OWNER not individually liable:

No Director, or official or employee of the OWNER/ PMC shall in any way be personally bound or liable for the acts or obligations of the OWNER 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.

### 80.0 OWNER not bound by personal representations:

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.

# 81.0 Land for Contractor's Field Office, Godown and Workshop:

The OWNER 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-

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CHARGE may at the 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 OWNER 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 OWNER. 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 OWNER 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 OWNER. Un-authorized buildings, constructions or structures should not 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 OWNER 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.

# **82.0** Rounding-Off 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.

### 83.0 Deleted

# 84.0 Work In Monsoon and Dewatering

- (i) 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.
- (ii) 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.

### 85.0 General conditions for construction and erection work:

- (i) The working time at the site of work is 48 hours per week. Overtime work is permitted in cases of need and the OWNER 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 OWNER on this account. No extra claims will be entertained by the OWNER 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.
- (ii) 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 OWNER will not entertain any claim for idle time payment whatsoever.

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(iii) The CONTRACTOR shall submit to the OWNER/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.

# 86.0 Action where no specification is issued:

In case of any class of WORK for which there is no SPECIFICATION supplied by the OWNER 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.

## 87.0 Care of Works:

- i) 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.
- Defects Prior To Taking Over: If at any time, before the WORK is taken over, the ENGINEER-IN-CHARGE shall: a) Claim 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 OWNER 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 OWNER 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 thereof provided in clause 3.0 (22) 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 OWNER 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 OWNER 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.
- iii) **Defects After Taking Over**: In order that the CONTRACTOR could obtain a COMPLETION CERTIFICATE he shall make good, with all possible speed, any

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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 is not remedied within a reasonable time, the OWNER 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 OWNER. 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 OWNER 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.

iv) COMPLETION CERTIFICATE' where ever mentioned shall be read as 'PRELIMINARY ACCEPTANCE CERTIFICATE'

# 88.0 Field Management & Controlling / Coordinating Authority:

- i) The field management will be the responsibility of the ENGINEER-IN-CHARGE, who will be nominated by the OWNER. The ENGINEER-IN-CHARGE may also authorize his representatives to assist in performing his duties and functions.
- ii) 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.

### 89.0 Local Conditions:

- i) 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 1956/2013, 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.
- ii) 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.

## 90.0 Special Conditions of Contract:

- i) Special Conditions of Contract (SCC) shall be read in conjunction with the General Conditions of Contract (GCC), specification of Work, Drawings and any other documents forming part of this CONTRACT wherever the context so requires.
- ii) 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.
- iii) 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 over-ride the provisions of the General Conditions of Contract and shall to the extent of such repugnancy, or variations, prevail.

- iv) 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.
- v) 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.

### 91.0 POWER OF ENTRY:

- 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 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 OWNER 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 OWNER 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 OWNER 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

## **INSTRUMENT AIR & PLANT AIR SYSTEM**

# TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) GENERAL CONDITIONS OF CONTRACT (GCC)

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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 OWNER by the CONTRACTOR and the OWNER 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.

### 92.0 LIENS:

- If, at any time there should be evidence or any lien or claim for which the OWNER might have become liable and which is chargeable to the CONTRACTOR, the OWNER shall have the right to retain out of any payment then due or thereafter to become due an amount sufficient to completely indemnify the OWNER against such lien or claim and if such lien or claim be valid, the OWNER 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 OWNER all money that the latter may be compelled to pay in discharging such lien or claim including all costs and reasonable expenses. OWNER reserves the right to do the same.
- The OWNER shall have lien on all materials, equipments including those brought by the CONTRACTOR for the purpose of erection, testing and commissioning of the WORK.
- 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.
- 4) CONTRACTOR will indemnify and hold the OWNER harmless, for a period of two years after the issue of FINAL ACCEPTANCE CERTIFICATE, from all liens and other encumbrances against the OWNER 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 OWNER will defend at his own expense, any claim or litigation brought against the OWNER 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.



# INSTRUMENT AIR & PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) SPECIAL CONDITIONS OF CONTRACT

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# SECTION – V SPECIAL CONDITIONS OF CONTRACT



# INSTRUMENT AIR & PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) SPECIAL CONDITIONS OF CONTRACT

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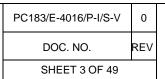


# **CONTENT**

SL.NO.	DESCRIPTION
	GENERAL
1.0	CONTRACTOR'S OBLIGATIONS
2.0	OWNER'S OBLIGATIONS
3.0	CHANGE IN WORK/CHANGE ORDER
4.0	ACCEPTANCE OF PLANTS AND FACILITIES
5.0	PLANT ACCEPTANCE CRITERIA
6.0	ISSUANCE OF PRELIMINARY ACCEPTANCE CERTIFICATE
7.0	LABOUR AND STAFF
8.0	TRAINING OF OWNER'S PERSONNEL
9.0	MODE OF CONTRACTING
10.0	FINAL BILL
11.0	DELETED
12.0	DELETED
13.0	STATUTORY VARIATION IN TAXES AND DUTIES
14.0	PAYMENT TERMS
15.0	BILLING SCHEDULE
16.0	DEEMED ACCEPTANCE
17.0	LIABILITY FOR DEFECTS
18.0	PERFORMANCE TESTS
19.0	FINAL ACCEPTANCE CERTIFICATE



# SPECIAL CONDITIONS OF CONTRACT





# **GENERAL**

The SPECIAL CONDITIONS OF CONTRACT shall be read in conjunction with the GENERAL CONDITIONS OF CONTRACT, specifications of work, DRAWINGS and any other document forming part of this CONTRACT wherever the context so requires.

Where any portion of the GENERAL CONDITIONS OF CONTRACT is repugnant to or at variance with any other provisions of the SPECIAL CONDITIONS OF CONTRACT, then unless a different intension appears, the SPECIAL CONDITIONS OF CONTRACT shall be deemed to over-ride the provisions of GENERAL CONDITIONS OF CONTRACT and shall prevail to the extent of such repugnancy or variations.

## 1.0 CONTRACTOR'S OBLIGATIONS

# 1.1.0 General Responsibility

1.1.1 The CONTRACTOR acknowledges that this CONTRACT is a Lumpsum turnkey contract and CONTRACTOR'S obligation hereunder, notwithstanding anything to the contrary contained herein, is to provide OWNER with fully operational PLANT, complete in all respects under and in accordance with the provision of CONTRACT, within the stipulated time and for the purpose designated herein by OWNER, and to do, furnish and provide everything necessary in connection therewith.

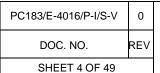
Without prejudice to the foregoing and except as otherwise expressly set forth in the CONTRACT as within the scope of OWNER's obligations under the CONTRACT, the CONTRACTOR shall perform or cause to be performed all WORK and services required in connection with the detailed design, engineering, manufacturing, supply of equipment, procurement (including, without limitation, all transportation services in connection therewith), Third Party Inspection (TPI) as applicable, testing, painting, Expediting, Site Survey and Condition Assessment, Insurance, Construction and Erection of Mechanical. Electrical and Instrumentation Works, Assembly and Installation of Equipments, obtaining all necessary Statutory Approvals, Pre-Commissioning, Commissioning including conducting of Sustained Load test and Performance Guarantee Test Run (PGTR), demonstration of guarantees & calibration and other work and services up to the PRELIMINARY ACCEPTANCE OF PLANT by the OWNER and in connection therewith provide all materials, equipment, machinery, tools, labour, transportation, administration and other services and items required to complete the PLANT in all respects up to the PRELIMINARY ACCEPTANCE OF PLANT and having the performance as guaranteed under the CONTRACT by the CONTRACTOR on a total, fixed price basis in accordance with this CONTRACT.

PLANT' for this NIT shall mean the 'INSTRUMENT AIR & PLANT AIR SYSTEM' as detailed below and in the Technical Section of NIT:

- (2W+1SB), Air Compressors
- 1 No wet Air receiver Knock Out Drum
- 1+1 No. Electric Heater with standby dryer/regeneration vessel(no purge loss)
- 1 No. Dried After Cooler



#### SPECIAL CONDITIONS OF CONTRACT





- 1 No. Dry Air Receiver
- (1working+1SB) Set of IA dryers
- 1 No. Low Pressure Wet Air Receiver
- 1 No. High pressure compressor for Back up receiver.
- 1 No. Back up IA receiver for 30 min storage @ 36.5 Kg/cm2g

The WORK shall, without prejudice to the generality of the foregoing or those enumerated in Clause 1.2.0 include but not be limited to the following:

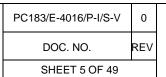
- (a) All engineering and design services including necessary investigation required for a completely engineered PLANT including necessary documentation;
- (b) Provision of all equipment, systems, materials, processes, CONTRACTOR's EQUIPMENT, temporary works and all other items, whether of a temporary or permanent nature including those required for the design, erection, Precommissioning, commissioning, conducting of PERFORMANCE GUARANTEE TEST RUN and remedying of DEFECTS during DEFECT LIABILITY PERIOD.
- (c) Transportation from works, port of entry and import clearance and handling services in and into India and inland transportation from the relevant points of delivery of EQUIPMENT required in connection with the completion of the PLANT, and the performance of the other WORK
- (d) Project management.
- (e) Receipt of EQUIPMENT at SITE including stores management.
- (f) Construction infrastructure services,; mechanical, electrical and instruments erection and installation services, inspection, testing and commissioning, and PERFORMANCE GUARANTEE TEST RUN before PRELIMINARY ACCEPTANCE of PLANT including all relevant applicable permits, with CONTRACTOR having responsibility for overall co-ordination of permits required by the OWNER and all training activities;
- (g) Provision of all necessary superintendence, labour, construction fuels and construction chemicals, tools, supplies and other consumables and services;

Construction water (at one point within factory premises and CONTRACTOR to arrange the line upto their Battery Limit) and Construction Power (1 No. 415V feeder of 63A at Existing Substation Near 132 kV Switchyard and CONTRACTOR to arrange tap off Power from this feeder) shall be provided within 3 months of issuance of FOA on chargeable basis (presently @ of Rs 4.50/m³ for Construction Water and Rs 5.915/KWH for Construction Power. In case of any escalation by statutory authorities in the unit rates during execution of Contract, the same shall be borne by Contractor)

Utilities as defined in Technical part of Section VI-2.0 of NIT and shall be made available to the LSTK CONTRACTOR at one point of battery limit 2 months before



# SPECIAL CONDITIONS OF CONTRACT





scheduled Completion Period. However required utilities prior to this will be arranged by LSTK CONTRACTOR.

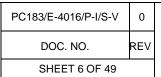
- (h) Rectification of defects during DEFECT LIABILITY PERIOD.
- 1.1.2 CONTRACTOR shall provide services, for PLANT, in accordance with good engineering practice. CONTRACTOR shall provide services of engineers, designers, draftsmen, buyers, inspectors, expediters and other persons required for the performance of WORK pursuant to CONTRACT.
- 1.1.3 In the event that there is any item of EQUIPMENT or WORK of the type provided for in CONTRACT, which is not specifically mentioned in the specifications or drawings set out in FINAL PROPOSAL, but which is necessary (even though not mentioned in CONTRACT) for normal, safe and continuous operation of PLANT, CONTRACTOR shall include such item of EQUIPMENT in the design and perform such items of WORK, for such EQUIPMENT or WORK free of cost to OWNER as if the same had been originally included in its Scope of Work/FINAL PROPOSAL.
- 1.1.4 Subject to prior consent of OWNER/PMC, CONTRACTOR may make use of the services of SUB-CONTRACTOR/ VENDOR (approved in writing by the OWNER) in accordance with the provisions in CONTRACT provided, however, the CONTRACTOR shall remain responsible and liable for the work done by such SUB-CONTRACTOR/vendor.
- 1.1.5 The CONTRACTOR shall be responsible for obtaining necessary approvals which are to be issued in the CONTRACTOR's name from the various statutory authorities. All approvals/permissions other than Environment Clearance and Consent to Establish/Operate shall be obtained by the CONTRACTOR.
- 1.1.6 The CONTRACTOR shall provide necessary full technical assistance to OWNER including follow-up for obtaining the necessary approvals to be issued in the name of OWNER from the various statutory authorities.
- 1.1.7 The CONTRACTOR shall furnish CONTRACT PERFORMANCE SECURITY as per the enclosed format in line with the provisions of bidding document.
- 1.1.8 The enumeration in subsequent Clauses of SPECIAL CONDITIONS OF CONTRACT, in GENERAL CONDITIONS OF CONTRACT and other documents of CONTRACT shall not in any manner limit the general scope of obligations and responsibilities of designing, engineering, procurement, supply, construction, commissioning and proving the performance guarantees of PLANT within the scope of CONTRACT.

# 1.2.0 CONTRACTOR's Scope of Work

- 1.2.1 CONTRACTOR shall provide and be responsible for the tasks specified in this Clause under the following heads:
- 1.2.2 Deleted



# SPECIAL CONDITIONS OF CONTRACT





# 1.2.3 Design & Engineering

- 1.2.3.1 CONTRACTOR shall provide all design and engineering services necessary for completion of the PLANTS in conformity with the CONTRACT and Good Engineering Practices and the NIT including but not limited to:
  - (a) Preparation of
    - Project design book which shall form the basis of PLANT design;
    - The conceptual design; and
    - The engineering and design necessary to describe and detail the PLANT and the Project.
  - (b) Provision of criteria for the detailed design by other suppliers of equipment/system/structures for incorporation into the PLANTS.
  - (c) Preparation of design, engineering, drawings, plans, bill of material, schedule and estimates for the PLANT and the project and the performance by CONTRACTOR of its obligations hereunder so that the PLANT constructed and commissioned by the CONTRACTOR is capable of meeting the performance guarantees and will be such as could be legally, safely and reliably placed in commercial operation by the OWNER.
  - (d) CONTRACTOR shall perform the design and engineering for PLANT so that when constructed and commissioned, PLANT shall be capable of meeting the guarantees with respect to quality and quantity of products, consumption of raw materials and utilities, and Pollution Level as guaranteed under CONTRACT and shall be reliable and safe and operable in accordance with the sound engineering practice. CONTRACTOR shall ensure design capacity of all sections of PLANT in accordance with CONTRACTOR's experience vis-a-vis as indicated in this NIT and expertise for obtaining a full throughput under varying conditions within the limits specified in CONTRACT. PLANT shall be designed so as to be capable of producing at full plant capacity when operated as specified in CONTRACT. CONTRACTOR shall review the basic design conditions and other conditions furnished by OWNER/PMC in NIT. If CONTRACTOR observes any inconsistency or insufficiency in these data, CONTRACTOR shall bring to the notice of OWNER/PMC the same, before its use.

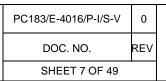
#### 1.2.4 Deleted

# 1.2.5 Codes and Standards

1.2.5.1 The engineering shall be performed and EQUIPMENT shall be manufactured and supplied according to acceptable international standards, as specified in the Technical Specification/FINAL PROPOSAL, meeting safety and other requirements of various national/international Codes and Regulations being in force as on submission of the FINAL PROPOSAL. The design of PLANT shall be based on the criteria enumerated in



### SPECIAL CONDITIONS OF CONTRACT





CONTRACT. However, it shall be CONTRACTOR's responsibility to follow all Indian Rules and Regulations as applicable.

CONTRACT shall comply with and shall cause the WORK and all components thereof (including, without limitation, the design and engineering of the PLANT) to comply with all APPLICABLE LAWS and APPLICABLE PERMITS as they may be in effect at the time of CONTRACTOR's performance under the CONTRACT.

The CONTRACTOR shall ensure that all actions on its behalf in connection with the WORKS shall be in compliance with applicable laws of India. The CONTRACTOR agrees to take all reasonable steps to ensure that Persons appointed by it in connection with the WORK shall comply with the applicable laws/ regulations/ guidelines and obligations.

# 1.2.6 **Drawings and Documents**

1.2.6.1 CONTRACTOR shall prepare or secure and furnish to OWNER all data, specifications, drawings, plans and other documents as required/used for WORK as specified in Technical Specifications.

## 1.2.7 Owner's/PMC Review

1.2.7.1 ENGINEER-IN-CHARGE shall review all documents and give its comments to CONTRACTOR within 14 (Fourteen) working days from the date of receipt of the same. Review as aforesaid by OWNER/PMC and furnishing of comments by OWNER/PMC or the failure of OWNER/PMC to review or comment as aforesaid shall not relieve CONTRACTOR in any manner of its obligations including performance guarantees under this CONTRACT.

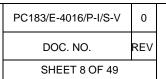
## 1.2.8 **Procurement Services**

- 1.2.8.1.1 As part of the WORK, CONTRACTOR shall procure and pay in CONTRACTOR's name as an independent contractor and not as agent for OWNER, all CONTRACTOR and SUB-CONTRACTOR's labour, materials, equipment, supplies, soil, gravel and similar materials and manufacturing, fabrication and related services (whether on or off the PLANT Site) for construction and incorporation in the PLANT or which are otherwise required for completion of the WORK in accordance with the Specification and the CONTRACT and are not explicitly specified to be furnished by OWNER pursuant to the terms and provisions of the CONTRACT including FINAL PROPOSAL.
- 1.2.8.1.2 CONTRACTOR shall procure and provide all EQUIPMENT required for PLANT. EQUIPMENT procured shall be according to specifications as set forth in the CONTRACT, proven record of performance and with suitable delivery time to meet the Contractual COMPLETION PERIOD. EQUIPMENT shall be procured from the vendor list agreed between CONTRACTOR and OWNER/PMC.

In connection with its procurement work, CONTRACTOR shall be responsible for the shipping, transportation and delivery of all items fabricated, manufactured, constructed or procured as set forth in the FINAL PROPOSAL and the CONTRACT. All such items and



# SPECIAL CONDITIONS OF CONTRACT





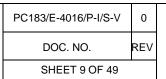
equipment, materials and supplies to be provided by the CONTRACTOR pursuant to the CONTRACT shall be new and of required quality, free from improper workmanship or defects and properly warranted or guaranteed in accordance with the CONTRACT. Any apparent omission or error in the equipment specifications will be corrected by the CONTRACTOR to the extent required by the CONTRACT.

# 1.2.8.2 **Equipment**

- 1.2.8.2.1 CONTRACTOR agrees that EQUIPMENT procured shall be strictly in accordance with the specifications as provided, however, that any apparent omission or error in the specifications will be corrected by CONTRACTOR if it is necessary for the functioning of EQUIPMENT. CONTRACTOR shall inform OWNER/PMC for such omission or error or ambiguity in the specifications and corrections made for the same.
- 1.2.8.2.2 Completeness of EQUIPMENT shall be the responsibility of CONTRACTOR. Any fittings, accessories, etc. which may not be specifically mentioned in Technical Specifications but which is required for the satisfactory functioning of EQUIPMENT and realization of PERFORMANCE GUARANTEES shall be provided by CONTRACTOR without any extra cost.
- 1.2.8.2.3 CONTRACTOR shall ensure that the modern practices in the manufacture of high grade EQUIPMENT are followed notwithstanding any omission in the specifications.
- 1.2.8.2.4 The supplies including fittings, accessories, etc. shall be in strict compliance to the applicable specifications/codes/standards. Components for which no relevant standards exist, the same shall be designed and manufactured as per good engineering practices.
- 1.2.8.2.5 The true intent and meaning of this Clause is that CONTRACTOR shall in all respects design, engineer, ensure quality of manufacture and supply EQUIPMENT in a thorough workman like manner, within prescribed time and in accordance with good engineering practice in order to enable proper operation of EQUIPMENT and PLANT.
- 1.2.8.2.6 CONTRACTOR shall furnish drawings and documents of EQUIPMENT as described in Technical part, Section VI. These documents shall include but not limited to technical documents, final drawings, preservation instructions, operation and maintenance manuals, test certificates, spare parts catalogues, etc. in a bound book for all rotating EQUIPMENT and in a folder for other EQUIPMENT, before despatch of EQUIPMENT under intimation to OWNER.
- 1.2.8.2.7 The documents, required for statutory approvals once submitted during construction period by CONTRACTOR shall be firm and final and not subject to subsequent changes unless such subsequent changes are approved by statutory agencies. CONTRACTOR shall be responsible for any payment of penalty as imposed by the Statutory Agencies consequent to furnishing of any in correct data/drawings.
- 1.2.8.2.8 All dimensions and weights shall be in metric system.



# SPECIAL CONDITIONS OF CONTRACT





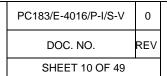
- 1.2.8.2.9 EQUIPMENT to be supplied and WORK to be carried out under CONTRACT shall conform to and comply with the provision of relevant Regulations/Acts (or both) as may be applicable in the State of ODISHA and in India to the type of EQUIPMENT/ WORK carried out and necessary certificates shall be furnished.
- 1.2.8.2.10 CONTRACTOR shall provide cross sectional drawings wherever applicable to identify the spare part numbers and their location, e.g. the size of bearings/ seals, their make and number shall be furnished.
- 1.2.8.3 CONTRACTOR shall furnish unpriced copy of Purchase Orders/Work Order/Contract for equipments and major items as per the list to be mutually agreed (including Priced copy of Purchase Orders/Work Order/Contract as required by the statutory authority) together with spares and special maintenance tools covering accurately all terms and conditions such as specifications requirements for quality, inspection, and test, warranties and guarantees, erection and commissioning assistance by vendor, delivery schedule, packing, transportation and insurance, and documentation.
- 1.2.8.4 CONTRACTOR shall arrange & furnish/provide to OWNER/PMC,
  - a) Lubrication schedule from VENDOR, if required
  - b) Mechanical specifications and equipment data sheets for review by OWNER for CRITICAL EQUIPMENT before manufacture is started.
  - c) Shop fabrication drawings as made available by vendor,
  - d) Characteristic curves for pumps and compressors, etc. as made available by vendor,
  - e) Certified drawings including civil scope drawing and loading data, pertinent bulletin, installation, operation and maintenance manuals and test certificates as received from vendor,
  - f) Final revised vendor's drawings, as described in Technical Specifications, before PRELIMINARY ACCEPTANCE.
  - g) Any other information as may be sought by OWNER/PMC.

Any changes necessary during commissioning period can be incorporated in the as-built drawing and will be submitted after PAC as per the mutually agreed schedule.

- 1.2.8.5 CONTRACTOR shall provide services of vendor's specialist for installation and commissioning of EQUIPMENT whenever necessary.
- 1.2.8.6 Deleted
- 1.2.8.7 Inspection, Expediting & Testing



# SPECIAL CONDITIONS OF CONTRACT





1.2.8.7.1 CONTRACTOR shall establish an inspection and expediting system and use its services for obtaining EQUIPMENT which conforms to the required technical and quality specifications and delivery schedule according to Purchase Order. CONTRACTOR shall send copies of expediting and inspection reports regularly to OWNER/PMC. CONTRACTOR shall arrange Third Party Inspection and quality certification of EQUIPMENT, as described in CONTRACT. Copies of all test results/report of the tests shall be furnished promptly by the CONTRACTOR to the OWNER/PMC.

Third party Inspection shall be carried by LLyods/BV/TUV/DNV.

- 1.2.8.7.2 OWNER/PMC or its INSPECTOR shall have the right to inspect and/or to test EQUIPMENT to check its conformity to the specifications laid down in the CONTRACT and as per approved QAP (Quality Assurance Plan). CONTRACTOR shall specify the inspections and tests to be carried out giving reference of applicable codes/standards and the location of inspection/test to OWNER/PMC. OWNER shall notify CONTRACTOR in writing the name of INSPECTOR retained for this purpose. Expediting by OWNER's representative in no way relieves the CONTRACTOR of his obligation under the terms and conditions of this CONTRACT.
- 1.2.8.7.3 The inspection and tests may be conducted at the premises of CONTRACTOR or SUB-CONTRACTOR/vendor before delivery and/or at SITE. All reasonable facilities and assistance including access to all drawings and production data shall be furnished to INSPECTOR at no charge to OWNER.
- 1.2.8.7.4 Should any inspected or tested EQUIPMENT fail to conform to the specifications, OWNER/PMC may reject it and CONTRACTOR shall either replace the rejected EQUIPMENT or make all alterations necessary to meet specification requirements free of cost.
- 1.2.8.7.5 OWNER's right to inspect and wherever necessary, comment about EQUIPMENT after its arrival at SITE or its participation in tests in respect of any EQUIPMENT shall in no way be limited or waived by reason of EQUIPMENT having previously been inspected, tested and passed by OWNER/PMC or INSPECTOR/representative prior to its shipment/despatch.
- 1.2.8.7.6 INSPECTOR shall follow the progress of the manufacture of EQUIPMENT under CONTRACT to ensure that the requirements outlined in CONTRACT are not being deviated from with respect to Schedule and Quality.
- 1.2.8.7.7 CONTRACTOR shall allow INSPECTOR to visit, during working hours, the workshops relevant to execution of CONTRACT during the contractual period and INSPECTOR will have the right to inspect EQUIPMENT at all stages of manufacture right from identification of material up to its shipment/despatch, to the extent that the delivery schedule shall not be delayed, with prior notice to CONTRACTOR in writing.



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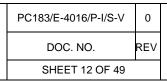


#### SPECIAL CONDITIONS OF CONTRACT

- 1.2.8.7.8 In order to enable INSPECTOR to obtain entry visa in time, CONTRACTOR shall notify OWNER/PMC two months before assembly, testing and packing of main EQUIPMENT and if requested assist INSPECTOR in getting visa in the shortest possible time.
- 1.2.8.7.9 CONTRACTOR shall place at the disposal of INSPECTOR free of charge all tools, instruments and other apparatus necessary for the inspection and/or testing of EQUIPMENT. INSPECTOR is entitled to prohibit the use and despatch of EQUIPMENT that has failed to comply with the characteristics/specifications of EQUIPMENT during test and inspection.
- 1.2.8.7.10 CONTRACTOR shall ensure that the permission for inspection/test is granted by its SUB-CONTRACTOR/VENDOR.
- 1.2.8.7.11 In respect of the inspection, CONTRACTOR shall advise in writing of any delay in the programme at the earliest possible date, describing in detail what has caused the delay and the proposed corrective action.
- 1.2.8.7.12 All tests and trials in general of EQUIPMENT shall be witnessed by INSPECTOR. Therefore, CONTRACTOR shall confirm to OWNER/PMC by E-mail about the exact date of inspection at least 15 DAYS in advance. CONTRACTOR shall specify the items and quantities ready for testing and indicate whether a Preliminary or Final Test is to be carried out. On receipt of this notice, if OWNER decides to waive the right to witness the test, information shall be given to CONTRACTOR within 15 DAYS of receipt of the notice from CONTRACTOR and CONTRACTOR then shall have right to proceed with the inspection
- 1.2.8.7.13 CONTRACTOR shall be held responsible for any possible delay in the approval or testing phase as well as for any possible delay in the remittance of necessary certificates. Delay on the part of the Inspection institutions will not be considered a case of 'Force Majeure'.
- 1.2.8.7.14 Any and all expenses incurred in connection with tests, preparation of reports and analysis made by qualified laboratories, necessary technical documents, testing documents and drawings shall be at CONTRACTOR's cost. Technical documents shall include the references and numbers of the standard used in the fabrication/construction and, wherever deemed practical by INSPECTOR. INSPECTOR shall attach importance to the views given by CONTRACTOR or its SUB-CONTRACTOR/VENDOR. Any and all expenses for boarding, lodging and airfare/rail fare incurred in connection with Owner's INSPECTOR shall be borne by OWNER.
- 1.2.8.7.15 Participation or presence of OWNER/PMC or their representatives at any tests or their failure to be present at or to witness any tests to be undertaken pursuant here to shall not in any way or manner relieve or release the CONTRACTOR from any of its warranties, guarantees or other obligations under the CONTRACT.
- 1.2.8.7.16 Nothing in Clause -1.2.8.7.2 to 1.2.8.7.15 shall in any way relieve CONTRACTOR from any warranty or other obligations under this CONTRACT.



# SPECIAL CONDITIONS OF CONTRACT





Not performing or failing to perform the inspection by OWNER hereunder shall not be a waiver of any of CONTRACTOR's obligations hereunder nor it be construed as an approval or acceptance of any of the WORK hereunder nor it shall absolve the CONTRACTOR in any way or manner of its liabilities, responsibilities and obligations under the CONTRACT.

- 1.2.8.7.17 Arrangements for all inspections required by Statutory Authorities and as specified in Technical Specifications shall be made by CONTRACTOR. If certain category of EQUIPMENT/piping fall under the jurisdiction of Indian Boiler Regulations (IBR), irrespective of the fact whether these are proprietary in nature or not, certification from an internationally recognised agency approved by IBR is considered necessary to enable local IBR authorities to allow their installation and operation. In such cases, inspection and certification from such authorities will also have to be arranged by CONTRACTOR. CONTRACTOR shall also submit, as may be required by IBR authorities, necessary design calculations from respective fabricators and/or manufacturers of such EQUIPMENT.
- 1.2.8.7.17 Rejections, Removal of Rejected EQUIPMENT and Replacement
- 1.2.8.7.17.1 Preliminary inspection at SUB-CONTRACTOR's / vendor's works by INSPECTOR shall not prejudice OWNER/PMC for commenting on EQUIPMENT including its specifications on final inspection at SITE or claim under warranty provisions.
- 1.2.8.7.17.2 If EQUIPMENT is not of specification or fail to perform specified duties, OWNER/PMC shall be entitled to reject EQUIPMENT or part thereof and ask for modification, repair or free replacement within reasonable time subject to the relevant provisions in the CONTRACT.
- 1.2.8.7.17.3 In the event of such rejection, OWNER shall be entitled to use EQUIPMENT in a reasonable and proper manner for a time reasonably sufficient to enable it to obtain replacement, without any liability to CONTRACTOR. After free replacement of such rejected EQUIPMENT, the rejected equipment shall become the property of CONTRACTOR.
- 1.2.8.7.17.4 Nothing in this Clause shall be deemed to deprive OWNER and/or affect any of its rights under CONTRACT which it may otherwise have in respect of such defects or deficiencies or in any way relieve CONTRACTOR of its obligation under CONTRACT.
- 1.2.8.7.17.5 EQUIPMENT rejected by OWNER/PMC shall be removed by CONTRACTOR, within reasonable time, at its own cost after replacement of the said EQUIPMENT. OWNER shall in no way be responsible for any deterioration or damage to rejected EQUIPMENT under any circumstances whatsoever.
- 1.2.8.7.17.6 In case, the rejected EQUIPMENT is to be taken out of OWNER's premises for repair, Owner shall have the right to withhold the payment for such cost of equipment to the extent of payment made by Owner towards the equipment until the equipment is returned / replaced.



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1.2.8.8 **Packing** 

- 1.2.8.8.1 CONTRACTOR shall ensure that packing of EQUIPMENT is as required to prevent their damage or deterioration during transit to its final destination.
- 1.2.8.8.2 The packing, markings and documentation within and outside the packages shall comply strictly with the provisions of CONTRACT.
- 1.2.8.8.3 CONTRACTOR shall be responsible for any eventual consequence occurred to EQUIPMENT due to improper packing of the same.

# 1.2.8.9 **Delivery/Time Schedule and Documents**

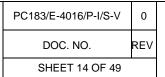
- 1.2.8.9.1 Time schedule shall include time for submission of documents/drawings for review/approval, incorporation of comments, if any, and final review of drawings by ENGINEER-IN-CHARGE. Within 14 (Fourteen) working days after receipt by ENGINEER-IN- CHARGE of any document requiring OWNER/PMC's review, ENGINEER-IN-CHARGE shall either return one copy thereof to CONTRACTOR as it is, if ENGINEER-IN-CHARGE has no comments or with its comments and reasons thereof.
- 1.2.8.9.2 Special care shall be taken by CONTRACTOR to furnish Manufacturer's Test Certificates, material of construction, make, type, pressure ratings wherever applicable and included in the scope of supply of EQUIPMENT.
- 1.2.8.9.3 In case of delay beyond the stipulated COMPLETION PERIOD, for reasons not attributable to OWNER, except FORCE MAJEURE and suspension of WORK by OWNER, even though provisional extension of COMPLETION PERIOD time is allowed by OWNER, all extra costs on account of changes of statutory regulations/Acts or increase in price on any other account, shall not apply to CONTRACT PRICE and the same shall be borne by CONTRACTOR.

# 1.2.8.10 **Despatch, Transportation/Shipping**

- 1.2.8.10.1 CONTRACTOR shall be responsible for despatch of EQUIPMENT by sea/ rail/ road/air after proper packing and protection. The consignment shall be despatched after inspection by OWNER 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 PRELIMINARY ACCEPTANCE OF PLANT.
- 1.2.8.10.2 Generally, on-Deck shipment shall not be made without prior permission of OWNER. However, in case of towers, reactors, vessels and other large-sized EQUIPMENT, CONTRACTOR may, at its own discretion, make on-deck shipment, without OWNER's prior permission. In case of damage to such EQUIPMENT, during delivery or at any stage



### SPECIAL CONDITIONS OF CONTRACT





before PRELIMINARY ACCEPTANCE OF PLANT, CONTRACTOR shall be responsible for repair/replacement of EQUIPMENT.

1.2.8.10.3 Clean onboard bill of lading for all offshore supplies shall be drawn as under:

For CIF/FOB/FAS/FCA shipments

Shipper = CONTRACTOR/Supplier

Consignee = CONTRACTOR

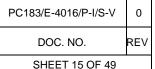
# 1.2.8.10.4 **Property in EQUIPMENT**

- 1.2.8.10.4.1 In case of all EQUIPMENTS/MATERIALS, the title of Ownership shall pass on to OWNER on PRELIMINARY ACCEPTANCE of Plant. However, the OWNER shall have Lien on all EQUIPMENTS/MATERIALS including those brought by the Contractor for the purpose of Erection, testing and commissioning of the WORK. However, in case of Termination of Contract the Transfer of Title shall pass automatically to OWNER.
- 1.2.8.10.4.2 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.
- 1.2.9 Spares, Special Maintenance Tools, Lubricants, Chemicals and Consumable
- 1.2.9.1 CONTRACTOR shall procure and supply commissioning spares, special maintenance tools and fixtures for EQUIPMENT, lubricants, chemicals and consumable in sufficient quantity for COMMISSIONING and maintenance of PLANT, as described in FINAL PROPOSAL. The commissioning spares, special maintenance tools, lubricants, chemicals and consumable procured and supply shall be optimum, so as not to fall short during COMMISSIONING, and PGTR. CONTRACTOR shall obtain for these items the appropriate guarantees and warranties. CONTRACTOR shall also ensure that the commissioning spares and special maintenance tools and fixtures are procured along with the related items of EQUIPMENT and form part of PURCHASE ORDER for the related items of EQUIPMENT.
- 1.2.9.2 Lubricants, Chemicals, Consumable etc.

CONTRACTOR shall supply Consumables, lubricants and chemicals, as required for 100% full load run for 6 months operation after successful commissioning (and include the cost in CONTRACT PRICE). Consumables, lubricants and chemicals to be supplied in phased manner and shall be mutually agreed between OWNER and CONTRACTOR considering the consumption and storage capacity.



### SPECIAL CONDITIONS OF CONTRACT





# 1.2.9.3 **Special Maintenance Tools**

CONTRACTOR shall supply special devices or tools required for normal maintenance, special handling and lifting of EQUIPMENT with main EQUIPMENT. The cost of such special maintenance tools shall be included in CONTRACT PRICE.

# 1.2.9.4 Bidder's Recommended Operational Spares

CONTRACTOR shall provide Itemised Price List for Bidder's Recommended operational spares 6 months prior to Mechanical Completion with validity of 2 Years. The recommended spares shall be optimum so as not to cause any short fall or excessive inventory. The price of above shall NOT be included in CONTRACT PRICE.

# 1.2.9.5 **Special Tools & Tackles**

CONTRACTOR shall supply special tools, tackles and fixture, required during normal operation & maintenance of PLANT. The cost of such special tools & tackles shall be included in CONTRACT PRICE.

## 1.2.9.6 Chemicals

CONTRACTOR shall supply all chemicals, if required for first filling and make-up, if required as indicated in Technical Section of NIT. The cost of these chemicals shall be included in the CONTRACT PRICE.

### 1.2.9.7 **Lubricants**

- 1.2.9.7.1 CONTRACTOR shall supply lubricants in sufficient quantity for the first filling and makeup required as indicated in Technical Section of NIT. The cost of lubricants shall be included in the CONTRACT PRICE.
- 1.2.9.7.2 CONTRACTOR shall furnish the name of recommended lubricants indicating their commercial/trade name, quality and grade and equivalent quality lubricants (in case of imported lubricants) available in India to OWNER.

## 1.2.9.8 Commissioning spares and Consumables

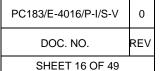
CONTRACTOR shall supply spares and consumables required for construction, PRE COMMISSIONING, COMMISSIONING, start-up and testing of PLANT. The cost of such spares and consumables shall be included in TOTAL CONTRACT PRICE.

# 1.2.9.9 **Mandatory Spares**

CONTRACTOR shall provide Mandatory Spares as per Section VI-5.0, of Technical Document. Notwithstanding anything contained in this CONTRACT, the Prices for Mandatory Spares/Insurance Spares shall be included in TOTAL CONTRACT PRICE.



# SPECIAL CONDITIONS OF CONTRACT



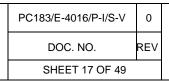


The price for "Mandatory Spares/Insurance Spares" shall be included in the supply portion of TOTAL CONTRACT PRICE. However, details along with breakup for the above shall be submitted by successful bidder during execution.

- 1.2.9.10 **General**
- 1.2.9.10.1 CONTRACTOR shall furnish to OWNER, the blue prints, drawings and specifications of the spare parts.
- 1.2.9.10.2 CONTRACTOR shall provide to OWNER all addresses and particulars of its SUB-CONTRACTOR/VENDOR on whom PURCHASE ORDER for EQUIPMENT covered under CONTRACT has been placed and will further ensure with its SUB-CONTRACTOR/VENDOR that, OWNER if so desires, shall have the right to place order for two years spare parts directly on them on mutually agreed terms based on offers of such SUB-CONTRACTOR/ VENDOR.
- 1.2.9.10.3 Spare parts shall be new and as per engineering standards/codes, free of any defects (even concealed), deficiency in Design, Materials and Workmanship and also shall be completely interchangeable with the corresponding parts.
- 1.2.9.10.4 Type and sizes of bearing/seals and bearing number with make shall be clearly indicated.
- 1.2.9.10.5 Spare parts shall be packed for long storage under tropical climatic conditions in suitable cases, clearly marked as to their intended purpose.
- 1.2.10 Warrantees and Guarantees
- 1.2.10.1 Materials and Workmanship Warranty
- 1.2.10.1.1 CONTRACTOR warrants that EQUIPMENT supplied under CONTRACT are new, unused, of the recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in CONTRACT. CONTRACTOR further warrants that EQUIPMENT supplied under this CONTRACT shall be according to specifications, have no defect (even concealed) arising from design, materials or workmanship or form any act or omission of CONTRACT that may develop under normal use of the supplied EQUIPMENT in the conditions prevailing in the country of final destination.
- 1.2.10.1.2 The warranty period for the EQUIPMENT supplied by CONTRACTOR shall be valid for minimum 12 months for all EQUIPMENT from the date of PRELIMINARY ACCEPTANCE Or 18 months from the date of supply which ever is earlier.
- 1.2.10.1.3 The warranty shall be valid for the period as described under Clause -1.2.10.1.2 from the date of PRELIMINARY ACCEPTANCE and shall be governed by Clause 17 of SPECIAL CONDITIONS OF CONTRACT. Should any DEFECTS be noticed in design, material and/or workmanship within the said warranty period, ENGINEER-IN-CHARGE shall inform CONTRACTOR and CONTRACTOR shall immediately on receipt of such



# SPECIAL CONDITIONS OF CONTRACT





intimation depute their personnel within 10 DAYS to investigate the causes of DEFECTS and arrange rectification / replacement / modification of the defective EQUIPMENT at SITE without any cost to OWNER, within a reasonable period. If CONTRACTOR fails to take proper corrective action to replace/ repair defective Equipment satisfactorily within a reasonable period, OWNER shall be free to take such corrective action as may be deemed necessary at CONTRACTOR's risk and cost, after giving notice to CONTRACTOR. OWNER shall promptly notify CONTRACTOR in writing of any claims arising under this warranty.

The cost of any special or general overhaul rendered necessary during the guarantee period due to defects for which CONTRACTOR is liable under CONTRACT in the PLANT or defective work carried out by the CONTRACTOR shall be borne by the CONTRACTOR.

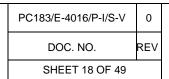
- 1.2.10.1.4 After the issue of the PRELIMINARY ACCEPTANCE CERTIFICATE and upto the defect liability period, in the event of an emergency where, in the judgement of the OWNER, delay would cause serious loss or damage, repairs or adjustments may be made by the OWNER or a third party chosen by the OWNER without advance notice to the CONTRACTOR and the documented and direct cost of such work shall be paid by the CONTRACTOR but only to the extent that the repair or adjustment was due a defect attributable to CONTRACTOR.
- 1.2.10.1.5 In case defects are of such nature that EQUIPMENT shall have to be taken to CONTRACTOR's/ SUB-CONTRACTOR's/ vendor's works for rectification etc., CONTRACTOR shall take EQUIPMENT at its cost after giving necessary undertaking or security as may be required by OWNER. OWNER shall, if so required by CONTRACTOR, despatch EQUIPMENT by quickest mode on freight to pay basis to CONTRACTOR's / SUB-CONTRACTOR's / vendor's works. After repairs CONTRACTOR shall deliver EQUIPMENT at SITE on freight paid basis. All transit risks to and from site shall be borne by CONTRACTOR.
- 1.2.10.1.6 EQUIPMENT or part thereof so repaired or replaced shall have further warranty for a period of 12 months from the date of its acceptance after repair/replacement and the Contract Performance Security shall be suitably extended for the same. The value of the Contract Performance Security during the extended warranty period shall be 03 (Three) percent of the cost of such repaired/replaced EQUIPMENT or its parts for which documentary evidence to be submitted.

However, extended DEFECTS LIABILITY PERIOD shall have an upper limit of 24 months for extended DEFECTS LIABILITY PERIOD, starting from the PRELIMINARY ACCEPTANCE.

At the end of the DEFECT LIABILITY PERIOD or the extended DEFECT LIABILITY PERIOD, the CONTRACTOR's liability ceases. In respect of goods supplied by the SUB-CONTRACTORS to the CONTRACTOR where a long guarantee (more than 12 months) is provided by such SUBCONTRACTORs/SUB- VENDOR(s), the OWNER shall be entitled to the benefit of such longer guarantees.



# SPECIAL CONDITIONS OF CONTRACT





- 1.2.10.1.7 If the repairs, replacements or modifications referred to above are of such nature which may affect the efficiency of EQUIPMENT, OWNER shall have right to give notice in writing to CONTRACTOR within one month of such repair/ replacement/ modification to carry out tests as may be required for acceptance of EQUIPMENT.
- 1.2.10.1.8 If CONTRACTOR fails to meet its obligation to repair or replace defective EQUIPMENT and make it good within a reasonable period of time and or if CONTRACTOR refuses to carry out WORK under the guarantee clause and implied guarantee conditions and/or in case of severe urgency, OWNER shall be entitled to carry out repair/replacement/WORK or arrange to carry out repair/ replacement/WORK by a third party. The entire cost of such repair/ replacement/WORK including transit insurance, freight, taxes and duties etc. shall be borne by the CONTRACTOR. In case, the cost of such repair/replacement has been incurred by OWNER, CONTRACTOR shall reimburse the same immediately on demand by OWNER with a document substantiating such costs.
- 1.2.10.1.9 Damages to EQUIPMENT deriving from incomplete, erroneous instructions issued by CONTRACTOR will be considered CONTRACTOR's fault and will be treated according to the provision of warranty clause. Normal wear and tear shall not come under purview of this clause.
- 1.2.10.1.10 The acceptance of any equipment by the OWNER shall in no way relieve the CONTRACTOR of his obligation under this clause.
- 1.2.10.1.11 During the GUARANTEE PERIOD, the CONTRACTOR shall provide if required by the OWNER, the services of operation engineers to advise the OWNER for such period and in such number as may be mutually agreed upon. The CONTRACTOR's operation engineers shall also train the OWNER's personnel, act as a liaison between the OWNER and the CONTRACTOR, assist the OWNER in ordering and obtaining spare parts, generally monitoring operation and maintenance and trouble shooting and supervising repair work under guarantee.

# 1.2.10.2 **Design and Vendors'/ Sub-Contractors' Guarantees**

- 1.2.10.2.1 CONTRACTOR shall guarantee the design and engineering work carried out by him against mistakes, errors, defective specifications, inadequacy and other such items which lead to the supply of inadequate PLANTS and Facilities. In case of detection of such mistakes, errors, deficiencies etc. the CONTRACTOR shall redo the design and/or engineering work to overcome all such mistakes, errors, deficiencies etc. at no extra cost to OWNER.
- 1.2.10.2.2 CONTRACTOR shall be responsible for all the items of the EQUIPMENT procured by him from VENDORS/ SUB-CONTRACTORS. Further, CONTRACTOR shall replace or repair any item of EQUIPMENT which is demonstrated to be defective under normal operating conditions within DEFECT LIABILITY PERIOD.



1.2.11

# INSTRUMENT AIR & PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) SPECIAL CONDITIONS OF CONTRACT

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Performance Guarantee of PLANT(S)/ EQUIPMENT

- 1.2.11.1 CONTRACTOR guarantees that the performance of PLANTS supplied under CONTRACT shall be strictly in conformity with the specifications and shall perform the duties and have consumption, production and other guarantees set forth in CONTRACT.
- 1.2.11.2 If the performance of PLANTS and/or any of EQUIPMENT fails as guaranteed and set forth in CONTRACT, CONTRACTOR shall investigate the causes and provide free of cost to OWNER, design, engineering, MATERIALS and services and EQUIPMENT within a reasonable period to prove guarantees. CONTRACTOR's liability in this respect shall be limited as per the provisions of 22.0 of SCC except that the Works Cost Guarantee shall be governed by the provisions of Cl.No.21.2. of GCC.

## 1.2.12 **STATUTORY APPROVALS**

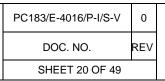
- 1.2.12.1 Unless otherwise specified in Bidding Documents, it shall be the CONTRACTOR's sole responsibility to obtain all approvals from any authority (except for environment clearance and Consent to Establish/Operate, however the data and information required for the same shall be made available by the LSTK contractor) required under any statute, rule or regulation of the Central or State Government concerned with the performance of the CONTRACT and/or the contractual Work. The application on behalf of the OWNER for submission to relevant authorities' along with copies of required certificates complete in all respects shall be prepared and submitted by the CONTRACTOR well ahead of time so that the actual execution of the WORKS is not delayed for want of the APPROVAL/inspection by the concerned authorities. The CONTRACTOR shall arrange for the inspection of the works by the authorities and will undertake necessary coordination and liaison required and shall not be entitled to any extension of time for any delay in obtaining such approval. All statutory fees shall be paid by the CONTRACTOR and the same shall be reimbursed by the OWNER upon production of documentary evidence by the CONTRACTOR.
- 1.2.12.2 Any deficiency (ies) as pointed out by any such authority shall be rectified by the CONTRACTOR within the scope of relative supply and/or WORK at no extra cost to the OWNER. The inspection and acceptance of the WORKS by such authorities shall, however, not absolve the CONTRACTOR from any of its responsibilities under this CONTRACT.
- 1.2.12.3 No extension of time shall be granted for meeting the requirement and/or obtaining APPROVAL of statutory authorities.

## 1.2.12.4 Government Clearances, Permits and Certificates

CONTRACTOR shall procure at its expenses, all necessary APPLICABLE PERMITS, certificates and licenses required by virtue of all APPLICABLE LAWS, regulations,



## SPECIAL CONDITIONS OF CONTRACT



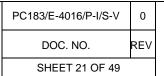


ordinances and other rules in effect at the place where any of WORK is to be performed, and CONTRACTOR shall further hold OWNER harmless from liability or penalty which might be imposed by reason of any asserted or established violation of such laws, regulations, ordinances or other rules. OWNER will provide the necessary assistance to CONTRACTOR for obtaining PERMITS for CONTRACTOR's personnel to undertake WORK in India in connection with CONTRACT.

- 1.2.12.5 CONTRACTOR shall furnish necessary technical information, data, drawing, etc. as and when required by OWNER for submission to Government/Statutory Agencies.
- 1.2.13 **Network Schedule**
- 1.2.13.1 OWNER would be using a computerized time and cost monitoring system and CONTRACTOR shall provide necessary input data for the same. CONTRACTOR shall prepare within 30 (thirty) days from date of FOA and provide to OWNER a PROJECT MASTER SCHEDULE indicating the important milestones of activities relating to WORK from date of FOA to the date of PRELIMINARY ACCEPTANCE. This PROJECT MASTER SCHEDULE shall be discussed with and approved by OWNER. Based on the approved PROJECT MASTER SCHEDULE, CONTRACTOR shall also prepare network schedules for activities relating to WORK. CONTRACTOR shall obtain the details of progress of various activities of WORK from SUB-CONTRACTOR and vendor wherever required and update the network schedules and PROJECT MASTER SCHEDULE incorporating the progress achieved by CONTRACTOR, SUB-CONTRACTOR and vendor and submit the same to ENGINEER-IN-CHARGE on monthly basis.
- 1.2.13.2 CONTRACTOR shall clearly indicate any delay in WORK in the above schedules and shall inform ENGINEER-IN-CHARGE the action taken to achieve the COMPLETION PERIOD.
- 1.2.14 Transportation and Storing of EQUIPMENT
- 1.2.14.1 CONTRACTOR shall be responsible for proper packing, transportation from vendor's workshop to port or railway station (whether by road, rail, ship or aircraft), handling and clearances at port or railway station including loading and unloading, customs clearance, carriage to SITE, unloading at SITE, warehousing, coding and tagging, storage including proper preservation, etc. of EQUIPMENT. Any special clearance, lifting, handling, loading/unloading, and transport arrangements for over dimensional consignments shall also be done by CONTRACTOR. CONTRACTOR shall ensure timely delivery of EQUIPMENT. CONTRACTOR shall endeavor to have the consignments in the upper part of the hold to enable early discharge at the Port of disembarkment. The above arrangement shall be in accordance with the guidelines set forth in the Co-ordination Procedure which shall be finalised mutually after issuance of FOA. CONTRACTOR shall be responsible for inspection of EQUIPMENT on receipt at SITE and for maintenance and management of stores and warehousing of EQUIPMENT at SITE including all activities connected with the issue of EQUIPMENT, accounting and final reconciliation and handing over of stores to OWNER.



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1.2.14.2 OWNER shall provide area at SITE for making shed/covered stores etc. for storing EQUIPMENT. CONTRACTOR shall be responsible for making shed/covered stores etc. for safe storage of EQUIPMENT.

# 1.2.15 Construction

1.2.15.1 CONTRACTOR shall be responsible for erection, insulation & painting works, , site fabrication, piping, instrumentation, electrical installation, and other miscellaneous construction jobs of PLANT leading to MECHANICAL COMPLETION and PRELIMINARY ACCEPTANCE of PLANT. CONTRACTOR shall organise these activities in appropriate sequence and use proper methods giving due regard to the requirements of safety, quality, sound engineering practice, compliance with relevant Codes and Regulations, and for achieving COMMISSIONING of PLANT on or before COMPLETION PERIOD.

The CONTRACTOR shall within the scope of work observe in addition to specifications, all national and local laws, ordinances, rules and regulation and requirements pertaining to the WORK.

Various procedures and methods to be adopted by CONTRACTOR during the construction as required in the respective specifications shall be submitted to OWNER in due time and well in advance of the specific work for approval.

The CONTRACTOR shall carry out required supervision as per Quality Assurance Plan and furnish all assistance required by the OWNER in carrying out inspection work. The OWNER will have authorized representatives present who shall have free access to the work at all times. If an OWNER's representative notifies the CONTRACTOR's representative of any deficiency in any work or in the supervision thereof, the CONTRACTOR shall make every effort to carry out such instructions consistent with best industry practice.

The CONTRACTOR shall so far as reasonably feasible employ skilled workers who are Certified Tradesmen in the field(s) of their relative activities(s).

- 1.2.15.2 CONTRACTOR shall submit and adhere to the completion schedule of construction/erection leading to PRELIMINARY ACCEPTANCE.
- 1.2.15.3 In case of delay in completion beyond the stipulated completion period as specified in Invitation For Bid (IFB) under clause 2 (E) for reasons attributable to Contractor, all extra costs on account of changes of statutory regulations / Acts, shall not apply to Contract price and the same shall be borne by Contractor.

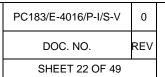
# 1.2.15.4 **Deleted**

# 1.2.16 Safety and Plant Security

1.2.16.1 CONTRACTOR shall observe and also use its best efforts to ensure that all parts of WORK carried out at SITE is being done in a safe and satisfactory manner conforming to the applicable Safety Rules and Regulations. Further, CONTRACTOR shall observe and



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make provisions in SUB-CONTRACT that employees working for PLANT observe all the Safety Rules as required under the Factories Act and Regulations and other Local Laws and SUB-CONTRACTOR to provide safety apparel and equipment to its employees. OWNER shall have the right to object to any unsafe practice followed by SUB-CONTRACTOR's employees or any CONTRACTOR's personnel and direct them to carry out the job in a manner considered safe by OWNER. CONTRACTOR shall further abide by all the Security Regulations imposed by OWNER.

1.2.16.2 CONTRACTOR shall observe all safety rules so that no harm is done to OWNER's employees or property. If on account of CONTRACTOR, OWNER's property or personnel are likely to suffer any damage, in such cases any directions issued by OWNER shall be carried out by CONTRACTOR.

## 1.2.17 **PRE-COMMISSIONING**

- 1.2.17.1 CONTRACTOR shall render and be responsible for pre-commissioning activities leading to MECHANICAL COMPLETION. These activities will include relevant checking, adjustment, testing, calibration, running in and trial runs of individual items of EQUIPMENT, and other similar jobs.
- 1.2.17.2 CONTRACTOR shall provide experienced personnel as required for carrying out the PRE-COMMISSIONING activities with OWNER's personnel.
- 1.2.17.3 CONTRACTOR shall provide SUB-CONTRACTOR's/VENDOR's specialists wherever required. Suitable provision for such services shall be made by CONTRACTOR in PURCHASE ORDER/CONTRACT with their Sub-Vendor/Sub-Contractor.
- 1.2.17.4 "PRE-COMMISSIONING" shall mean preparation of PLANT so that it is capable of operating on a continuous basis at or near rated capacity for carrying out COMMISSIONING activities

# 1.2.18 **MECHANICAL COMPLETION**

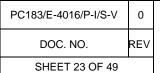
1.2.18.1 CONTRACTOR shall be responsible for completing the design, engineering, procurement, inspection and expediting, arranging for transportation of EQUIPMENT, construction and erection & testing for making PLANT ready for MECHANICAL COMPLETION.

MECHANICAL COMPLETION" shall mean completion of erection to such an extent that PLANT is ready for commissioning. This shall happen when:

A. The EQUIPMENT capable of producing to rated capacities are installed, aligned and grouted (wherever applicable) in accordance with drawings, specifications as per finally approved P&I Diagrams in accordance with all applicable codes, and laws.



# SPECIAL CONDITIONS OF CONTRACT





B. All pressure EQUIPMENT are hydrostatically or pneumatically tested once either in CONTRACTOR'S shop or in the field in accordance with Technical Specifications.

- C. Deleted
- D. Compressor, Pumps, Machinery etc. are cold aligned. Couplings are assembled and guards installed as applicable.
- E. Instruments, control system, instrument cable, safety interlock are installed, inspected and such non-operating checks are made as to ensure operability in the manner required for the process application. Instrument air lines are checked for correct hook up. Airlines are leak tested.
- F. Relief valves are installed prior to this, and have been checked by the CONTRACTOR in the CONTRACTOR's shop.
- G. Piping is hydrostatically or pneumatically tested in accordance with the specifications. Special treatment such as chemical cleaning is done as required by drawing or specifications. Suction screens are installed and test blinds are removed. Spring support anchors and guide are checked for removal of all shipping locks.
- H. The electric system is installed and tested in accordance with and to the extent required by electrical specifications. All wiring is checked for correct hook up. Motor rotation is checked. All power system protective devices are set.
- I. Insulation and drying out are completed to the extent necessary to permit start of commissioning.
- J. Pipe support system installed as per drawings.
- K. Painting is completed. EQUIPMENT /MACHINERY, piping duly marked and labelled.
- L. Safety equipments, systems are installed and checked for operations. Effluent management and treatment systems are installed and operational.
- M. All Emergency & Instrument power system are checked and operating.
- N. All chemical & lubricants are charged into the system.
- O. PRECOMMISSIONING has been completed.



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- P. The PLANT is ready for Commissioning
- Q. All packing and bed support materials are installed.
- R. Liquidation of all punch list applicable for achieving MECHANICAL COMPLETION. Balance items of punch list, if any, shall be liquidated as mutually agreed
- S. Temporary constructions facilities are removed to extent necessary to permit start of commissioning of Plant

# 1.2.19 **COMMISSIONING**

- 1.2.19.1 CONTRACTOR shall be responsible for COMMISSIONING after Mechanical Completion have been completed giving due regard to safety of EQUIPMENT in accordance with the procedures as per the requirement of Contract document after successful testing, precommissioning & trial run and per sound engineering practices. LSTK CONTRACTOR shall provide operating and maintenance personnel for the same. The COMMISSIONING activities shall be conducted as detailed in Section VI-2.0 of NIT)
- 1.2.19.2 CONTRACTOR shall provide engineers as required to commission the PLANT. CONTRACTOR shall be responsible to provide supervision personnel for operation of PLANT for a period of 2 months from date of successful commissioning and OWNER will operate the PLANT under the supervision and instructions of CONTRACTOR.
- 1.2.20 Performance Guarantee Test Run (PGTR)

'PERFORMANCE & GUARANTEE TESTS RUN (PGTR)' shall mean all operational checks and tests required to determine and demonstrate capacity, efficiency and operating characteristics and proving guarantees for work cost as specified in the CONTRACT documents.

CONTRACTOR shall successfully complete PERFORMANCE TEST as specified in Technical Section-VI, 2.0 of NIT.

- 1.2.21 Deleted
- 1.2.22 Deleted.
- 1.2.23 Laws and Regulations
- 1.2.23.1 CONTRACTOR shall abide, while fulfilling its obligations, by all applicable codes and APPLICABLE LAWS from time to time in force in the State of ODISHA and in India. FINAL PROPOSAL shall be based on the codes, and regulations applicable on the date of submission of the FINAL PROPOSAL.



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In the event of change in any codes, legislation, laws or regulation applicable to PLANT WORK or any part thereof after date of submission of FINAL PROPOSAL, which alters the scope of CONTRACTOR's obligations under CONTRACT, CONTRACTOR shall agree to make the necessary changes in scope of WORK. Such changes shall be governed by CHANGE IN WORK as per the provisions of Clause -3 of SCC. Any additional fee becoming applicable due to any change of Acts, regulations, by-laws, orders and requirements after date of submission of FINAL PROPOSAL shall be borne by OWNER in accordance with SCC clause 3.0.

- 1.2.24 Deleted
- 1.2.25 **Progress Monitoring and Reporting**
- 1.2.25.1 CONTRACTOR shall develop a suitable system for monitoring and reporting progress on the various activities up to PRELIMINARY ACCEPTANCE. CONTRACTOR shall submit PROJECT MASTER SCHEDULE and detailed Network Schedule covering the activities and milestones starting from date of FOA until PRELIMINARY ACCEPTANCE, as described under Clause -1.2.13 above. These schedules shall include the activities of CONTRACTOR, SUB-CONTRACTOR/Sub-Vendor. CONTRACTOR shall monitor progress continuously and submit to EIC monthly progress reports giving the status of the activities, indicating those delayed and action being taken, or required to be taken, to bring back those activities on schedule. These reports will also include progress at vendor's workshops and shall be supplemented with photographs, wherever necessary. The Network Schedule shall be updated once in a month. CONTRACTOR shall also furnish information to ENGINEER-IN-CHARGE as may be required by any other Government Authority or any other agency such as Financing Institution etc.

## 1.2.26 **Technical Information**

CONTRACTOR shall furnish to OWNER, CONTRACTOR's Technical Information and 1.2.26.1 know-how as may be necessary for the operation of PLANT and relating to its process according to the provisions of Article 53 of General Conditions of Contract. CONTRACTOR shall grant or cause to be granted to OWNER an irrevocable right to use all such above technical information for PLANT and shall further advise OWNER for a period of five (5) years from date of COMMISSIONING of any improvements in process. know-how, engineering, operation methods, and other conditions which will result in more efficient operation of PLANT that are developed by CONTRACTOR or process licensor or have come to the knowledge of CONTRACTOR, at no extra cost to OWNER. OWNER shall also grant to CONTRACTOR, at no extra cost to CONTRACTOR, to the benefit of process licensor the same right on OWNER's improvements as per the provisions of this Clause. Notwithstanding the generality of the foregoing, ownership of data, technical information processes, technology or software proprietary to CONTRACTOR and/or SUBCONTRACTORS shall remain with CONTRACTOR and/or SUBCONTRACTOR. CONTRACTOR and/or SUBCONTRACTOR shall ensure that OWNER is legally entitled to use of such data, processes, technology and software in the form of a perpetual, nonterminable, non-exclusive, royalty-free License for the purpose of the operation and maintenance of the PLANT.



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### 1.2.27 Work of SUB-CONTRACTOR and vendor

1.2.27.1 CONTRACTOR shall remain responsible for proper execution of such part of WORK as are carried out by its SUB-CONTRACTOR and vendor and any failure of SUB-CONTRACTOR/vendor shall not relieve CONTRACTOR of its obligations under CONTRACT. Furthermore, in the event of any default by SUB-CONTRACTOR/vendor, CONTRACTOR shall either take over SUB-CONTRACTOR/vendor's part of WORK on mutually agreed terms or take remedial action as may be necessary in order to comply with COMPLETION PERIOD and any other activities leading to PRELIMINARY ACCEPTANCE.

### 1.2.28 **Co-ordination**

- 1.2.28.1 CONTRACTOR shall render all necessary assistance to ENGINEER-IN-CHARGE required for overall co-ordination of all activities connected with WORKS. For this purpose, CONTRACTOR and ENGINEER-IN-CHARGE shall agree on a meeting as soon as practicable after issuance of FOA, with SUBCONTRACTOR/vendor's and such other parties as are necessary to settle the following:
  - a) Review the basic design conditions set forth in FINAL PROPOSAL and where appropriate, review possibilities of standardisation.
  - b) Assess the priorities and key dates required to be included in CONTRACTOR's PROJECT MASTER SCHEDULE.
  - c) Make an assessment of all items requiring co-ordination.
  - d) Fix up a date and agenda of any subsequent meeting as may be required in association with OWNER.
  - e) Discuss with ENGINEER-IN-CHARGE and furnish all technical information.

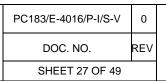
In the event, ENGINEER-IN-CHARGE pursuant to its responsibilities of overall coordination requests CONTRACTOR to make any alteration to the programme, scope of responsibility under CONTRACT, CONTRACTOR shall do the same, subject to the provisions of Clause 3.0.

# 1.2.29 Notices and Reports

- 1.2.29.1. CONTRACTOR shall submit the following copies of notices to ENGINEER-IN-CHARGE as part of the Scope of Work:
  - a) Immediate notification of safety incidents and accidents, including near misses, of any kind or type followed as soon as possible after such event by a full report.
  - b) Notices from any Government / Statutory Agency or any other Person for a violation of any Law or Government Approval, immediately upon receipt by CONTRACTOR and no later than twenty-four (24) hours after its receipt.



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- c) Inspection reports by any inspector whether relating to any accident, accepting any test reports or otherwise immediately upon receipt by CONTRACTOR and no later than two (2) working DAYs after its receipt.
- d) Any other matter/issue that involves OWNER's interest.

# 1.2.30 CONTRACTOR's Representative and Key Personnel

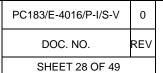
- 1.2.30.1 CONTRACTOR shall with prior consent of ENGINEER-IN-CHARGE, appoint a CONTRACT MANAGER to manage the execution of WORK and to be nominated as CONTRACTOR's Representative. CONTRACTOR's personnel stationed at SITE for providing services during the execution of WORK shall work under the supervision and guidance of CONTRACT MANAGER. The CONTRACT MANAGER shall have the full authority to make binding and enforceable decisions in the name of CONTRACTOR and shall receive all notices/correspondence that OWNER serves on CONTRACTOR.
- 1.2.30.2 CONTRACTOR shall be responsible for the work performed by CONTRACT MANAGER and CONTRACTOR's personnel and shall under no circumstances be relieved of its responsibilities and obligations under CONTRACT on account of acts or omissions of CONTRACT MANAGER and personnel.
- 1.2. 30.3 The Key Personnel shall hold the staff positions as indicated in CONTRACT. CONTRACTOR shall use reasonable efforts to ensure that such Key Personnel will be engaged in the execution of WORK continuously until their role is completed unless prior release is approved by OWNER, such approval not to be unreasonably withheld or delayed. Replacement of or addition to Key Personnel shall only be made with persons having qualifications and experience equal to or better than those replaced or added to, and shall be similarly subject to OWNER's prior approval. In the event, any person identified in CONTRACT decides to leave the employment of CONTRACTOR, CONTRACTOR shall use reasonable efforts to retain the services of such person until his portion of WORK is complete. CONTRACTOR further agrees not to remove from WORK Key Personnel, which OWNER considers to be necessary for the proper performance of WORK without the prior written approval of OWNER.

# 1.2.31 General Warranties

- a) CONTRACTOR shall perform WORK in full compliance with its FINAL PROPOSAL and all other terms and conditions set forth herein.
- b) WORK shall be performed, in a good and workmanlike manner and in accordance with the FINAL PROPOSAL, all other terms and conditions of this CONTRACT, all DOCUMENTS, all Government Approvals, all APPLICABLE LAWS, and Good Industry Practices.
- c) All EQUIPMENT, installed as part of PLANT, (i) shall be free from any encumbrance or lien and shall conform to the specifications and descriptions set forth in CONTRACT and (ii) shall be new and unused, free from DEFECTS and Deficiencies of any kind and shall meet the requirements of the Scope of Work.



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- d) The completed PLANT shall be free of DEFECTS and Deficiencies and shall be designed, constructed and engineered, in compliance with the Scope of Work.
- e) PLANT shall be designed, engineered, constructed, tested, completed and delivered based on Good Industry Practices, CONTRACTOR's specifications and guidelines for operation and maintenance in accordance with the Scope of Work, for CONTRACT PRICE and no later than the COMPLETION PERIOD.
- f) All SUB-CONTRACTOR/vendor shall perform their portion of the Scope of Work or supply or install EQUIPMENT in accordance with the applicable terms set forth herein.
- g) Adherence to the Operations Manual shall allow safe start-up, operation, maintenance and shut-downs of the completed PLANT, in accordance with CONTRACTOR's guidelines and will not impair any warranty or guarantee of EQUIPMENT incorporated or to be incorporated into PLANT.

### 1.2.32 General

- 1.2.32.1 CONTRACTOR shall incorporate during design stage maximum utilization of goods manufactured and/or available in India and also avail shipping, insurance, banking, catering and any other services available from India-owned companies for installation of plant, if quality, delivery and overall cost characteristics are equivalent.
- 1.2.32.2 CONTRACTOR shall arrange insurance pursuant to Clause 28.0 of GCC, at its own cost.
- 1.2.32.3 CONTRACTOR shall provide necessary information, documentation, and assistance for obtaining any approvals from Financial Institutions or any other agencies or authorities.

### 2.0 OWNER'S OBLIGATIONS

OWNER shall be responsible for fulfilling all obligations as specified under the following heads:

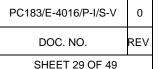
### 2.1 Deleted

### 2.2 Overall Co-Ordination

The objective of overall co-ordination is to organise orderly execution of WORK, bring about requisite integration amongst the various project activities of executing agencies, to avoid interference between the various activities of the parties in order to achieve the earliest possible completion of WORK. The aim will be to integrate, have compatibility between plants and uniform standardisation of design, engineering, layout, etc.



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### 2.3.0 Review and Approval of Work

- 2.3.1 CONTRACTOR shall associate OWNER's representatives with WORK as carried out by CONTRACTOR's personnel. For this purpose, OWNER shall associate with WORK at all stages. Specifically, OWNER shall undertake the following tasks:
  - a) Review/APPROVAL of drawings as per Technical Section and other documents connected with basic and detailed engineering.
  - b) Review of specifications for EQUIPMENT, lists of spare parts and special maintenance tools, and lists of special construction aids, tools, tackles, and fixtures.
  - c) Participation in inspection, expediting and testing of EQUIPMENT at SUB-CONTRACTOR's / vendor's works and at SITE, wherever considered necessary by OWNER.
- 2.3.2 For the smooth functioning, OWNER will nominate an individual who will act as EIC under the CONTRACT. The EIC will have full authority to act on behalf of the OWNER in connection with the CONTRACT. Except as otherwise provided in the CONTRACT, all communications between the OWNER and the CONTRACTOR relating to the WORKS shall be between the ENGINEER-IN-CHARGE and the CONTRACT MANAGER.

### 2.4 Deleted

### 2.5 Facilities for CONTRACTOR's Personnel

OWNER shall assist CONTRACTOR in obtaining Visas and other PERMITS from the appropriate authorities for CONTRACTOR's and SUB-CONTRACTOR's / vendor's expatriates to enter and stay in India as necessary for performance of WORK. OWNER shall also provide facilities to CONTRACTOR's expatriates in accordance with the provisions described in Clause-2.8.

### 2.6 Operating and Maintenance Personnel

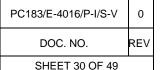
OWNER may associate its personnel with the construction and erection of PLANT to familiarise the personnel with WORK, and generally to prepare for proper operation and maintenance of PLANT.

### 2.7 Utilities

OWNER shall make available the utilities as specified in Section VI-2.0 of bid document for commissioning and PGTR.



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### 2.8 Site Facilities

OWNER shall provide the following SITE facilities:

- a) Land for Construction Activities
- b) General safety and security without prejudice to Contractor's obligations.
- c) Construction Power & Construction Water shall be provided as per clause 1.1.1 (g) above
- d) Free and unrestricted access to SITE for CONTRACTOR's Authorized Personnel
- e) OWNER shall NOT provide any accommodation and facilities for travelling to and from SITE to the place of residence to the personnel of CONTRACTOR/ SUB-CONTRACTOR, deputed at SITE for performing WORK under CONTRACT.
- f) Area for making shed/covered storage for storing EQUIPMENT, as available.

### 3.0 CHANGES IN WORK/CHANGE ORDER

3.1 OWNER may at any time order change in work scope. OWNER shall have the right to request in writing changes in WORK within the scope of CONTRACT. When the request for a change in WORK by OWNER has been agreed and complied by CONTRACTOR, CONTRACTOR's obligations under CONTRACT shall remain unaffected unless otherwise agreed.

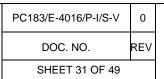
Changes may consist of additions, deletions or revisions of the Scope of Work, and may cause the CONTRACT PRICE, the work schedule or the COMPLETION PERIOD or any other CONTRACTOR's WARRANTEES to be adjusted.

CONTRACTOR shall be entitled to an extension of time to COMPLETION PERIOD suffered and/or payment of additional costs incurred as a result of any change in law or legislation, by way of a CHANGE ORDER, in case it is necessitated or if it becomes applicable.

The ENGINEER IN CHARGE shall have the right to make any alterations in, omission from, additions to or substitutions for in the scope of work, 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



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rates for such additional, altered or substituted WORK under this clause shall be worked out in accordance with the following:-

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.

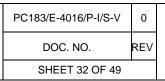
- 3.3. If it is established that a request for Change in Work asked by Owner does not fall under original Scope of Contract, then CONTRACTOR shall promptly submit cost estimate, and / or time extension and / or terms of payment (as applicable) for making the requested change in WORK together with the details of any variation required to be made to any of CONTRACTOR's or OWNER's obligations and/or guarantees as per clause 3.2 above.
- 3.4 If in CONTRACTOR's opinion fulfillment of any of its obligations under CONTRACT would be jeopardized by a CHANGE IN WORK requested by OWNER, then CONTRACTOR shall explain in writing to OWNER the reasons for not accepting these changes within fifteen (15) days of receipt of OWNER's written request.
- OWNER and CONTRACTOR shall agree upon the basis and terms of the CHANGE IN WORK in writing.
- 3.6 It is understood that no change shall become effective and no change will alter the scope of WORK until all of the matters referred to in this *Clause 3* have been mutually agreed upon in writing by OWNER and CONTRACTOR.
- 3.7 It is agreed by both parties that the following changes shall not be considered a CHANGE IN WORK in the meaning in this Clause:
  - Minor changes requested by OWNER and accepted by CONTRACTOR which do not involve any substantial additional cost or man-hour effort, and have no effect on contractual completion period, and/or
  - b) Any change necessitated due to requirements of prevalent laws in India upto the time of submission of FINAL PROPOSAL.
- 3.8 This clause is to be read in conjunction with Clause No. 5.0 of GCC.

### 4.0 ACCEPTANCE OF PLANTS AND FACILITIES

CONTRACTOR's liabilities for the Performance Guarantees given for the PLANTS and Facilities in respect of capacity, consumption, product quality and pollution level shall be discharged only when the PERFORMANCE AND GUARANTEE TESTS as stipulated in



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Technical, Section VI-2 of NIT have been successfully carried out as per Plant Acceptance criteria specified at Clause 5.0 below and OWNER has issued PRELIMINARY ACCEPTANCE CERTIFICATE.

### 5.0 PLANT ACCEPTANCE CRITERIA

Subject to fulfilling PERFORMANCE AND GUARANTEE TESTS as per Section VI-2.0 of NIT and Clause 18.0 of SCC, OWNER shall be in readiness to accept the PLANT. CONTRACTOR shall take all steps to fulfil the provisions of the CONTRACT for OWNER to issue PRELIMINARY ACCEPTANCE CERTIFICATE. The care and custody of the PLANT shall be passed on to OWNER on COMMISSIONING of all the PLANT.

### 6.0 PRELIMINARY ACCEPTANCE

PRELIMINARY ACCEPTANCE shall mean that following milestones have been achieved for each PLANT (i) MECHANICAL COMPLETION has occurred, (ii) PRE-COMMISSIONING and COMMISSIONING of the PLANT have been accomplished, (iii) the Sustained Load Test has been passed successfully, (iv) PGTR has been conducted by LSTK Contractor and accepted by OWNER (v) All statutory approvals in the scope of Contractor, required to operate and maintain the PLANT have been obtained (vi) OWNER has received all DOCUMENTS required hereunder to start up, operate and maintain the PLANT(vii) OWNER has received all operations, maintenance, and spare parts manuals and instruction book necessary to operate and maintain the PLANT in a safe, efficient and effective manner (viii) all special tools and spare parts purchased by CONTRACTOR as provided herein have been delivered to OWNER.; and (ix) Deleted (x) All demonstration runs have successfully completed

### 6.1 ISSUANCE OF PRELIMINARY ACCEPTANCE CERTIFICATE

Within 30 (thirty) DAYs from completing successfully all activities as defined at clause 6.0 above by the CONTRACTOR and CONTRACTOR fulfilling all the obligations under the provision of the CONTRACT, OWNER shall issue PRELIMINARY ACCEPTANCE CERTIFICATE to CONTRACTOR. On issue of this Certificate by OWNER, CONTRACTOR shall become entitled to receive all associated payment as per provisions of the CONTRACT due to CONTRACTOR subject to CONTRACTOR's fulfilling the obligations stipulated under CONTRACT.

### 7.0 LABOUR AND STAFF

- 7.1 The CONTRACTOR shall make his own arrangement for labour, erection and COMMISSIONING engineers and all other staff required for carrying out the WORK. The necessary permissions from Government of India regarding work permit and visa requirement shall be obtained by the CONTRACTOR.
- 7.2 The CONTRACTOR shall make his own arrangements for providing canteen service to his labour and staff. Open space for this purpose may be provided by OWNER.



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- 7.3 The CONTRACTOR shall at his own cost provide office and other accommodation for his staff and workmen. The CONTRACTOR shall also provide communication, transport and medical facilities to his staff and workmen.
- 7.4 The CONTRACTOR shall be responsible for all statutory obligations and any other laws in this regard in force from time to time regarding the employment or conditions of service of CONTRACTOR's labour, workman or employees.
- 7.5 The CONTRACTOR shall observe all safety rules as required under various rules, regulations and laws in India and shall also strictly adhere to safety regulations of OWNER.

#### 8.0 Deleted

### 9.0 MODE OF CONTRACTING

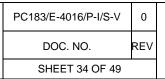
- 9.1 Notwithstanding anything stated elsewhere in the CONTRACT documents, the CONTRACT is awarded on Lumpsum turnkey basis with single point responsibility.
- 9.2 The CONTRACT shall be in all respect being construed and governed in accordance with the Indian laws.
- 9.3 The Contract shall be treated as a "WORK CONTRACT SERVICE".

### 10.0 FINAL BILL

- 10.1 On the basis of the LUMPSUM PRICE provided in the CONTRACT and subsequent Change Order(s)/Amendment(s), if any and the approved billing schedule, the CONTRACTOR shall prepare a Final Bill in the prescribed form. Additions claimed to the LUMPSUM PRICE or reductions thereof on account of CHANGE ORDER(s) shall be separately indicated in the Final Bill with reference to the relative CHANGE ORDERS(s).
- The Final Bill shall, in addition to the payment entitlements arrived at according to the provisions of Clause 10.1 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.
- The Final Bill drawn in accordance with Clause 10.1 shall be submitted together with the PRELIMINARY ACCEPTANCE CERTIFICATE to the ENGINEER-IN-CHARGE for certification, who shall certify the Final Bill, if drawn in accordance with Clause 10.1 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) accompanied by the PRELIMINARY ACCEPTANCE CERTIFICATE to the OWNER for payment.
- All monies payable under the CONTRACT for WORKS to be performed and MATERIALS to be supplied up to and including successful completion and final tests and commissioning of the system and performance tests 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 10.1 hereof and associated provisions there



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under accompanied by the PRELIMINARY ACCEPTANCE CERTIFICATE in respect of the WORKS.

- Payments of the amount(s) due on the Final Bill to the extent certified by the ENGINEER-IN-CHARGE, shall be made within 84 (Eighty Four) days from the due date as specified in Clause 10.4 hereof, subject to the deductions provided in Clause 10.6.
- All payments due to the CONTRACTOR on the Final Bill shall be subject to, tax deductions as provided for in Clause 11.0 and associated clauses there under and any other deduction 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.
- 11.0 **Deleted**
- 12.0 **Deleted**

### 13.0 STATUTORY VARIATION IN TAXES AND DUTIES

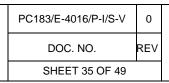
- No variation on account of taxes and duties, statutory or otherwise, (other than due to change in turnover) shall be payable by OWNER to CONTRACTOR, except for GST. Any statutory variation in GST, shall be payable up to COMPLETION PERIOD against documentary evidence. Any reduction in the amount of GST resulting from a reduction in the rate of GST or remission or exemption from GST with respect to Goods and Services provided to the OWNER shall be refundable to the OWNER at actuals within the COMPLETION PERIOD and also during the delayed contractual Project completion, if any. The CONTRACTOR shall submit a copy of the 'Government Notification' to evidence the rate as applicable on the Bid due date and on the date of revision.
- 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.
- 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, or 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.



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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.

### 14.0 TERMS OF PAYMENT

14.1 Payments shall be made by OWNER to the CONTRACTOR through RTGS / NEFT.

### 14.2 MOBILISATION ADVANCE

The CONTRACTOR shall be paid an interest bearing recoverable Mobilisation Advance on request, limited to maximum 10% (Ten percent) of the TOTAL CONTRACT PRICE (excluding GST) provided Bank Guarantee is submitted by the CONTRACTOR for 110% of advance (including GST).

The interest rate shall be at Marginal cost of fund based landing rate (MCLR) for Six Month charged by SBI (applicable on the date of disbursement of Moblisation Advance) plus 2.0% per annum on reducing balance basis.

The interest bearing Mobilization Advance shall be paid in two installments. The first installment of advance shall be maximum 50% of the Mobilisation Advance. Further the disbursal of second installment of balance amount can be made at the end of 3 months from the first installment subject to utilization certificate of first installment but not earlier than 3 months from the date of disbursal of first installment.

Mobilization Advance shall be paid subject to fulfillment of the following conditions:

- a. Unconditional Acceptance of Fax of Acceptance (FOA) by CONTRACTOR.
- b. Submission of Bank Guarantee(s) for 110% value of the said advance(s) including GST, valid for 15 months from date of FOA, as per format F-18. The CONTRACTOR shall, at the request of the OWNER, suitably extend the validity of the Bank Guarantee (s) for such period or periods as may be required to fully recover the amount of the Advance Payment not recovered before the expiry of the validity of such Bank Guarantee, failing which, without prejudice to any other right or remedy available to the OWNER, the OWNER shall be entitled to encash the Bank Guarantee (s)."



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c. Submission of Bank Guarantee(s) by way of Contract Performance Security as stipulated in Clause 8.0 of the GENERAL CONDITIONS OF CONTRACT. The CONTRACTOR shall at the request of the OWNER extend the validity of the Bank Guarantee(s) for such further period or periods as may be required failing which, without prejudice to any other right or remedy available to the OWNER, the OWNER shall be entitled to encash the Bank Guarantee(s).

### Notes:

- The CONTRACT PRICE for the purpose of cum Contract Performance Security would be derived on date of CONTRACT and would not be revised except in case scope of work is altered.
- 2. The advance paid to the CONTRACTOR shall be used only for execution of this CONTRACT and the CONTRACTOR shall satisfy the OWNER in this regard whenever required. If it is found that the said advance has been utilised by the CONTRACTOR in whole or part for any other purpose, the OWNER may at its discretion forthwith recall the entire advance and without prejudice to any other right or remedy available to the OWNER, recover the same by recourse to any Bank Guarantee(s).
- 3. Mobilization Advance (principal plus interest) shall be recovered from the Running Account Bills and shall be fully extinguished within 12 months from the date of disbursement of first instalment of advance. The percentage deduction from each RA bill shall be arrived at based on the total cumulative payment for 12 months as per billing schedule [for example, if advance amount to be recovered (principal + interest) is Rs 48 Crore and the cumulative amount to be invoiced for first 12 months is 300 Crore as per billing schedule, then percentage deduction from each RA bill shall be made @16% (48/300 x 100)] or
  - **Note 1**: incase if the certified bills received are not sufficient enough to recover the said amount in 12 months, then 8.33% per month would be recovered from the said bill.
  - **Note 2**: Further incase the certified RA bill is not sufficient to recover the Mobilisation advance due on that particular month, then the unadjusted balance will be recovered in the subsequent certified RA bill.
- 4. Bank Guarantee furnished by the Contractor towards mobilization advance may be reduced quarterly subject to adjustment made from Contractors running bill. The BG against Mobilization advance shall be returned immediately after full recovery of advance.
- 5. In case of termination of CONTRACT due to default by CONTRACTOR, advance Bank Guarantee shall be encashed and unadjusted advance payment recovery will become interest bearing (the interest rate shall be simple interest of Six Month MCLR + 5.25%) calculated from the date of disbursement of first installment of advance.
- 14.3 Subject to the other provisions of the Contract documents, payments shall be made as follows:



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### 14.3.1 Mobilization Advance

Interest bearing Mobilization advance limited to 10% of Contract value shall be given, if asked by the Bidder, as indicated above.

Successful Bidder to indicate their requirement as to the quantum of first installment of Mobilization Advance (not more than 5% of the contract price) and the second installment of Mobilization Advance such that first installment and the second installment add up to 10% of the CONTRACT PRICE.

### 14.3.2 A FOR SUPPLIES INCLUDING SPARES, LUBRICANTS, CHEMICALS, ETC:

i) Deleted.

### ii) AGAINST PROOF OF SHIPMENT / DESPATCH OF MATERIALS:

30% (Thirty percent) on pro-rata basis as indicated in the approved Billing schedule (refer clause 15.0 below). Stage payment against "Proof of despatch of Materials" shall be released on submission of the following documents:

- a) Signed Invoice(s)
- b) Delivery Challan
- c) Packing list.
- d) Manufacturer's certificate of inspection for shipment duly approved by the CONTRACTOR in one original and one photocopy
- e) Third Party Inspection Release Note clearly indicating that material has been inspected and accepted as per QAP approved by OWNER/PMC, or waiver certificate issued by OWNER/PMC.
- f) Railway Receipt/LR
- g) Certificate of Insurance Policy
- h) Guarantee certificate (wherever applicable)
- i) Operation & Maintenance manual (wherever applicable)

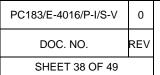
### iii) AGAINST RECEIPT OF MATERIAL AT SITE:

45% (Forty Five Percent) on pro-rata basis as indicated in the approved Billing schedule on submission of:

- (a) Signed Invoices.
- (b) Photocopy of Third Party Inspection certificate as per QAP approved by OWNER along with Test Certificate.



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- (c) Entry gate pass duly endorsed by OWNER's security for verification of physical entry of material to SITE.
- (d) Certificate of Verification and Good Condition after receipt of material at site by Owner.
- iv) 5% (Five percent) as indicated in the approved Billing schedule on issue of MECHANICAL COMPLETION Certificate against CONTRACTOR's certified running Accounts Bill(s).
- v) 8% (Eight percent) as indicated in the approved Billing schedule on issue of PRELIMINARY ACCEPTANCE CERTIFICATE against the CONTRACTOR's certified Running Account Bills.
- vi) 2% (Two percent) as indicated in the approved Billing schedule on completion of balance jobs, if any, against the CONTRACTOR's Certified Final Bill.

#### **B** Deleted

### 14.3.3 FOR SERVICES (including transportation, insurance, installation Erection & Commissioning)

- 85% (Eighty Five Percent) of the Services Price component shall be paid on pro-rata basis against progress of Service duly certified by the Owner for the quantum of work completed and field quality billed as per the approved Billing Schedule/monthly progress report.
- ii) 5% (Five percent) on issue of MECHANICAL COMPLETION Certificate against CONTRACTOR's certified running Accounts Bill(s).
- iii) 8% (Eight percent) as indicated in the approved Billing schedule on issue of PRELIMINARY ACCEPTANCE CERTIFICATE against the CONTRACTOR's certified Running Account Bills.
- iv) 2% (Two percent) on completion of balance jobs, if any, against the CONTRACTOR's Certified Final Bill.

#### **14.3.4** Deleted

#### **14.3.5** Deleted

14.4 All payments shall be released only after finalization of the planning and monitoring documents and Progress Schedule.



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All invoices shall be submitted in quadruplicate to EIC by the Bidder. The payment shall be released within 30 days of submission of invoice.

### 14.5 **Payment Methodology**

CONTRACTOR shall enclose all documents as per check list issued by PMC/OWNER. After receipt of complete RA Bill as per terms and conditions of the contract and duly certified by Engineer-in-Charge (EIC) / PMC, on-account payment equivalent to seventy percent (70%) of the net payable certified amount of the RA Bill will be released to the Contractor within a period of seven (07) working days from submission of certified bill by PMC to TFL.

14.6 All invoices shall be submitted in quadruplicate to EIC by the Bidder.

### 15.0 BILLING SCHEDULE

The CONTRACTOR shall submit all invoices for a particular month under a single covering letter (once in a month) based on the billing schedule duly certified by OWNER with related documents.

The Billing Schedule shall consist of the following Heads:

1.0	SUPPLIES (Break-up in line with the Material Control Index-MCI)
a.	Total of Supplies (excluding Spares , Chemicals, Lubricants)
b.	Mandatory/Insurance Spares as per list enclosed in Section VI-10
C.	Lubricants & Consumables
d.	Others
2.0	SERVICES
a.	Basic Engineering (Break-up In line with the Document Control Index-DCI)
b.	Detailed Engineering (Break-up In line with the Document Control Index-DCI)
C.	Installation
d.	Erection
e.	Mechanical completion
f.	Commissioning
g.	PGTR
h.	Insurance
i	Others
j	Transportation Charges



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The CONTRACTOR shall raise "Tax Invoices" on the OWNER against the GST to enable OWNER to reimburse the same

The GST paid on the local procurements by the CONTRACTOR have to be shown separately with all the supporting documents to enable the owner to reimburse the same.

The Bill of Entry shall have to be filed by the CONTRACTOR within the stipulated time with the appropriate authorities.

#### Note:

- 1. Bidder shall indicate all Prices in INR only
- Spares for Start-up/ Commissioning and Mandatory Spares/Insurance Spares are in CONTRACTOR's scope of supplies and are to be included in the quoted TOTAL CONTRACT PRICE.
- 3. It will be the responsibility of the contractor to include prices of all materials/equipments/Services/Civil & Structural Works required for completion of work as per the CONTRACT.
- 4. The total price payable under the CONTRACT shall be restricted to TOTAL CONTRACT PRICE.
- 5. The Civil & Structural Works shall include but not limited to the Price of Piling, Equipment Foundation, Buildings, Structural Works, etc.
- 6. The SUPPLIES shall include but not limited to the Price of all materials complete in all respect including Commissioning and Mandatory Spares, etc.
- 7. The supply of Services shall include but not limited to the Price of all services complete in all respect including Basic Engineering, Detailed Engineering, installation/Erection Services including site fabrication, Transportation, Insurance, Pre- Commissioning, Commissioning, Performance Guarantee Test Run (PGTR), etc.
- 8. CONTRACTOR shall be entirely responsible for all taxes, cess, stamp duties, and other such levies applicable, on performance of WORK under CONTRACT, outside OWNER's country. CONTRACTOR and shall also be responsible for payment of all taxes, duties and levies such as custom duty, GST, income tax, etc. as applicable on performance of WORK under CONTRACT, in India. All such taxes, stamp duties, cess, licence fees, and other such levies applicable shall be included in the quoted TOTAL CONTRACT PRICE.



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### 16.0 **DEEMED ACCEPTANCE**

In case COMMISSIONING & PGTR of a PLANT is delayed by 12 months from successful MECHANICAL COMPLETION of the PLANT due to reasons solely attributable to the OWNER, the PLANT shall be considered as DEEMED ACCEPTED with a DEFECT LIABILITY PERIOD of another 12 months from DEEMED ACCEPTANCE.

In case of DEEMED ACCEPTANCE, a reasonable cost for conductance of Performance Guarantee Tests shall be worked out mutually and shall be retained by OWNER. Payment against PRELIMNARY ACCEPTANCE, less the aforesaid retention amount shall be released upon DEEMED ACCEPTANCE of the PLANT. The CONTRACT PERFORMANCE SECURITY shall be extended by the CONTRACTOR so as to ensure validity of three (03) months beyond the date of completion of DEFECT LIABILITY PERIOD.

This provision of DEEMED ACCEPTANCE shall not be applicable in case reasons for delay solely attributable to the OWNER are resolved before the completion of 12 months from successful MECHANICAL COMPLETION. In that case, remaining activities including PERFORMANCE GUARANTEE TEST RUN shall be completed as per the terms & conditions of the CONTRACT and CONTRACT PERFORMANCE SECURITY shall be extended, accordingly, by the CONTRACTOR so as to ensure minimum validity of 3 months beyond the expiry of DEFECT LIABILITY PERIOD.

Even after the DEEMED ACCEPTANCE, CONTRACTOR shall not be absolved from his obligations of carrying out COMMISSIONING including PGTR. However, in such case, the CONTRACTOR shall have no obligation to prove the Performance Guarantee Parameters.

The CONTRACTOR may, in consultation with the OWNER, demobilise the team from the Site. It shall remobilise at the time of conductance of COMMISSIONING & PGTR by OWNER which shall be within DEFECT LIABILITY PERIOD. The OWNER shall reimburse the reasonable cost to be incurred by the CONTRACTOR for remobilization.

In case of DEEMED ACCEPTANCE, OWNER shall be responsible for care, custody and proper maintenance of the PLANT. However, OWNER, at its option, may retain the CONTRACTOR's services for watch, ward and preservation of the PLANT and reimburse the CONTRACTOR a mutually agreed reasonable cost incurred to do so.

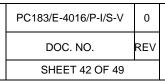
After Deemed Acceptance, on performance of PGTR by the CONTRACTOR, if the Guaranteed parameters are not achieved, then the CONTRACTOR shall furnish the Recommendation/Report for corrective action to be implemented by OWNER to achieve the desired Guaranteed parameters.

### 17.0 DEFECT LIABILITY PERIOD AND LIABILITY FOR DEFECT

17.1 The DEFECT LIABILITY PERIOD shall be for a period of 12 (Twelve) months from the date of PRELIMINARY ACCEPTANCE/DEEMED ACCEPTANCE



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If at any time before the PRELIMINARY ACCEPTANCE or during the DEFECT LIABILITY PERIOD stated below, the OWNER:

- (a) Claims that any matter is a DEFECT; and
- (b) as soon as reasonably practicable gives to the CONTRACTOR notice of the particulars of the DEFECT; the CONTRACTOR shall as soon as possible make good the DEFECT so notified and the OWNER shall so far as may be necessary place the PLANT at the CONTRACTOR's disposal for this purpose. The CONTRACTOR shall, if so required by the EIC, submit his proposals for making good any DEFECT to the EIC for his approval.
- 17.2 If any DEFECT arises from any breach of the CONTRACT by the CONTRACTOR, the CONTRACTOR shall bear his own cost of making good the DEFECT. In the case of any other matter made good by the CONTRACTOR, the work done by the CONTRACTOR shall be the subject of CHANGE ORDER.
- 17.3 The performance guarantees are demonstrated only through the performance tests carried out before the achievement of the PRELIMINARY ACCEPTANCE CERTIFICATE.

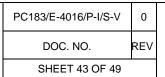
CONTRACTOR shall carry out further test(s) on the repaired/replaced item during the DEFECT LIABILITY PERIOD having the sole purpose to verify that said item is capable of working in compliance with contractual requirements. Such test(s) shall not be intended as a repetition of the performance tests already performed.

If DEFECT is made good after the issue of a PRELIMINARY ACCEPTANCE CERTIFICATE, the EIC may require the CONTRACTOR to repeat any appropriate performance test for the purpose of establishing that the DEFECT has been made good. The CONTRACTOR shall be responsible for the cost of any repeat inspection or test in the event of an inspection or test failure.

- 17.4 If in the course of making good any DEFECT which arises during the DEFECT LIABILITIES PERIOD and CONTRACTOR repairs, replaces or renew any part of the PLANT, this Clause 17 shall apply to the repair or to that part of the PLANT so replaced or renewed and shall further apply until the expiry of a period of 12 months from the date of such repair, replacement or renewal (the extended DEFECT LIABILITY PERIOD). However, extended DEFECT LIABILITY PERIOD shall have an upper limit of 24 months, starting from the date of Commissioning.
- 17.5 If the CONTRACTOR does not make good with a reasonable time any DEFECT which he is liable to make good under Sub-Clause 17.1 then the OWNER may, in addition to any other remedies or relief available to him under the CONTRACT, proceed to do the work, provided that the OWNER gives at least fourteen DAYS notice of his intention.
- 17.6 If the OWNER reasonably requires that any DEFECT notified to the CONTRACTOR under Sub-clause 17.1 which arises during the DEFECT LIABILITY PERIOD be made good urgently and the CONTRACTOR is unable or refuses to comply within a reasonable time, the OWNER may, in addition to any other remedies or relief available to him under the CONTRACT,



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proceed to do the work in such a manner as the ENGINEER-IN-CHARGE may decide, including the employment of a third party.

- 17.7 If the OWNER has made good a DEFECT in accordance with Sub-clause 17.5 or 17.6, the CONTRACTOR shall reimburse the OWNER his reasonable cost of so doing provided that the OWNER gives a notice to the CONTRACTOR of his intention and submits a claim supported by DOCUMENTS. The ENGINEER-IN-CHARGE and the CONTRACTOR may agree the amount to be paid by the CONTRACTOR, or in the absence of agreement the ENGINEER-IN-CHARGE shall decide such amount as may be reasonable. Such amount shall be:
  - a) deducted from any money that would otherwise be payable under the CONTRACT; or
  - b) paid by the CONTRACTOR to the OWNER
- 17.8 If the PLANT cannot be used because of a DEFECT to which this Clause 17 applies, the DEFECT LIABILITY PERIOD, or if applicable the extended DEFECT LIABILITY PERIOD, shall be extended by a period equal to the period during which it cannot be used. Similarly the DEFECT LIABILITY PERIOD, or if applicable the extended DEFECT LIABILITY PERIOD shall be extended by any period wherein the PLANT cannot be used by reason of the CONTRACTOR putting the PLANT into such condition that it passes any relevant performance test or attempting to do so.

### 18.0 PERFORMANCE TESTS

- The performance tests to be carried out on the PLANT shall be as specified in Technical, Section VI-2.0 of NIT.
- The performance test shall be carried out by the CONTRACTOR in the presence of OWNER/PMC.

The CONTRACTOR shall give a notice to the EIC/OWNER about his readiness to carry out the performance tests, including a proposal for the time at which the tests would commence. The CONTRACTOR shall then confirm, at least fifteen (15) DAYS before the commencement of the performance tests.

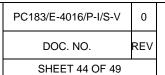
- 18.3 Every performance test shall be carried out to completion unless the EIC or the CONTRACTOR shall order it to be stopped because its continuance would be unsafe or unacceptable to either party.
- 18.4 If PGTR fails due to any reason, CONTRACTOR has to make necessary adjustments and modifications and take all remedial measures at his own cost and demonstrate PGTR.

The OWNER shall permit to CONTRACTOR to make adjustments and modifications to any part of the Plant before the repetition of any performance test.

The CONTRACTOR shall submit details of the adjustments and modifications which he proposes to make.



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18.5 If any performance test is stopped before its completion, due to reasons attributable to OWNER, such test shall be repeated as soon as practicable thereafter. However, the OWNER shall have the option to operate the plant in accordance with the Operating Manuals provided by CONTRACTOR, whereupon care and custody of the PLANT shall pass on to the OWNER and DEFECT LIABILITY PERIOD shall start. The OWNER shall exercise the option to allow CONTRACTOR to carry out the Performance Tests with grant of extension of time by such number of days of deferment. Such deferment shall not exceed more than 90 days. In case the deferment exceeds 90 days, the Owner shall reimburse the additional cost of remobilisation incurred due to such deferment. However, the outer limit of such deferment shall be 12 months from COMMISSIONING and the provisions of Clause 16 shall apply thereafter. If the PLANT fails to pass any performance test, such test shall, subject to Subclause 18.7, be repeated as soon as practicable thereafter. The OWNER shall permit to CONTRACTOR to make adjustments and modifications to any part of the Plant before the repetition of any performance test and shall, if the CONTRACTOR reasonably requires, shut down any part of the PLANT for such purpose and restart it after completion of the adjustments and modifications, which shall be made by the CONTRACTOR with all reasonable speed.

The timing of such shutdown shall be agreed between the CONTRACTOR and the EIC, provided that if any or both i.e. the timing of shutdown or repetition of Performance Test, is required to be deferred, the agreed period of Performance Test Period shall be accordingly extended.

The CONTRACTOR shall, if so required by the EIC, submit to the EIC for his information details of the adjustments and modifications which he proposes to make.

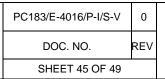
The CONTRACTOR shall make such adjustment and modifications at his own cost.

- 18.6 The result of the performance tests shall be compiled by the CONTRACTOR and to be submitted to OWNER/PMC for evaluation.
- 18.7 If the PLANT passes performance tests towards meeting all Performance Guarantees specified at Section VI-2.0 of NIT, but does not pass the performance test towards meeting Works Guaranteed cost for reasons which are the responsibility of the CONTRACTOR, then
  - i) If, the results of the performance tests towards meeting Guaranteed Works Cost are within the limits for the application of MUTUALLY AGREED DAMAGES, CONTRACTOR shall at its option either:
    - (a) may carry out remedial measures necessary to attain the Guaranteed Works Cost and repeat the performance test; or
    - (b) pay the applicable MUTUALLY AGREED DAMAGES in terms of clause 31 GCC.

Upon payment or allowance of such sum the CONTRACTOR shall become entitled to PRELIMINARY ACCEPTANCE CERTIFICATE which shall inter alia state that applicable MUTUALLY AGREED DAMAGES have been paid in respect



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of shortfall in performance and CONTRACTOR shall be released from all liability with respect to PGTR.

Further, in case of a) above, the CONTRACTOR will be allowed only one more chance to pass the performance test towards meeting Guarantee Works Cost.

- ii) If the results of the performance tests towards Guaranteed Works Cost are outside the limits for application of MUTUALLY AGREED DAMAGES specified in the CONTRACT, OWNER may at his option:
  - a) instruct the CONTRACTOR to investigate or to co-operate with the EIC or others in the investigation of the reasons in its WORK for the shortfall in the performance;
  - b) instruct the CONTRACTOR to propose remedial measure and work necessary to correct the shortfall whether as the result of any such investigation or not;

and/or

c) Recommend the CONTRACTOR to carry out, at CONTRACTOR'S option, whatever remedial measures and work within its scope of WORK may be necessary to correct the shortfall.

Thereafter the EIC or CONTRACTOR may require that the PERFORMANCE GUARANTEE TEST RUN be repeated, the result of which shall be subject to this Subclause 18.7 (i).

The CONTRACTOR shall bear his own cost of work undertaken in accordance with (a), (b) or (c) above.

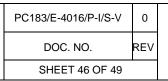
iii. After 3 (three) failed Performance Tests as specified at Section VI-2.0 of NIT for reasons attributable to the CONTRACTOR, the OWNER shall have right to proceed with the encashment of Contract Performance Security and other provisions also take all action as per Clause 34 of GCC shall further apply.

### 19.0 FINAL ACCEPTANCE CERTIFICATE

- As soon as DEFECT LIABILITIES PERIOD for the PLANT has expired or the CONTRACTOR has made good all DEFECTS that have within such period appeared in the PLANT in accordance with Clause 17 (Liability for Defects), whichever is later, the EIC shall issue a FINAL ACCEPTANCE CERTIFICATE to the CONTRACTOR certifying that the CONTRACTOR has performed his obligations in respect of the DEFECT LIABILITY PERIOD and associated clauses thereunder, and until issue of such FINAL ACCEPTANCE CERTIFICATE, the CONTRACTOR shall be deemed not to have performed such liabilities notwithstanding issue of the PRELIMINARY ACCEPTANCE CERTIFICATE or payment of the Final Bill by the OWNER.
- 19.2 The FINAL ACCEPTANCE CERTIFICATE shall constitute conclusive evidence for all purposes and in any proceedings whatsoever between the OWNER and the CONTRACTOR



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that the CONTRACTOR has completed the PLANT and made good all DEFECTS therein in all respects in accordance with his obligations under the CONTRACT.

No FINAL ACCEPTANCE CERTIFICATE shall be conclusive as stated above if FINAL ACCEPTANCE CERTIFICATE was issued in reliance upon any fraudulent act, misrepresentation or concealment.

- In the event that OWNER fails to issue the FINAL ACCEPTANCE CERTIFICATE, or fails to notify CONTRACTOR the reason for not issuing said certificate of acceptance, within a period of 60 days from CONTRACTOR's application, the FINAL ACCEPTANCE CERTIFICATE shall be deemed as issued by OWNER for all contractual purposes.
- 19.4 Upon application for the FINAL ACCEPTANCE CERTIFICATE, the CONTRACTOR shall:
  - (i) Be deemed to have warranted that it had been fully paid and satisfied all claims for or arising out of the WORK, labour, MATERIALS, supplies and EQUIPMENT used in or connected with the CONTRACT and all other liabilities whatsoever touching or affecting the CONTRACT, or its performance, including in relation to SUB-CONTRACTORS and suppliers, and
  - (ii) To have undertaken to indemnify and keep indemnified the OWNER from and against all claims, demands, debts, liens, obligations and liabilities whatsoever arising there from or relating thereto.
- 19.5 Upon issue of the FINAL ACCEPTANCE CERTIFICATE, the CONTRACTOR shall be deemed to have released, acquitted and discharged the OWNER from and against all claims (known or unknown), liens, demands or causes of action of any kind whatsoever arising out of or relating to the CONTRACT or otherwise howsoever touching or affecting the same.
- Forthwith on application made by the CONTRACTOR in this behalf accompanied by the FINAL ACCEPTANCE CERTIFICATE, or within 84 (Eighty Four) days of the OWNER passing the CONTRACTOR's Final Bill, whichever shall be later, the OWNER shall cancel and return to the CONTRACTOR all previous Bank Guarantees remaining unutilised in the hands of the OWNER, and upon such cancellation and return, the OWNER shall stand discharged of all obligations/ liabilities under the CONTRACT provided that the cancellation and return of any Bank Guarantee(s) furnished by the CONTRACTOR as and by way of Contract Performance Security shall be subject to the CONTRACTOR replacing such Bank Guarantee(s) covering 3% (three percent) of the value (or as determined by the OWNER) of equipments/works replaced or repaired during the DEFECT LIABILITY PERIOD for the unexpired term of extended defect liability period in respect thereof plus a 6 (six) months period. The claims or demands made during such additional 6 months period shall refer to events which has occurred before the expiry of the DEFECT LIABILITY PERIOD.

### 20.0 **COMPLETION PERIOD**:

Completion period for the entire package shall be 15 (Fifteen) months from the date of issuance of FOA.



# INSTRUMENT AIR & PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED, ODISHA (INDIA) SPECIAL CONDITIONS OF CONTRACT

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### 21.0 MUTUALLY AGREED DAMAGES (MAD)

### 21.1 For Delay in Completion

- The CONTRACTOR agrees that the work shall be commenced and carried on at such points, and in the order of precedence and at such times and seasons as may be directed by the OWNER in accordance with the schedule for the completion of work as outlined in the CONTRACT. The CONTRACTOR declares that he has familiarised himself with the site and rights of way, ground conditions, with all the local conditions, and with all the circumstances which may or are likely to affect the performance and completion of the work and that he has allowed for such conditions in the preparation of this schedule. The progress of work shall be checked at regular monthly intervals and the percentage progress achieved shall be commensurate with the time elapsed after the award of the CONTRACT.
- 21.1.2 However, it is not incumbent upon the ENGINEER-IN-CHARGE to notify the CONTRACTOR when to begin or to cease or to resume work, nor to give early notice of the rejection of a faulty work, nor in any way to superintend so as to relieve the CONTRACTOR of responsibility of any consequence of neglect or carelessness by him or his subordinates.
- The time stipulated in the CONTRACT for the execution and completion of the works -shall be deemed to be of utmost importance of the CONTRACT. In the event the CONTRACTOR fails to attain the PRELIMINARY ACCEPTANCE of PLANT within the CONTRACTUAL COMPLETION SCHEDULE due to the reasons not attributable to OWNER, then the CONTRACTOR shall pay to the OWNER as MAD at the rate of 0.5% of the TOTAL CONTRACT PRICE (excluding taxes) per week of delay or part thereof. The total deductions under this head shall not exceed 5% of the TOTAL CONTRACT PRICE (excluding taxes).

The OWNER may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the CONTRACTOR. In the event of extension of time being granted by the OWNER in writing for completion of the WORKS without levy of MAD (Mutually Agreed Damages), this clause will be applicable after expiry of such extended period. GST at the prevailing rate, if applicable on "MUTUALLY AGREED DAMAGES" shall be recovered extra from the CONTRACTOR on the amount of such MUTUALLY AGREED DAMAGES levied as per the Contractual terms.

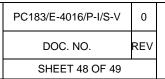
OWNER shall raise separate Tax Invoice for recovery of MAD along with applicable GST.

Mutually Agreed Damages represent, without prejudice to the respect of the contractual obligation under the CONTRACT by CONTRACTOR, the sole and exclusive remedy of OWNER for such delay.

The decision of the OWNER on the applicability of MAD shall be final and binding on the CONTRACTOR.



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### 21.2 For Failing to Meet Guaranteed Works Cost

LSTK bidder shall guarantee overall consumption of Utilities so as to guarantee the works cost for all the facilities provided by the CONTRACTOR as detailed in Technical Section VI-2.0.

In the event works cost is more than 100% but upto 102.5% of the Guaranteed Works Cost for each PLANT, then the CONTRACTOR will pay to OWNER Mutually Agreed Damages for the applicable PLANT as under:

For every 0.50% increase in Works cost above the Guaranteed Works Cost or part thereof, CONTRACTOR will pay Mutually Agreed Damages equal to 1.0% of the TOTAL CONTRACT PRICE (excluding taxes).

If the Guaranteed Works Cost as demonstrated during the performance test is more than /102.5% of the Guaranteed Works Cost , then CONTRACTOR at their own cost shall take corrective action irrespective of the cost involved. In case the Guaranteed Works Cost is more than 102.5% even after taking the corrective action, the same shall be considered as breach of Contract and necessary action as per clause 34 of GCC shall be taken by OWNER.

### 22.0 OVERALL CEILING ON TOTAL LIABILITY

- The Maximum Overall Liability under the CONTRACT on account of (a) Delay in execution of project (b) Contractor failing to meet the Guaranteed Works Cost up to 102.5 % (c) Termination of CONTRACT (d) Carrying out balance work at the risk and cost of the CONTRACTOR, re-engineering, make good, mechanical warranty (e) Patent infringement and (f) any other liabilities (if any) defined in the NIT shall be capped to 100% of the TOTAL CONTRACT PRICE.
- 22.2 Except for criminal negligence or wilful misconduct, the Contractor shall not be liable to the Owner, whether in contract, tort, or otherwise, or any indirect or consequential loss or damage, loss of use, loss of production, or loss of profit or interest cost, provided that this exclusion shall not apply to any obligation of the Contactor to pay liabilities to the Owner, as defined in clause 22.1 above.

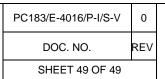
### 23.0 PLANNING AND DESIGNING IN PURVIEW OF VULNERABILITY ATLAS OF INDIA

Vulnerability Atlas of India (VAI) is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT- wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation stage.

This atlas is one of its kind single point source for the various stakeholders including policy makers, administrators, municipal commissioners, urban managers, engineers, architects,



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planners, public etc. to ascertain proneness of any city/location/site to multi-hazard which includes earthquakes, winds, floods thunderstorms, cyclones and landslides. While project formulation, approvals and implementation of various urban housing, buildings and infrastructures schemes, this Atlas provides necessary information for risk analysis and hazard assessment.

The Vulnerability Atlas of India has been prepared by Building Materials and Technology Promotion Council under Ministry of Housing and Urban Affairs, Government of India and available at their website www.bmtpc.org.

It is mandatory for the bidders to refer Vulnerability Atlas of India for multi hazard risk assessment and include the relevant hazard proneness specific to project location while planning and designing the project in terms of

- i. Seismic zone (II to V) for earthquakes,
- ii. Wind velocity (Basic Wind Velocity: 55, 50, 47, 44, 39 & 33 m/s)
- iii. Area liable to floods and Probable max, surge height
- iv. Thunderstorms history
- v. Number of cyclonic storms/severe cyclonic storms and max sustained wind specific to coastal region
- vi. Landslides incidences with Annual rainfall normal
- vii. District wise Probable Max Precipitation.

### 25.0 STANDARD CONDITIONS OF SCC: PART I TO PART III

The Contractor has to fully comply with all applicable Labour Laws and Regulations passed, modified and notified from time to time by the Central, State and Local Government agencies/authorities. Brief guidelines and Annexures related to labour laws/Acts for Workmen/labour are enclosed as STANDARD CONDITIONS OF SCC: PART I to PART IV.

### **STANDARD CONDITIONS OF SCC: PART I**

### **Compliances under various Labour Laws**

The Contractor has to fully comply with all applicable Labour Laws and Regulations passed, modified and notified from time to time by the Central, State and Local Government agencies/authorities. Specific attention of the Contractor is drawn to the following obligations amongst others:

1. The Minimum Wages Act, 1948, Payment of Wages Act, 1936 and Payment of Bonus Act 1965 or The Code on Wages, 2019 (after it comes into force)

### 1.1. Minimum Wages:

- a. During the tenure of the contract, the Contractor must ensure the payment of minimum wages, as notified by the Central Government or State Government whichever is higher, as per the provisions of the Minimum Wages Act, 1948 / Code on Wages, 2019 (after it comes into force).
- b. Wage period and monthly wages: Wage period shall be monthly and wages for a month shall be calculated by multiplying daily rate of Minimum Wages by 26. The monthly wages include the wages of the weekly days of rest as applicable to the office/establishment of TFL. Deduction in case of any days of absence other than weekly days of rest shall be calculated using the following formula:

Deduction for absence = days of absence x (monthly wages / number of days in the relevant month)

However, in case the resource has worked for less than 7 working days in a particular month, the payment of wages is to be made as per the actual number of days worked based on notified wage rate per day.

### *Illustration I (05 days per week working pattern):*

Sl. No.	Month	Nos. of days in the month	Nos. of weekly off	Nos. of days absence	Nos. of days present	Daily wage as notified	Monthly wage	Deduction	Wage to paid
1	Feb.	28	8	2	18	603	15678	1119.86	14558.14
2	March	31	10	5	16	603	15678	2528.71	13149.29
3	April	30	8	10	12	603	15678	5226	10452.00
4	May	31	10	-	4	603	2412	0	2412.00

### Illustration II (06 days per week working pattern):

Sl. No.	Month	Nos. of days in the month	Nos. of weekly off	Nos. of days absence	Nos. of days present	Daily wage as notified	Monthly wage	Deduction	Wage to paid
1	Feb.	28	4	2	22	603	15678	1119.86	14558.14
2	March	31	5	5	21	603	15678	2528.71	13149.29
3	April	30	4	10	16	603	15678	5226	10452.00
4	May	31	5	-	4	603	2412	0	2412.00

### 1.2. Payment of Wages:

The Contractor shall disburse monthly wages through e-banking / digital mode through cashless transaction only, and avoid illegitimate deductions and maintain records /returns as prescribed. The Contractor shall be solely responsible for the payment of wages and other dues to the resources, if any, deployed by him latest by 7<sup>th</sup> day of the subsequent month as per the provisions of the Payment of Wages Act, 1936 / as applicable under Code on Wages, 2019 (after it comes into force) in the presence of Engineer In-charge (EIC) or authorized representative of TFL. After disbursement of wages, the representative of the Contractor and EIC/ authorised representative of TFL have to certify the payment of wages to the resources and sign the Wage Register - Form B (under The Ease of Compliance to Maintain Registers under various Labour Laws Rules, 2017) / FORM-I of Code on Wages, 2019 (after it comes into force) with specific seal detailing name/designation/Company.

### 1.3. Payment of Bonus:

Contractor shall ensure payment of bonus as per the provisions of the Payment of Bonus Act, 1965 / Code on Wages, 2019 (after it comes into force). Present minimum rate of payment of Bonus as per the Payment of Bonus Act, 1965 is 8.33% of minimum wages per month or 8.33% of Rs.7,000/- per month whichever is higher. The rate shall be subject to amendments made from time to time to the legislation.

Payment of Bonus / ex-gratia (if Bonus is not applicable) shall be made preferably before Deepawali festival falling after the end of relevant financial year(s) and the balance payment at the time of closure of contract.

The amount towards the payment of bonus/ex-gratia shall be released / reimbursed to the contractor, after submission of proof of payment.

### 2. Leaves/ Leave with wages/ Holiday:

The Contractor shall comply with all the applicable leave Rules including leave with wages in terms of applicable labour legislations i.e. Factories Act, 1948 / Shops & Establishment Act/Industrial Establishment (national & festival holidays, casual & sick leave) Act, 1965.

The Contractor shall extend the leave with wages and maintain the Register of Leave pertaining to the resource deployed. The payment towards un-availed leave, as per the Factories Act, 1948

- / Shops & Establishment Act, shall be settled with the resource at the time of closure of the contract or separation of resource from the contract by the contractor.
- i. As per the **Factories Act, 1948** (**if applicable**):-Annual Leave with Wages @ 01 day for every 20 days of work performed by him in the previous calendar year becomes due.
- ii. As per the **Shops & Establishment Act (if applicable)**: Privilege Leave not less than 15 days and Sickness/Casual Leave not less than 12 days (this provision may vary from state to state).
- iii. As per the **Industrial Establishment** (national & festival holidays, casual & sick leave) Act, 1965 (if applicable): (a) three national holidays of one whole day each on the 26<sup>th</sup> January, 15<sup>th</sup> August and 2<sup>nd</sup> October (b) five other holidays on any of the festivals specified in the Schedule appended to this Act. (c) Every worker shall in each calendar year, be allowed by the employer 07 casual leave and 14 sick leave in such manner and on such conditions as may be prescribed (This provision may vary from state to state).

### 3. The Employees' Provident Fund & Miscellaneous Provisions Act 1952

- a) The Contractor shall have independent PF code no. with the RPFC as required under the Employees' PF & Misc. Provisions Act, 1952.
- b) The Contractor has to ensure compliance (as per prevailing rates) and extend benefits under the Employees' Provident Fund Scheme 1952, the Employees' Pension Scheme 1995 & the Employees' Deposit Linked Insurance Scheme, 1976 to the resources deployed by him.
- c) The Contractor is required to submit copies of *separate e-Challans / ECR alongwith proof of payment/receipt* in respect of resources engaged through this contract only, on monthly basis. <a href="Common challans would not be acceptable in TFL">Common challans would not be acceptable in TFL</a>. The Contractor should submit copies of previous months EPF e-Challans / ECR alongwith current month's bill. The TRRN. No. of the ECR would be verified online from EPFO portal by the Engineer-in-charge to confirm the status of payment and names of the resources deployed.
- d) PF is mandatory irrespective of the number of resources deployed by the Contractor under this contract. PF membership and deposit of PF contribution is also mandatory even if the wage payment to the resource is exceeding the prescribed monthly wage ceiling (i.e. Rs. 15,000/-) under the Employees' PF & Misc. Provisions Act, 1952 and in such case the liability of the Contractor towards PF contribution shall be limited to the prescribed monthly wage ceiling notified from time to time (i.e. Rs. 15,000/- currently).
- e) In case, the Contractor deploys any "International Worker", the Contractor should also make compliance under para 83 of EPF Scheme, 1952 i.r.o the "International Workers" and must register on the *International Worker Portal of EPFO*.

### 4. The Employees' State Insurance Act, 1948 (If applicable and as per prevailing rates)

- a) The Contractor shall have his own ESI code No. allotted by Employees' State Insurance Corporation (ESIC) as required under the Employees' State Insurance Act, 1948.
- b) The Contractor has to arrange **Smart Cards** (i.e. **ESI Identity Card**) /e-**Pehchan Card** for the resource(s) engaged by him from the Corporation.

### 5. The Employees' Compensation Act 1923 (wherever applicable)

In case, the work place is out of the notified coverage area under ESIC i.e. ESIC is not implemented in the area **or** in case of excluded employees under ESIC, the Contractor is required to take Employee Compensation / Workmen Compensation Policy from IRDAI approved Insurance Company taking into consideration the **maximum compensation liability** as per provisions of Employees' Compensation Act, 1923. It must be ensured that the contractor/contracting firm should extend coverage to the contract workers through Employee Compensation Policy, to meet the **Compensation Liability** under **Employee's Compensation Act, 1923** along with **Medi-claim Policy** within the overall premium @ 3.25 % of Minimum wages (i.e. employer contribution towards ESI).

### 6. Group Personal Accident Insurance Policy

The Contractor is required to take a Group Personal Accident Insurance Policy with coverage of **Rs. 3 Lakhs** per resource for the entire period of contract covering all resources deployed under the contract.

### 7. The Payment of Gratuity Act, 1972

In case of Death or permanent disablement of a resource during execution of work under the contract, the Contractor has to pay the Gratuity as per the provision under the Payment of Gratuity Act, 1972 to the nominee(s) of the resource as per the details maintained in the duly signed Nomination Form maintained by the Contractor. The proof of disbursement may be submitted to the EIC for claiming reimbursement of amount paid towards death Gratuity from TFL.

### 8. The Contract Labour (R&A) Act, 1970

- a) The Contractor is required to obtain Labour license under the provisions of the Contract Labour (R&A) Act, 1970 from the office of Licensing Officer, Central Labour Authority, Ministry of Labour and Employment, Govt. of India having jurisdiction of the Region.
- b) The Contractor shall discharge obligations as provided under the Contract Labour (R&A) Act, 1970 rules and regulations framed under the same and enforced from time to time.
- c) The Contractor shall ensure regular and effective supervision and control over the resources deployed for which a supervisor / representative of the Contractor should be available at all the times for giving suitable direction for undertaking the Contractual Obligations.
- d) The Contractor is solely responsible for payment of wages to each resource deployed by him and such wages shall be paid before the expiry of such period as may be prescribed.
- e) It shall be the duty of the Contractor to ensure the disbursement of wages to resource(s) through e-banking/digital mode. In case the resource does not have a bank account, the disbursement of wages may be made in cash in the presence of the Engineer-in-charge /

- authorized representative of TFL initially and Contractor shall simultaneously arrange for opening the bank account of each contract labour deployed by him.
- f) In case, the Contractor fails to make payment of wages and deposit of PF contribution within the prescribed period or makes short payment of wages / short deposit of PF contribution, then TFL, as Principal Employer, will make payment of wages in full or the unpaid balance due, as the case may be, to the resource(s) deployed by the Contractor and deposit the PF contribution with PF authorities. Such amounts will be recovered from the Contractor either by deduction from any amount payable to the Contractor under any contract or as a debt payable by the Contractor.
- **9.** The contractor is required to comply with all applicable labour laws and regulations including, but not limited to the following:
  - a) The Factories Act, 1948 / The Shops & Establishment Act, 1948 (which ever applicable)
  - b) The Maternity Benefit Act, 1961
  - c) The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1979 & Building and Other Construction Workers Welfare Cess Act, 1996
  - d) The Inter State Migrant Workmen (RECS) Act 1979 (if applicable)
  - e) Contract Labour (R&A) Act-1970
  - f) Employees' Provident Fund & Misc. Provisions Act- 1952
  - g) Employees' State Insurance Act-1948
  - h) Employees' Compensation Act, 1923
  - i) Payment of Gratuity Act, 1972
  - j) Minimum of Wages Act,1948
  - k) The Payment of Wages Act, 1936
  - 1) The Payment of Bonus Act, 1965

### **STANDARD CONDITIONS OF SCC: PART II**

### Responsibilities of the Contractor

- 1. The Contractor shall be solely responsible and indemnify TFL against all charges, dues, claim etc. arising out of the disputes relating to the dues and employment of resources, if any, deployed by him.
- 2. The Contractor shall indemnify TFL against all losses or damages, if any, caused to it on account of acts of the resource(s) deployed by him.
- 3. The Contractor shall indemnify TFL from all claims, demands, actions, cost and charges etc. brought by any court, competent authority / statutory authorities against TFL.
- 4. The Contractor shall also indemnify TFL for any action brought against him for violation, non-compliance of any act, rules & regulation of center / state / local statutory authorities.
- 5. All resources deployed by the Contractor are deemed to be on the rolls of the Contractor.
- 6. **Age**: No resource below the age of **18 years** and above age of **58 years** shall be deployed by the contractor for the execution of the contract.

### 7. Appointment/Nomination of supervisor:

As a part of the contract, the Contractor is required to appoint/nominate a supervisor (s) who will supervise, control and give directions to the resource(s) for discharging the contractual obligations. Accordingly, the Contractor has to give in writing the name and contact details of the supervisor (s) to the EIC. A copy of the same is also to be sent to HR In-charge and Security In-charge for records.

- 8. A copy of the Letter of Acceptance (LOA) should be submitted to the Security Department by the Contractor / his representative or supervisor for facilitating the movement of resource(s) including machine & materials involved in the contract.
- 9. The resources to be deputed/ deployed by the Contractor shall observe all security, fire and safety rules of TFL while at the site/work. All existing and amended safety / fire rules of TFL are to be followed at the work site by the Contractor and his deployed resource(s).
- 10. **Personal Protective Equipment / Safety Kit and Liveries**: Contractor shall ensure adequate supply of personal protective equipment / Safety Kit and Liveries as mentioned in the Scope of Work to all such resources deployed.
- 11. In case of accident, injury or death caused to the resource(s) 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.
- 12. The Contractor shall not deploy any resource suffering from any contagious or infectious disease. The Contractor shall get the deployed resource(s) examined from a civil Govt. Doctor / TFL's Doctor.

- 13. No resource(s) or representatives of Contractor (including Contractor) are allowed to consume alcoholic drinks or any narcotics within the premises of TFL (including Plant, Office and Residential etc.). If found under the influence of above, the Contractor shall immediately replace that resource(s) with intimation to the EIC.
- 14. While engaging / deploying the resources, the Contractor is required to make efforts to provide opportunity of employment to resources belonging to **Schedule Caste**, **Schedule Tribe** and **Other Backward Class** in order to have a fair representation of these sections of the society.
- 15. While engaging the resources, the Contractor is required to make efforts to provide an **opportunity to** candidates with experience of **apprentice training in TFL** under the provisions of the Apprentices Act, 1961.
- 16. The Contractor is required to maintain all Registers and other records in an **office** within the premises of TFL or at a place **within a radius of three kilometers**.
- 17. Contractor shall provide proper **Employment cards** (**FORM XII**) for the resource to be deployed by him, duly signed by the Contractor or authorized person on behalf of Contractor.

### 18. Gate/ Entry Pass or Authorization:

Entry to the premises of TFL is restricted and is subject to appropriate entry authorization in the prescribed format of a Gate Pass or any other entry authorization w.r.t police verification as per instruction of Security department from time to time. Similarly, entry for material/equipment's/ tools/ tackles etc. is restricted & subject to entry authorization by security department.

- 19. The Contractor shall issue **Identity cards** in his firm's name to the resource deployed.
- 20. Discipline of the resource(s) during discharge of duties must be regulated by the Contractor himself or by his representative.

### 21. Police verification

- a) The Contractor (including his sub-Contractors/Petty Contractors etc, if allowed) will undertake police verification in respect of the resource(s) engaged by him in TFL's premises. Such verification will have to be carried out from concerned police station of their permanent place of residence/present place of residence.
- b) Further, the Contractor is advised not to deploy any resource having past criminal record in the establishment/premises of TFL under this contract awarded to him.
- c) In the event of violation of above clauses at (a) and (b), the Contractor will be solely responsible for the same.
- d) If any such resource(s) having criminal record is deployed by the Contractor in the premises of TFL and has come to the notice of TFL at any point of time, the Contractor shall immediately replace that resource(s), failing which that particular resource(s) of the Contractor will not be allowed to enter into the premises of TFL.
- 22. While confirming to any of these conditions, the Contractor must ensure that all applicable Laws of State regarding labour, their welfare, conduct etc. are complied.

### STANDARD CONDITIONS OF SCC: PART III

### **Compliance of Government of India Directives**

### 1. Pradhan Mantri Suraksha Bima Yojna (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojna (PMJJBY)

Contractor shall, ensure that all its resources deployed under this contract have obtained additional insurance coverage under the Pradhan Mantri Suraksha Bima Yojana (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) through the participating banks and submit the proof of such insurance coverage to the satisfaction of TFL. The cost has been included in the estimate mentioned in SOR and the Contractor shall submit evidence / proof to TFL in this respect. Both the schemes are to be regulated continuously on yearly basis and the same should be renewed on each successive relevant date in subsequent years during the period of the contract.

### 2. Labour Identification Number (i.e. LIN) Registration (Mandatory)

The Unified Shram Suvidha Protal, developed by Government of India, facilitates reporting of Inspections & submission of Returns and has also been envisaged as a single point of contact between employer, resources and enforcement agencies bringing in transparency in their day-to-day interactions. For integration of data among various enforcement Agencies, the Contractor, as an inspectable unit, is required to register and obtain Labour Identification Number (i.e. LIN) from Shram Suvidha Portal and submit the same in TFL.

### 3. Pradhan Mantri Rojgar Protsahan Yojna (PMRPY) – if applicable

In order to support the Govt. of India's Initiative on Employment Generation, the Contractor must register for Pradhan Mantri Rojgar Protsahan Yojna (PMRPY) Scheme. The Contractor shall inform TFL/Engineer in Charge about the benefit availed, if any, against the scheme for adjustment against the invoice(s) / bill(s).

### Details in support of RA Bill for the Month of \_\_\_\_\_\_, 20\_\_\_

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### **UNDERTAKING**

### (To be submitted along with un-priced bid)

I/We hereby undertake that I/We have completely understood the terms & conditions of the Tender including minimum resources required to be deployed and the cost involved thereof in deployment of resources.

I/We further undertake to ensure all compliances of the tender conditions. Any non-compliance may be construed as deficiency in the performance of the contract. If such non-compliance is noticed TFL/owner is at liberty to take action in line with the tender conditions including termination of the contract.

Signature of Bidder
Name of Bidder

### **Summary of Insurance Policies**

Contractor is required to cover all resources deployed by him with the following insurances / schemes:

Sl. No.	SCHEME	APPLICABILITY	PREMIUM/ CONTRIBUTION	SUM ASSURED/ BENEFITS	REMARKS
1	The Employees' State Insurance Act, 1948	Applicable to all resources of the Contractor (within ESI wage limit) working in notified area.	3.25% of wages by employer 0.75% of wages by employees	Benefits under the Employees' State Insurance Act, 1948.	
2	The Employees' Compensation Act, 1923 (in lieu of ESI – mentioned at Sl. 1)	Applicable to excluded employees under ESI and those who are working in non-notified area to extend similar benefits as available under ESI Act, 1948	Premium to be calculated considering wage limit under EC Act, 1923 (i.e. Rs. 15,000/- p.m currently)	Maximum Compensation Liability under Employee's Compensation Act, 1923 along with a Mediclaim policy within overall premium @ 3.25 % of Minimum wages (i.e. employer contribution towards ESI)	Provides compensation and medical facility to resources.
3	Group personal Accident Insurance	Applicable to all resources of the Contractor	Based on the coverage	Insured value: Rs. 3 Lakh to cover expenses associated with any accident.	Death, permanent disablement, temporary total disability or any other medical expenses related to accident.
4	Pradhan Matri Suraksha Bima Yojana (PMSBY)	Eligibility – age group 18 to 70 years	Rs. 12/- per annum	Accidental death disability:  (i) Permanent total clakhs.  (ii) Permanent par Rs. 1 Lakh.	disability – Rs. 2
5	Pradhan Mantri Jeevan Jyoti Bima Yojana(PMJJB)	Eligibility – age group 18 to 50 years. (can continue upto 55 years)	Rs. 330/- per annum.	Risk coverage – Fi case of <b>death due to</b>	



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Tälcher Fertilizers

SECTION - VI: TECHNICAL

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INSTRUMENT AIR/PLANT AIR SYSTEM

AT

**TALCHER FERTILIZERS LIMITED** 



# INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED INDEX (TECHNICAL)

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**SECTION VI: TECHNICAL** 

**PART - 1.0** 

**SCOPE OF WORK** 

**INSTRUMENT AIR/PLANT AIR SYSTEM** 

ΑT

**TALCHER FERTILIZERS LIMITED** 



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#### INTRODUCTION:

Government of India has formed a joint venture company of major Public Sector Units – M/s GAIL (India) Limited (GAIL), M/s Rashtriya Chemicals & Fertilisers Ltd. (RCF), Coal India Limited (CIL) and M/s Fertilizers Corporation of India Ltd. (FCIL) by name M/s Talcher Fertilizers Ltd. (TFL) hereinafter also referred to as "OWNER", for setting up a Coal Gasification based Ammonia Urea Fertilizer Complex along with its associated offsite & utility facilities at Talcher, in the Angul District of Odisha State.

Projects & Development India Ltd. (PDIL) has been retained by TFL as Project Management Consultant for selection of a suitable Contractor for execution of the Instrument Air/Plant Air system for Ammonia & Urea fertilizer complex as detailed in subsequent sections of this NIT.

#### 1.1 GENERAL DESCRIPTION OF PACKAGE:

Instrument/plant air system shall comprise of following items for each location:

- Air Filter for Air Compressor: 4(3W+1S) Nos.
- Air Compressor: 4(3W+1S) No's common for Plant air, Instrument air system, electric motor driven integrally geared Centrifugal air compressors.
- Air Comp after Cooler: 4 Nos.
- > Wet air receiver K. O. Drum: 1 No
- Air dryer Pre Filter for each dryer set: 2 No.(1W+1S)
- Adsorber:2 Set (2W)
  - Air dryer After Filter for each dryer set: 2 No.(1W+1S)
  - Dried Air after Cooler for each dryer set: 1 No.
  - Electric Heater for each dryer set: 1 No.
  - Regeneration after Cooler for each dryer set: 1 No.
  - Regeneration Air Moisture Separator for each dryer set: 1 No.

IA Dryer working/regeneration cycle shall be as follows:

Cycle Time for Adsorption: 8 hrs approx

Cycle Time for Regeneration: 8 hrs. (Heating 6 hrs approx. & Cooling 2 hrs approx).

Type - Heat of Compression with No Purge Loss type Instrument Air Dryers, of capacity 4500 Nm3 /hr (2 working x 50%).

- Instrument Air Receiver @ 8.5 kg/cm2g:1 No.
- HP Compressor (belt driven type): 1 No.
- ➤ HP IA Emergency receiver @36.5 Kg/cm2g for 20 Min backup- 1 No.



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The Instrument Air and plant air system, a Package unit shall be provided to supply instrument air and plant air to meet the requirement of normal operation of process plants & at time of plant start-up, shutdown and maintenance work.

Atmospheric air is compressed by air compressor; Compressed air is cooled in after-cooler and through wet air receiver K.O.Drum, sent to various plant facilities as plant air and instrument air drier at a pressure of 9.0-9.5 Kg/cm2g. The dried air is sent to instrument air header through instrument air receiver at a pressure of 8.5 Kg/cm2 (g) and temperature of 45 °C, Instrument Air provided by at battery limit considering design flow rate of 9000 Nm³/hr, Dew Point of Instrument Air shall be (-) 40 Deg C at Atmospheric pressure, from header instrument air is distributed various facilities of plant.

#### 2.0 SCOPE OF WORK

Offered packaged should be an integrally geared centrifugal air compressor (As per latest API 672). The Bidder's scope of work shall include detailed design, engineering, manufacturing, procurement, inspection, testing, painting, supply, erection, commissioning, performance testing at site and handing over of Compressed air package on turnkey basis, along with associated electrical, instrumentation, structural, architectural, piping and insulation works etc., complete in all respects as detailed in the enquiry document i.e. Design & Engineering, procurement, supply, construction & erection, Testing, pre-commissioning, commissioning including, Mechanical, electrical & Instrumentation works as a single point responsibility Vendor(SPRV), Sustained load test & Performance Guarantee Test Run (PGTR), trial runs and demonstration of guarantees, calibration & supply of complete package along with spares & maintenance tools etc. as per related documents enclosed with enquiry for complete instrument/plant air system package and final acceptance of Plant after successful completion of Performance Guarantee Test Run.

The scope of supply will include the following items but not limited to 4 No. Air Compressor, 2 set of Air Drier package & Dry Air Receiver in line with NIT requirement items as listed below including Interconnecting piping, all fittings, mechanical valves, control valves, motors, cables, supply of field and control room instrumentation etc. as required for completing the systems per enquiry specifications. Any other item not specifically mentioned above but which is essential for good engineering practice for continuous operation and maintenance of the system safely at all times shall be included in scope of supply by Bidder.



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#### **Temporary Construction Facilities:**

The Bidder shall arrange following facilities at his own cost for Construction/Erection purpose:

- i. Construction power supply facilities: 1 No. 415 V, 63 A Feeder at Existing Substation near 132 KV Switchyard shall be made available. Tapping of Construction Power (chargeable basis) from this feeder (including supply & erection of all required materials like structural supports for cable tray, cable trays, power cables, control cables, protection & metering, cable termination etc. as well as underground cabling work) and further distribution shall be in LSTK Contractor's scope.
- ii. Construction Water Supply facilities: Construction water shall be supplied at one point at plant location, bidder to make arrangement for construction water supply from given plant location to bidder plant battery limit on chargeable basis. Bidder to install meter for consumption measurement.
- iii. Instrument Air required, if any for commissioning/construction/erection.
- iv. Construction sheds
- v. Material storage
- vi. Construction offices
- vii. Temporary Communication facilities
- viii. Office furniture

Bidder shall provide following drawing/documents/data for Civil & Structural Design to Owner":

- a. Overall equipment layout with co-ordinates
- b. Static equipment:-
  - G.A. drawing of the equipment showing bolt details
  - Drawing having following details of weight:-
    - Empty weight of equipment
    - Operating weight of equipment
    - Hydro test of equipment
  - Shear force and moment at base plate level due to wind and seismic separately
- c. Dynamic equipment:-
  - G.A. drawing of equipment with bolt/pocket details and base frame.
  - Combined C.G. of the system.
  - Maximum permissible amplitude.
  - Operating frequency of the system.



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Unbalance forces if any and its point of application.
 Civil scope of work has been already taken in bagging building Tender.

- 2.1 The Bidder's scope of work shall include all activities e.g. engineering, Procurement, Construction, Supplies and Services necessary for turnkey execution of the project from basic design to commissioning and successful performance guarantee Test run at site.
- 2.2 Bidder shall develop Approved for Construction (AFC) drawings/Documents, Taking into account of detailed requirements of the documents appended to the bid Package:-
  - Process Design Basis Package,
  - Engineering Design Basis,
  - Job Specification,
  - · Standard specifications,
  - Drawings,
  - Engineering tables,
  - Installation Standards,
  - Piping & Instrumentation Diagrams (P&IDs),
  - Data sheets of all equipment,
  - OWNER/PDIL's review and comment, etc.
- 2.3 Bidder's scope of Work (For Static Equipment) shall include but shall not be limited to following:
  - Process Design and Engineering comprising preparation of the following documents:-
  - Residual basic engineering design,
  - PFD with major controls, material & energy balance,
  - P&IDs,
  - Interlock and logic diagram with full description
  - Equipment and line list with sizes,
  - Functional loop schematics, etc.
- a) Detailed Engineering comprising of:-
  - Process flow diagram,
  - Plot plan development,
  - Scope of Work
- b) Complete mechanical design & thermal design (For heat exchanger).
- c) Detailed engineering of equipment including all mountings, accessories & bought-out items.



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- d) Procurement of all materials & bought out items.
- e) Shop/site fabrication ( as applicable) & assembly
- f) Inspection, testing (including hydro testing)
- g) Surface preparation, painting, insulation, pickling and Passivation (for SS equipments), internal and/or external coating, epoxy coating, rubber lining etc
- h) Packing (seaworthy when sea transportation) forwarding, transportation to site etc.
- i) All process equipments shall be supplied with Nitrogen filled. In case of equipment assembled and welded at site, it shall be filled with N2 after testing at site. Dry Nitrogen shall be filled at a pressure of 0.5 Kg/cm2g and equipment shall be fitted with a pressure gauge and valve.
- j) Stage wise and final inspection by appointed TPIA/Owner
- k) Fire proofing as per requirement of the bid package
- I) Any other requirement for safe and smooth operation
- m) Submission of engineering drawing & document for Owner/PDIL review. All drawing submitted to owner/PDIL shall be thoroughly checked by contractor before submission.
- n) Supply of "As Built documentation and QC dossiers".

## Bidder scope of supply for Static equipment shall include but shall not be limited to following:

- Supply of static equipment ( Vessels, heat exchanger, Tanks, PHE etc) including their accessories
- Supply of all fabricated and proprietary internals for all equipment as applicable.
- > Supply of mandatory spare parts for two year operation & maintenance) and commissioning spares attached elsewhere in bid package.
- Insulating material, primer paints etc. if any.
- Equipment will be dispatched with primer painting, surface preparation e.t.c from shop and internal & external coating, FRP lining e.t.c. if required shall be provided by bidder. Equipment and material for blast cleaning, chemical cleaning, pickling, Passivation is not required.
- Supply of all equipments, tool & tackles including torque wrench, bolt tensioned etc. as per specification.
- > Supply of template for foundation for heavy lift equipment.
- > Eye bolts, jack screws, dowel pins and lifting lugs etc. as required
- Lifting lugs / erection lugs
- Cleats for earthing connections
- Cover flanges for manholes, handholes, inspection openings etc. with bolting and gaskets.



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- > Supply of all other materials whether specifically mentioned or not but required for completion of the job in all respect as per bid package.
- Name plate with bracket

The above mentioned activities shall be carried out in accordance with applicable code and all technical requirements covered in the bid package

- 2.4 The bidder's scope of work shall include all activities e.g. engineering, Procurement, Construction, Supplies and Services necessary for turnkey execution of the project from basic design to commissioning and successful performance guarantee Test run at site.
- 2.5 The Contractor's scope of services shall include but not be limited to the following:-
- 2.5.1 Process Design and Engineering comprising preparation of the following documents:-
  - Residual basic engineering design,
  - PFD with major controls, material & energy balance,
  - P&ID,Interlock and logic diagram with full description.
  - · Equipment and line list with sizes,
  - Functional loop schematics, etc.
- 2.5.2 Detailed Engineering comprising of:-
  - Process flow diagram,
  - Plot plan development,
  - All Layouts,
  - General arrangement Drawings,
  - Fabrication and assembly drawings, etc
  - Procurement of material and bought outs items.
  - Shop/Site fabrication and testing.
  - Assembly of sub-assemblies.
  - Stage wise inspection at shop.
  - Customs clearances.
  - All type of Insulation, cladding, and painting of the plant.
  - Supply & Transportation to site.
  - Shop/Site fabrication and testing.
  - Assembly of sub-assemblies.
  - Stage wise inspection at shop.
  - Unloading, prolong storage/preservation and security at site.
  - Movement of material equipment, consumables etc at site.
  - Construction, erection, installation, assembly, hook ups and field testing.



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- Filling of lubricants, Oils, consumables, chemicals etc. (for first filling and replacement as required before handing over to owner).
- Clear the work space of all construction aids debris etc. and provide a tidy work place from pre-commissioning stage.
- Pre commissioning and commissioning.
- Satisfactory performance guarantee tests at site.
- Handing over of plant to the owner as per PDIL/Owner's satisfaction.
- All statutory clearances and permits from local, statutory and other bodies such a Indian Boiler Regulations, Static and mobile pressure vessel rules, Chief controller of explosives, Factory inspector, Labour Inspector, Electrical inspector, pollution controls board etc.
- Contractor shall prepare a comprehensive equipment List showing all items classified on the basis of each Process and utility unit. Equipment list shall also identify Equipment requiring:-
- Approval from Statutory authorities (PESO, IBR, etc.),
- ASME Code Stamping,
- Compliance to Petroleum rules, etc
- Equipment list shall include the following against each item:-
- Equipment/item tag numbers,
- Description,
- Drawing number,
- Vendor,
- Data sheet number,
- Design flow, pressure and temperature,
- Special features if any, etc.
- Contractor shall carry out requisitioning activities and the requisition shall contain the as a minimum.
- 2.5.3 Equipment data sheets including accessories and auxiliaries etc. indicating operating Parameters, performance requirements, construction features, instrumentation & Controls, inspection and testing.
  - Scope of Supply of Vendor equipment and supply by others.
  - List of applicable specifications as well as Codes and Standards.
  - Mechanical and Performance Guarantees.
  - Vendor documentation and data requirement.
  - Experience record format required to be completed by Vendor.



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- Mandatory spare parts (for two year operation & maintenance) are included in bid document.
- Erection and Commissioning spares (part of base price).
   Erection and commissioning spare shall be included in the base price of the bid document.
- Recommended spare parts (only list not spare parts) with unit price shall be provided by bidder with a validity of two years as per the past experience for smooth operation of package system.
- Special Tools & Tackles (if any) (itemized list to be submitted. Price shall be part of base price)
- Supply of first fill of lubricants, chemicals, cleaning fluids, hydraulic oils, refrigerants,
- Desiccants and subsequent filling before handing over to owner.
- Vendors site support services for construction and commissioning
- CONTRACTOR shall prepare stage wise Inspection programmes to ensure the Integrity of all equipment and piping. This programme should include inspection & Testing as per data sheet, design basis, job specs. Standard specifications/standards, and codes etc. but are not limited to the following:-
- Identification of Raw Material including all Non-destructive testing to be mutually agreed between Contractor, PDIL and Owner.
- Co-ordination in design, procurement, Inspection, testing and commissioning of packaged equipment.
- Technical advisory control on all Mechanical matters, throughout all phases of project execution i.e. from design through procurement, construction and commissioning/Problems resolution.
- Preparation of spare parts interchanges ability records.
- Specific maintenance instructions, which will minimize the removal of obstacles for
- Routine maintenance.

#### 3.0 SCOPE OF SUPPLY

Contractor's scope of supply shall include but not be limited to the following on turnkey Basis:-

All equipment's as per (Equipment / Packages list) of this NIT.

However, Contractor shall supply all the required equipment/ items as per BEDP to complete the system in all respects.



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- All electrical, instrumentation and controls.
- All supports for equipment, piping, ducting etc.
- Foundations and Foundation Bolts for all equipment and supports
- First fill of all lubricants, activated alumina, chemicals, hydraulic oils, and heat transfer media, Desiccants (Activated Alumina) and subsequent filling before handing over to Owner. Any special tools and tackles required for operation and maintenance of the Plant and equipment.
- Spares for start-up and commissioning.
- Mandatory Spares
- Spares list for 2 year's normal operation with itemized price with recommended Quantity to be furnished.

#### 3.1 Scope of Services

- a) Detailed process design including preparation of P&ID, heat and mass balance diagram, control and logic diagram, interlock schemes, etc.
- b) Detailed design of plant and equipment, instrumentation, electrical and control system. Detailed design of civil and structural work.
- c) Detailed equipment layout, piping GAD & isometrics, battery limit hook ups and other works as required.
- d) Documentation & approvals including approvals from statutory authorities including those required to be taken by Owner.
- e) Procurement of raw materials, bought out components, fabrication and assembly at shop.
- f) Inspection & testing, including third party inspection at shop, packing, forwarding & delivery to site.
- k) All piping works as per piping specification. All isolation valve at battery limit shall be in bidder's scope.
- Assistance/supervision in Mechanical Completion.
- m) Assistance/supervision in Hydro testing, Pre-commissioning and reliability runs.
- n) Assistance/supervision in Commissioning and performance guarantee run and handing over.
- o) Arrange all necessary instruments, tools/tackles required to aid pre-commissioning, commissioning and performance guarantee tests.
- p) All documents/drawings shall be submitted by the bidders as per documentation schedule.



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- q) Undertake a HAZOP study for the system. The HAZOP study will be carried out at PDIL/TFL office. Bidders to incorporate all HAZOP study changes into their design and supply without any price and time implication.
- r) All incoming and outgoing utilities shall be provided with isolation valve along with companion flanges gasket and bolting at the battery limit of the unit. All the utilities shall be supplied at battery limit of the plant at a single point.

All consumable chemicals lubricants etc. are excluded. However first charge of all chemicals, grease and lubricants are to be supplied by the bidder.

Operating staff is excluded but operation supervisors and maintenance personnel shall be arranged by the bidder during commissioning, trial and performance test runs.

#### 3.2 MECHANICAL

#### 3.2.1 STATIC

For Detailed Scope of work with respect of Static, refer attached Document No. PC183/E/4008/SEC-VI/PART-3.2.1 (SOW)

#### 3.2.2 ROTARY

For Detailed Scope of work with respect of Rotary, refer attached Document No. PC183/E/4008/SEC-VI/PART-3.2.2

#### **3.2.3 PIPING**

For Detailed Scope of work with respect of Piping, refer attached.

Document No. PC183/E/4008/SEC-VI /PART-3.2.3

#### 3.3 ELECTRICAL

For Detailed Scope of work with respect of Electrical, refer attached.

Document No. PC183/E/4008/SEC-VI/PART-3.3

#### 3.4 INSTRUMENTATION

For Detailed Scope of work with respect of Instrumentation, refer attached.

Document No. PC183/E/4008/SEC-VI/PART-3.4

#### 3.5 INSPECTION & TESTING REQUIREMENTS

For detail requirements of Inspection & Testing, please refer Technical Specifications of individual discipline attached.

All equipment covered in this NIT shall be subjected to stage-wise and final inspection by Third party inspection (TPI) agency (here in after called Inspector)



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during manufacture. The approval of TPI for passing such inspection/test will not however prejudice the right of purchaser to reject equipment if it does not comply specifications when erected or do not give service to complete satisfaction of client. Cost of such tests shall be borne by the Bidder. Particulars of proposed procedures and tests shall meet requirements of the specifications/applicable standards without which Inspector's approval will not be given. Pre-assembled units shall be tested at the factory as much as possible to demonstrate their specified/required duty conditions prior to despatch to site.

Shop test shall include various tests to be carried at bidder's or his sub-contractor's works and at works where raw material supplied for equipment is manufactured. Bidder shall carry out comprehensive inspection and testing programme during manufacture in the works. Indicative programme of inspection/tests envisaged by client is given below. However, it is contractor's responsibility to draw up and carry out such a quality assurance plan/programme and submit for approval by TFL/PDIL

Check on control panels for dimensions, wiring, continuity, insulation, tubing leakages etc.

All panel mounted and local instruments and accessories to be checked for performances, over-range protection etc., as per Standard or other approved standards, by client.

Test for control valves for body/seat/diaphragm chamber leakage, lift characteristics, bonnet and material composition.

#### 3.6 FUNCTIONAL TEST OF CONTROL SYSTEM.

All test certificates and reports shall be submitted to TFL for approval. The Inspector or his representative shall be given full access to all tests.

Bidder shall inform the TFL/PDIL well in advance regarding the tests.

After erection at site, all components, equipment shall be tested for satisfactory performance without showing any sign of defect of individual equipment-wise or complete system-wise.

All pipings, fittings and valves after installation will be tested hydraulically for 1.5 times that of maximum attainable system pressure as per applicable standard.

All valves shall be operated and checked for 100% of trouble-free travel.

Visual checks shall be carried out on all structural components, welding, painting etc.



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All the test instruments and equipment shall be furnished by the bidder free of cost.

#### 3.7 QUALITY ASSURANCE & CONTROL:

Quality Assurance (QA) shall mean the organizational set up, procedures as well as test methods and facilities developed by bidder in order to assure that all equipment leaving bidder's shop are of the highest possible quality i.e. either equal to or better than the requirement specified.

Quality Control (QC), shall mean all the tests, measurement, checks and calibration which are to be carried out in bidder's shop in order to compare the actual characteristics of the equipment/unit/system with the specified ones, along with furnishing of the relevant documentation (certificates/records) containing the data or result of these activities.

Bidder shall submit a comprehensive description (manual) of QA/QC measures contemplated by him for implementation with regard to this specification. It is contractual obligation of the bidder to develop and implement adequate QA/QC systems.

QA/QC system shall cover all products and services of the contract i.e. documentation material, shop and site fabrication, transportation and site works, including job sub contracted by the bidder.

#### 3.8 PROGRESS REPORTING:

Bidder shall submit monthly progress report and detailed project schedule to Principal.

#### 3.9 INTERCONNECTING PIPING:

Bidder shall provide block valve with spectacle blind for all inlet & outlet lines at the battery limit for complete isolation.



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**SECTION -VI: TECHNICAL** 

**PART - 2.0** 

# TECHNICAL SPECIFICATION INSTRUMENT AIR/PLANT AIR SYSTEM AT TALCHER FERTILIZERS LIMITED



#### **INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED**

### PC183/E/4016/SEC-VI/PART-2.0 DOCUMENT NO





#### **TECHNICAL SPECIFICATION**

SHEET 2 OF 10

#### **CONTENTS**

Sr No.	DESCRIPTION
1.0	General Description Of Package
2.0	Design Basis
3.0	Guarantees
4.0	Time Schedule

#### **LIST OF ANNEXURE**

Annexure Number	Description	Number of Sheets
Annexure -1	Process Flow Diagram	1



#### INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

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**TECHNICAL SPECIFICATION** 

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#### 1.0 **GENERAL DESCRIPTION OF PACKAGE**

Same as page no 2 of 13 in PC183/E/4016/SEC-VI/PART-1.0

#### 2.0 **DESIGN BASIS:**

#### 2.1 **DESIGN CAPACITY**

#### **Instrument Air System**

Design Capacity; -2 (W) x 4500Nm3/hr (Dry Air) for TFL

Pressure kg/cm2 (g), 8.5 at battery limit

Temperature °C Ambient

-40 C at Atm Pressure Dew point °C

Online Dew point analyser with range of 0 - (-) 60 Degree Celsius at the inlet of IA receiver shall be provided.

Dew Point of Instrument Air shall be (-) 40 Deg C at atm Pressure.

#### Plant Air System

Design Capacity; -7500 Nm3/hr for TFL

Pressure Kg/cm2 (g), 8.5 - 9Temperature °C **Ambient** 

#### 2.2 **QUALITY (Instrument Air)**

**Dew Point** -40 DEG C at atm pressure

Oil Nil

Temperature ⁰c **Ambient** 

#### 2.3 Noise Level

Noise level shall be maximum 85 dBA at one meter from the source

#### **Hazardous Area Classification:** 2.4

In general Area classification shall be in accordance with IS 5572 along with latest update. IA/PA plant is located in SAFE AREA i.e. Non Hazardous area, however bidder to note that Area Classification class for instrumentation shall be as per NIT.

#### 2.5 **Equipment Specifications**

#### **Air Compressor** 2.5.1

No. 4(3W+1S)

Centrifugal Type

5000 - 5500 Nm<sup>3</sup>/hr each (on Dry Basis) Capacity

Suction Pressure Atmospheric

Discharge Pressure 9.0 - 9.5 Kg/cm2g (g)

0-100% Capacity Control



## INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

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Bidder shall consider margin for pressure drop in suction piping & suction strainer. All compressors must be able to operate in parallel.

#### 2.5.2 Air Compressor after Cooler

No. 3(operating) + 1 (standby)
Fluid (Hot (shell)/Cold (tube)) Instrument Air/Cooling Water

Air outlet temp. 45°C
Cooling water inlet temp. 33°C
Cooling water outlet temp. 43°C

Cooling water inlet pressure 3.5Kg/cm<sup>2</sup>g (g)

Design Pressure (cooling water) 8Kg/cm<sup>2</sup>g

Allowed pressure drop (cooling water) 0.7Kg/cm<sup>2</sup> (Across B/L)

Air inlet pressure by bidder
Allowed pressure drop (air) by bidder
Design pressure (air) 10.5Kg/cm²g

Air fouling resistance 0.0002 Hrm² °c/kcal Cooling water fouling resistance 0.0006 m² °c h/kcal

Heat duty by bidder

**NOTE:** All heat exchangers MOC shall be as follows:

SHELL: KCS+3mm CA
 TUBE: SS-304/SS-304L
 Channel: Carbon Steel

#### 2.5.3 Wet Air Receiver K.O. Drum

No. 1

Operating/Design Pressure 9.5 / 10.5 kg/cm<sup>2</sup>g

Capacity By bidder but not less than 30 m<sup>3</sup>

Operating/Design Temperature 45/70 °C
Height (between tangent lines) By Bidder
Diameter By Bidder
Material of Construction Carbon Steel



#### **INSTRUMENT AIR/PLANT AIR SYSTEM** TALCHER FERTILIZERS LIMITED

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#### **TECHNICAL SPECIFICATION**

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#### 2.5.4 Adsorber

No. 2 set (2W)

4500 Nm<sup>3</sup>/hr (each) for TFL Capacity

Type HOC type (No-purge split flow type Dryer)

Operating Temperature By bidder Operating Pressure By bidder Allowed pressure drop By bidder Design Temperature By bidder Design Pressure 10.5 kg/cm<sup>2</sup>g Material of Construction C.S. (internals S.S.) **Activated Alumina** Desiccant

Dew point of dried air -40 °C at Atm Pressure

maximum 8 hrs Cycle time

Bidder shall provide 1 No. Low Pressure Wet Air Receiver upstream of Instrument Air Generation package to avoid any fluctuations in operation of Instrument Air Generation package.

#### 2.5.5 Air dryer Pre-Filter

No. 2No (1W+1S) for each dryer set Hydrofobic sintered polypropylene Type Filtration 5 micron with 99.9% efficiency

#### 2.5.6 Air dryer After Filter

2No (1W+1S) for each dryer set No.

Type Cartridge

Filtration 1 micron with 99.9% efficiency

#### 2.5.7 Dried Air after Cooler

1 no. for each dryer set No. Fluid (Hot (shell)/Cold (tube)) Dried Air/Fresh Cooling Water

Flow (Dried Air/Fresh cooling water) 4500Nm3/hr Air inlet temp. By bidder

45°c Air outlet temp. Cooling water inlet temp. 33°c Max. cooling water outlet temp. 43°c

Cooling water inlet pressure 3.5Kg/cm2g

Allowed pressure drop ( water) 0.7 Kg/cm2 (Across B/L)

Air inlet pressure By bidder Allowed pressure drop (air) By bidder Design pressure (air/water) 10.5/8Kg/cm2g Air fouling resistance 0.0002 Hrm<sup>2</sup> oc/kcal 0.0006 Hrm<sup>2</sup> oc/kcal Cooling water fouling resistance

By bidder

Heat duty Material of Construction:

Tube/tube sheet S.S.304 Carbon Steel Channel Shell Carbon Steel

Corrosion Allowance 3 mm



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#### **TECHNICAL SPECIFICATION**

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#### 2.5.8 Regeneration after Cooler

1 No. for each dryer set

Fluid (Hot (shell)/Cold (tube)) Regeneration Air/ Cooling Water

By bidder

Flow (Regen Air/ cooling water) By bidder Regen air inlet temp. By bidder Regen air outlet temp. By bidder Cooling water inlet temp. 33°c Cooling water outlet temp. 43°c

Cooling water inlet pressure 3.5Kg/cm2g Design Pressure (cooling water) 8.0Kg/cm2g

Allowed pressure drop (fresh water) 0.7 Kg/cm2 (Across B/L)

Regen air inlet pressure by bidder Allowed pressure drop (air) by bidder Design pressure (air/water) 10.5/8Kg/cm2g Air fouling resistance 0.0002 Hrm<sup>2</sup> oc/kcal 0.0006 Hrm<sup>2</sup> oc/kcal Cooling water fouling resistance

Heat duty

Material of Construction:

Tube/tube sheet S.S.304 Channel Carbon Steel Shell Carbon Steel

#### 2.5.9 Regeneration Air Moisture Separator

No. 1 No. for each dryer set

Capacity By bidder Operating/Design Temperature By bidder/70°c

Operating/Design Pressure By bidder/ 10.5 Kg/cm2g

Height By bidder Diameter By bidder Material of Construction Carbon Steel

#### 2.5.10 Electric Heater

No. 1 No. for each dryer set

Capacity By bidder Operating/Design Temperature By bidder Operating/Design Pressure 9.5/10.5 **Heat Duty** By Vendor

#### 2.5.11 HP Instrument Air emergency Receiver:

No.

Capacity by Bidder

Hold up time: TOTAL Capacity will be such that

> Pressure in receiver will not fall below 6.5 Kg/cm2g when instrument air is

withdrawn at a rate of 9000 Nm3/hr for 20

Minutes. 36.5 kg/cm2g by Bidder

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**Normal Pressure** 

**Design Pressure** 



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#### 2.5.12 HP Compressor:

No.

Type Belt driven type
Discharge Pressure 40 Kg/cm2g
Capacity: 250 Nm3/hr (min.)

1

#### 2.5.13 Instrument Air Receiver:

No.

Capacity 30 m3
Height (between tangent lines) By Bidder
Diameter By Bidder

Operating/Design Pressure 8.5 / 10.5 kg/cm2g

#### 2.6 SITE METEOROLOGICAL DATA:

#### 2.6.1 TFL

Wind load design as defined in IS: 875 Part 3
Prevailing Wind Direction : W & NW

1	Atmospheric Pressure	
	Average	1008 mbar
2	Ambient Temperature	
	Maximum Dry Bulb Temperature	46.3°C
	Minimum Dry Bulb Temperature	1°C
	Wet Bulb Temperature	29°C
	Average temperature	31.9°C
3	Rainfall	
	Average Annual rainfall	1329 mm
	Design in 1 hour	116 mm
4	Relative Humidity	
	Maximum	100 %



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**TECHNICAL SPECIFICATION** SHEET 8 OF 10

#### 3.0 Guarantees:

3.1 Workmanship guarantee: Bidder shall guarantee all components of package against faulty design, improper material of construction and poor workmanship in addition to performance guarantee. Approval by Principal for design calculation and detailed shop drawing, will not in any way absolve the bidder from his responsibility. Should any repair or replacement be necessary owing to any type of failure on account of design material and workmanship of the item, bidder shall in view of this guarantee be bound to replace the same either in part or whole without additional cost to purchaser. Repaired or replaced part shall also be covered by same guarantee as in case of main supply

#### 3.2 Performance guarantee and trial run:

The individual equipment shall be tested in accordance with standards prior to commissioning to establish the parameter and performance.

The sustained load test of the composite plant shall be deemed to have been completed, if Plant produces an average of not less than 90% of the daily rated capacity. If, during the sustained load test, there are interruptions due to reasons not attributable to the obligations and responsibilities of LSTK Contractor, periods of such interruptions shall be included and regarded as days of operation at min. 90% of design capacities or actual load prior to interruptions whichever is lower. The cumulative period of such interruptions shall be limited to a maximum of 2 (Two) days. Owner shall have option to reduce the period of sustained load test of 72 hours.

Trial run shall be performed for a period mutually agreed upon, without interruption prior to commissioning to establish the satisfactory working of the accessories, equipment. After the pre-commissioning and testing, each unit shall be commissioned to operate at the parameters specified and performance test run shall be conducted.

In the event of failure of performance test run, bidder shall carry out necessary modification at his own expense to meet the guarantees.

The Performance Test shall comprise a 72 hour performance test run. Vendor shall provide to Principal (for approval) not later than 90 days prior to mechanical Completion, a proposed procedure including dates, arrangements and forms of tests, durations of tests, numbers of readings to be taken, instrument lists and numbers of observers required. The Performance Test must demonstrate the requirements outlined in clause 3.3. If the Performance Test is interrupted or terminated for any reason such test shall be restarted from the beginning. Performance Test to be carried within 3 months of commissioning. Bidders to make adequate allowance for these requirements in their tender.



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After 3 (three) failed Performance Tests as specified for reasons attributable to the CONTRACTOR, the OWNER shall have right to proceed with the encashment of Contract Performance Security and other provisions also take all action.

#### 3.3 Process Guarantees:

#### Performance Guarantee parameters for Instrument air system:

- a) Electric Power Consumptions
- b) Capacity of air dryers
- c) Outlet pressure of Instrument Air at battery limit.
- d) Dew point of outlet Instrument Air
- e) Pressure drop across instrument air dryer
- f) Outlet air temperature of Instrument air
- 3.3.1 The rated capacity of each LP air compressor shall be minimum 5000 5500Nm³/hr (Dry Basis) at 9.0 9.5Kg/cm2g.

The rated capacity & pressure of HP air compressor i.e. 250 Nm3/hr at 40kg/cm2g.

- 3.3.2 The plant air capacity shall be 7500 Nm3/hr (at vendor B/L).
- 3.3.3 The plant air header pressure (at vendor B/L) shall be 8.5-9 Kg/cm2 (g)
- 3.3.4 Instrument Air Generation Capacity is 9000Nm3/hr at 8.5 Kg/cm2g pressure at Dry Air Receiver outlet. Instrument Air Dryer working/regeneration cycle as per NIT.
- 3.3.5 The Dried instrument air at B/L (at dry air receiver outlet) shall be minimum at 8.5Kg/cm2 g.
- 3.3.6 Dew point of dried air shall be –40 °C at Atmospheric pressure.
- 3.3.7 Noise level shall be maximum 85 dBA at one meter from the source
- 3.3.8 Pressure drop across each Air Instrument dryer & across the system shall not exceed 0.5 Kg/cm².
- 3.3.9 Temperature of outlet of dried instrument air at 45°C at B/L (at dry air receiver outlet).
- 3.3.10 The Bidder shall demonstrate following parameters during COMMISSIONING at site:
  - Capacity
  - Battery limit condition i.e. Pressure, temperature, dew point, switch over time,

#### 3.4 Guarantee of Utilities:

Bidder shall guarantee performance of Instrument air/plant air system for the following utilities:

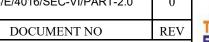
- Total Power consumption
- Total Cooling water consumption
- Guarantee work cost shall be calculated on the basis of total consumptions figure as furnished by bidder in the price bid:-



#### **INSTRUMENT AIR/PLANT AIR SYSTEM** TALCHER FERTILIZERS LIMITED

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#### TECHNICAL SPECIFICATION

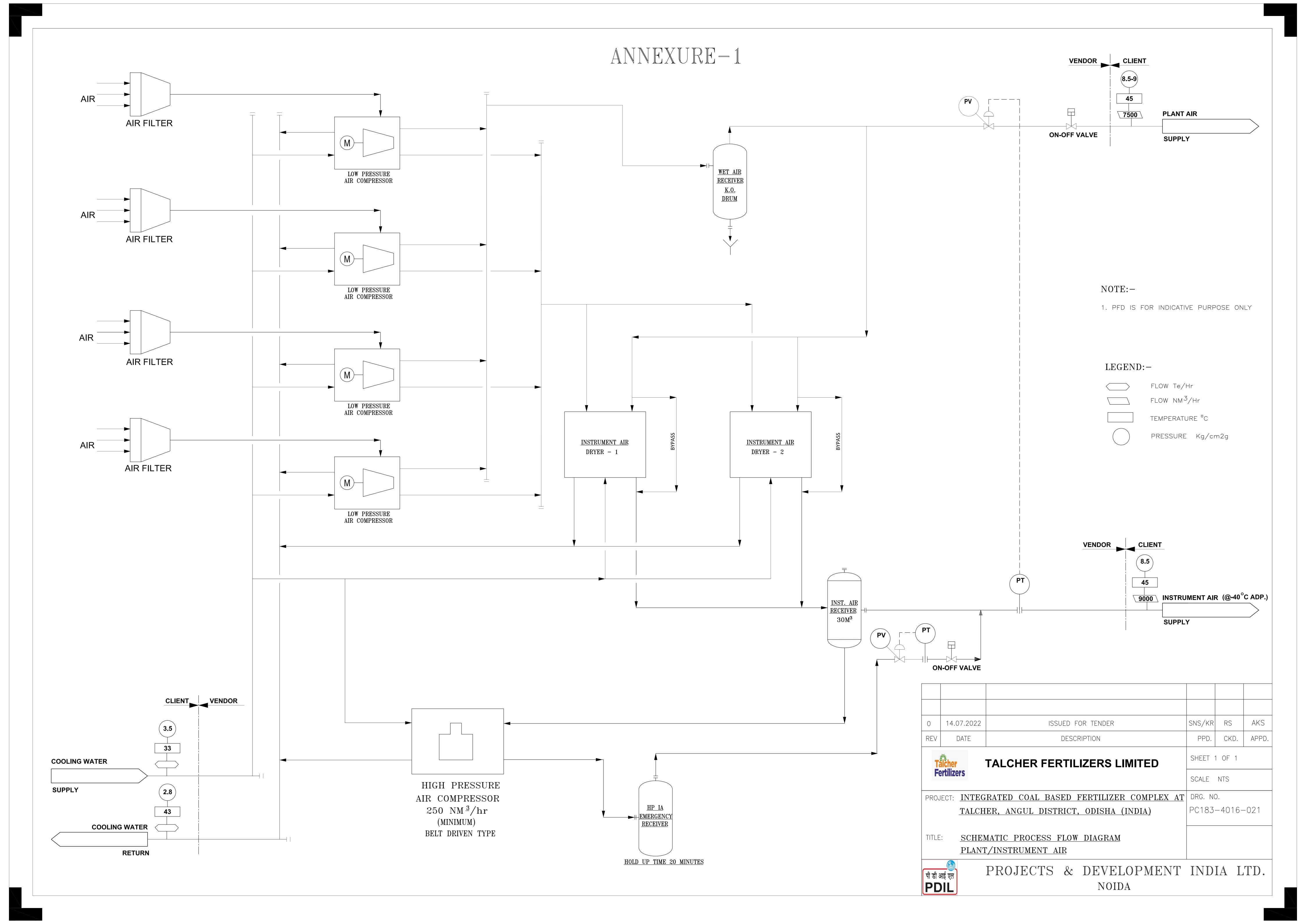
SI.No	Raw Material/ Utilities	Unit Price in Rs.	Consumption per day for required capacity as per Specification	Cost Rs. per day
1.	Cooling water, m <sup>3</sup>	37.75/m3		
2.	Power, kWh	5.915/kWh		
	Guaranteed operating Cost			

#### Note:

- 1. All Guaranteed Consumptions including power & cooling water Cost shall be indicated in price schedule and indicated figures to be furnished in technical bid.
- 2. Total cooling water requirement for complete instrument air system at full Load with Three (3) air compressors & Two (2) Dryer system (including regeneration) working.
- 3. The power consumption (power at motor input) at full Load of Three (3) air compressors (including auxiliaries) & Two (2) Dryer system (including regeneration) working.
- 4. Performance guarantee test run of Air Compressor shall be performed at rated capacity for three running centrifugal air compressor, two air dryer in line and two regeneration heater in line.

#### 4.0 Time Schedule

- Bidder shall furnish programme in form of master network identifying main phases in 4.1 various areas of total work like design, engineering, procurement of materials and bought out items, manufacture of equipment, delivery and field activities.
- 4.2 Master network shall be prepared in Primavera software, discussed and agreed upon. Engineering drawings and data submission schedule shall also be discussed and finalised before issue of letter of intent. Liquidated damages leviable for delays shall be effective from the dates mentioned above.
- 4.3 After award of contract, the bidder shall plan sequence of work of manufacture and erection to meet the plant commissioning dates given above and shall ensure that all work/manufacture, shop testing and shipment of equipment is in accordance with required construction/execution sequence.
- 4.4 Within fifteen days after award of letter of intent bidder shall submit for review and approval of detailed network schedules based on master network as mutually agreed upon, showing logic and duration of activities in following major areas: Detailed engineering, procurement, manufacture, shop, inspection, testing, despatch/shipment and receipt at site.





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**SECTION -VI: TECHNICAL** 

**PART - 3.0** 

**DESIGN SPECIFICATIONS** 



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**SECTION -VI: TECHNICAL** 

# PART – 3.1 DESIGN SPECIFICATION – PROCESS INSTRUMENT AIR/PLANT AIR SYSTEM AT TALCHER FERTILIZERS LIMITED



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#### **CONTENTS**

Section Number	Description
1.0	General
2.0	Design Pressure
3.0	Design Temperature
4.0	Corrosion Allowance
5.0	Heat Exchangers
6.0	Pumps
7.0	Compressors
8.0	Pressure Relief Valves
9.0	Columns & Vessels



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#### 1.0 GENERAL:

The plants shall be designed to operate safely and satisfactorily at a capacity of 50 to 105% of Design Capacity. Equipment and machinery shall be provided so that the plants can operate for at least two years without major overhaul or inspection. All design shall conform with the latest edition of the applicable sections of ASME, ASTM, IEEE, NFC, TEMA, AISI, NEMA, AISC, ACI, OSHA, UBE and other governing codes or standard practices. Any other equivalent and acceptable Code of Standard practice may be adopted with the approval of the PMC/Owner. In addition, the following state/local Codes/laws shall supplement:

a)	Pressure Vessels/ Formed ends	ASME, Section VIII, DIV.I / Indian Standard IS 4049.
b)	Buildings & Structural	Relevant Indian Standard (BIS)
c)	Electricity	Indian Electricity Rules.
d)	Sanitary	Relevant Indian Standard (BIS)
e)	Safety	a) Manual of Chief Inspector of Explosives, Govt. of India.
f)	Water Pollution	Relevant Indian Standard (BIS) / Odisa Pollution Board limits

#### 1.1 System of Measurements

The system of measurement shall be Metric as follows:

Parameter	Preferred Units	Alternative Units
Temperature	°C	
Pressure - absolute	kg/cm² abs	
Pressure - gauge	kg/cm² g	
Flow (liquid)	m³/hr	kg/hr
Flow (gas)	Nm³/hr	kg/hr
Flow (steam)	kg/hr	
Length, Level	mm	M
Time	hr	sec, min
Heat	kcal	Gcal
Power	kW	



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Fouling resistance	m² hr °C / kcal	
Pipe size / diameter	Inches (in)	mm
Mass	kg	
Liquid relative density	sp gr T°C/15.6°C	
Liquid density	kg/m <sup>3</sup>	
Vapor flowing density	kg/m <sup>3</sup>	
Furnace draft	mm of WC	
Storage tank pressure	mm of WC	
Vacuum	mm of Hg, mm WC	
Standard vapor	Nm³/hr at 0°C & 1.033	
Standard Vapor	kg/cm <sup>2</sup> a	
Standard liquid	m <sup>3</sup> /hr at 15.6°C	
Thermal conductivity	kcal/hr-m-°C	
Heat Transfer coefficient	kcal/hr-m²-°C	
Enthalpy, Entropy	kcal/kg	
Heat rate	10 <sup>6</sup> kcal/hr or MM kcal/hr	Gcal
Viscosity	сР	
Kinematic Viscosity	cSt	
Sound Pressure	dB(A)	
Sound Power	dB(A)	

#### 2.0 DESIGN PRESSURE:

#### 2.1 **General Rule:**

Design pressure of Process Static Equipment shall be based on the maximum Operating Pressure. Malfunction and Equipment failure shall be taken into consideration by safety devices. Design pressure shall be for process equipment shall be whichever is higher. Alternatively LSTK Contractor shall select the design pressure as standard design.

- a) For max operating pressure below 2 kg/cm² g use 3.5 kg/cm² g
- b) For max operating pressure between 2 kg/cm<sup>2</sup>g and 15 kg/cm<sup>2</sup>g use Max. Operating Pressure + 1.5 kg/cm<sup>2</sup>
- c) For Max. Operating Pressure between 15 kg/cm² g and 100 kg/cm² g use Max. Operating pressure x 110 %



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d) For Max. Operating Pressure equal and above 100 kg/cm<sup>2</sup> g use the Maximum Operating Pressure + 10 kg/cm<sup>2</sup> g.

#### 2.2 **Equipment under Vacuum:**

Equipment normally operated under vacuum is designed for full vacuum and for the highest pressure it can experience in case of vacuum failure. Equipment containing a fluid with a vapour pressure at ambient temperature lower than atmospheric pressure which can be isolated shall be equipped with vacuum breaking device or else be designed for full vacuum. Equipment subject to vacuum due to mal-operation or failure shall be equipped with vacuum breaking devices or else be designed for full vacuum.

#### 2.3 Complete Systems:

Several pieces of Equipment protected by the same relief valve shall have a design pressure of at least the set pressure of the relief valve.

#### 2.4 Equipment on the Discharge of a Pump:

Equipment which may have to bear the shut-off pressure of a pump shall have a design pressure equal to or higher than the shut-off pressure. Pump shut-off pressure shall be estimated according to Clause 7.0.

#### 2.5 Thin Walled Tanks And Vessels:

Atmospheric thin walled tanks and vessels shall have a design pressure equal to the highest pressure imposed upon discharge of the pressure relief device. The design pressure for vacuum shall be equal to the lowest pressure imposed upon suction of the vacuum relief device.

#### 3.0 DESIGN TEMPERATURE:

Design temperature for process equipment shall be whichever is higher:

- a) Maximum operating temperature + 15 °C (+25°C for Feed/Effluent exchanger)
- b) Boiling temperature at design pressure of process medium inside, if applicable.
- c) Design temperature shall be rounded up to full 5°C steps.
- d) Design minimum temperature shall be specified only if the minimum operating temperature is below 0 °C. Design minimum temperature shall be 5 °C less than the minimum operating temperature. Special attention shall be given to low boiling liquids.



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e) For piping, design temperature shall be determined according to ASME B 31.3.

Alternatively LSTK Contractor shall select the design temperature as standard design.

#### 4.0 CORROSION ALLOWANCE:

Materials of construction and corrosion allowance for all Equipment and machinery shall be for a design life of 25 years (except for heat exchanger tubes). However, minimum corrosion allowance for carbon steel (including 0.5 Mo alloy steels) shall be:

Pressure Vessels and other applicable Equipment	3 mm
Storage Tanks	1.5 mm
Piping	1.5 mm
Removable parts or internals (on each side in Contract with operating fluid)	0.75 mm
For stainless steel/titanium	0 mm
Carbon steel with epoxy resin coating	3 mm

MOC of instrument air piping shall be SS304.

#### 5.0 HEAT EXCHANGERS:

In general heat exchangers shall be designed to 110 % of their operating duty/flow.

Columns overhead coolers shall be designed to 120 % of their operating duty/flow.

Large heat exchangers shall be split into two or more shells for easy operation and maintenance.

#### 6.0 PUMPS:

Normally pumps shall be designed to 110 % of their maximum required flow rate in worst case of operation.

The shut-off pressure shall be estimated according to the following criteria whichever is higher:

a) Differential head at rated flow x 120 % + LH (level high) suction static head + max operating pressure suction side.



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b) Differential head of pump at rated flow + LHH (level high high) suction static head + design pressure suction side x 120 %. No over design shall be applied to the rated pressure.

#### 7.0 COMPRESSORS:

The plants shall be designed to operate safely and satisfactorily at maximum capacity of 105% of Design Capacity.

#### 8.0 PRESSURE RELIEF VALVES:

Pressure relief valves shall be supplied with locked open isolating valves. Pressure relief valves for operational failure shall have installed spares. Also PRV on fire case with Hydrocarbon service shall have installed spare. LSTK Contractor shall take care of any additional requirement as per guidelines. The set pressure of pressure relief valves shall be equal to the design pressure of the equipment. All safety valves will have bypass with exception of safety valves which are only for fire cases and if there is more than one safety valve.

All solenoid operated on-off valve 4" and above shall be butterfly valve.

#### 9.0 COLUMNS AND VESSELS:

#### 9.1 Nozzle:

- a) Minimum size 3/4" (for S.S shall be 1 inch).
- Nozzle rating according to once of connected piping for instrument min. Class 150 ANSI rating.

#### 9.2 Manhole:

Manhole size 24" (\*)

#### 9.3 Hand hole or Inspection hole:

- a) Preferable Size 8 inches
- b) Minimum Size 6 inches



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#### 9.4 Vent and Drain:

Vent and drain for vessels will normally be provided at the minimum length on overhead or bottom line in accordance with the following table:

Volume or diameter of vessel (m³ or mm)	Vent diameter	Drain diameter
	(inches)	(inches)
V < 75 or D <= 4,500	2	2
75 < V <= 220	3	3
4,500 < D <= 6,000		
220 < V <= 420 or	4	4
D > 6,000		
V > 420	6	4

Note: Vent and drain connections are not necessarily located on vessels.



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**SECTION -VI: TECHNICAL** 

**PART - 3.2** 

**DESIGN SPECIFICATION - MECHANICAL** 



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# SCOPE OF WORK (MECHANICAL STATIC EQUIPMENT)

**PLANT: INSTRUMENT AIR/PLANT AIR SYSTEM** 

PROJECT: INTEGRATED COAL BASED FERTILIZER COMPLEX AT TALCHER, ANGUL, DISTRICT- ODISHA, INDIA

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#### SCOPE OF WORK (STATIC EQUIPMENT)

INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LTD.

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#### 1.0 Scope

This specification covers the requirements for the complete design (Mechanical), procurement, fabrication, construction/erection, insulation, painting ,Pickling & Passivation (for SS equipments), inspection and testing, Route survey, statutory approvals (as applicable ) of static equipment ( Pressure Vessels, Heat Exchangers, Vessel Internals etc.) for Instrument Air/Plant Air System of the M/s Talcher Fertilisers Limited (TFL) in accordance with this specification, standards specification, codes and other attachment etc. listed in NIT document.

#### Bidder scope of Work (For Static Equipment) shall include but shall not be limited to following:

- a) Complete mechanical design & thermal design (For heat exchanger).
- b) Detailed engineering of equipment including stability check due to external loads such as wind, earthquake, vibration, connected piping weight, all mountings, accessories & bought-out items e.t.c
- c) Procurement of all materials & bought out items. Material test certificates shall comply to EN10204 Type 3.1 for pressure parts and EN10204 Type 2.2 for Non-pressure parts.
- d) Shop/site fabrication & assembly /construction/erection ( as applicable)
- e) Route survey, if required
- f) Design and supply of Anchor bolt
- g) Inspection, testing (including hydro testing)
- h) Surface preparation, painting, insulation, internal and/or external coating, epoxy coating, e.t.c
- i) Pickling and Passivation of SS components (where applicable).
- j) Packing (seaworthy when sea transportation) forwarding, transportation to site etc.
- k) N2 filling of equipment
- I) Statutory approvals (If applicable )
- m) Stage wise and final inspection by TPIA (Approved by owner)
- n) Submission of engineering drawing & document for Owner/PDIL review. All drawing submitted to owner/PDIL shall be thoroughly checked by contractor before submission.
- o) Supply of "As Built documentation and QC dossiers".

The above mentioned activities shall be carried out in accordance with applicable code and all technical requirements covered in the NIT package.

#### 1.1 Scope of supply (For Static Equipment)

Bidder scope of supply shall include but shall not be limited to following:

- Supply of static equipment (Vessels, heat exchanger, PHE e.t.c) including their accessories.
- Supply of all fabricated and proprietary internals for all equipment as applicable.



#### SCOPE OF WORK (STATIC EQUIPMENT)

INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LTD.

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- Supply of mandatory spare parts (for two year operation) and commissioning spares attached elsewhere in NIT package.
- Surface preparation, painting, insulation, internal and/or external coating, epoxy coating,
   e.t.c
- Supply of Anchor bolt, template for foundation for heavy lift equipment and for the erection for all equipment.
- · Eye bolts, jack screws, dowel pins and lifting lugs etc. as required
- Lifting lugs / erection lugs
- Cleats for earthing connections
- Name plate with bracket
- Cover flanges for manholes, hand holes, inspection openings etc. with bolting and gaskets.
- Supply of all other materials whether specifically mentioned or not but required for completion of the job in all respect as per NIT package.



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# SECTION – VI 3.2.1 DESIGN PHILOSOPHY-STATIC EQUIPMENT

**PLANT: INSTRUMENT AIR/PLANT AIR SYSTEM** 

PROJECT: INTEGRATED COAL BASED FERTILIZER COMPLEX AT TALCHER, ANGUL, DISTRICT- ODISHA, INDIA



#### DESIGN PHILOSOPHY-STATIC EQUIPMENT

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1.0	DESIGN CRITERIA
2.0	MATERIAL OF CONSTRUCTION
3.0	TECHNICAL REQUIREMENT
4.0	FABRICATION
5.0	INSPECTION & TESTING
6.0	PICKLING AND PASSIVATION
7.0	PAINTING
8.0	INSULATION
9.0	SPARE PARTS
10.0	DOCUMENTATION
11.0	VENDOR LIST

### **LIST OF ATTACHMENTS**

SL. NO.	DESCRIPTION	DOCUMENT NO.
1.	VESSEL TOLERANCE	PDS:PV-001
2.	PROJECTION OF NOZZLES	PDS:PV-002
3.	NAME PLATE FOR VESSEL & TOWER	PDS:PV-003
4.	SKIRT SUPPORT FOR VERTICAL VESSEL	PDS:PV-301
5.	LIFTING LUG	PDS:PV-302
6.	PIPE DAVIT	PDS:PV-303
7.	NAME PLATE FOR HEAT EXCHANGER	HE 321
8.	LUG SUPPORT FOR VERTICAL VESSEL	PDS:SR-300
9.	SUPPORT SADDLE FOR HORIZONTAL VESSEL	PDS:SR-302
10.	BRACKET SUPPORT FOR VERTICAL VESSEL	PDS:SR-304



DESIGN PHILOSOPHY-STATIC EQUIPMENT

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#### 1. 0 **Design Criteria**

1.1 This specification covers the requirements for the complete design (Mechanical), procurement, fabrication, construction/erection, insulation, painting ,Pickling & Passivation (for SS equipments), inspection and testing, Route survey, statutory approvals (as applicable) of static equipment (Pressure Vessels, Heat Exchangers, Vessel Internals etc.) for Instrument Air/Plant Air System of the M/s Talcher Fertilisers Limited (TFL) in accordance with this specification, standards specification, codes and other attachment etc. listed in NIT document.

1.2 The equipment shall be designed & constructed as per the latest edition of the following codes and standards:

and standards:  Code	Description		
	·		
ASME Section VIII Div 1	Rules for construction of Unfired Pressure Vessels		
TEMA / API 660	Standards of Tubular Exchangers Manufacturer's		
TEMA / AFT 000	Association / For Shell & Tube Heat Exchanger		
Heat Exchanger Institute standards for steam s			
	condensers and steam jet ejectors		
API 661	Air Cooled Heat Exchangers		
API 662	Plate type Heat Exchangers		
IBR	Indian Boiler regulations		
API 650	Welded Steel Tanks for Oil Storage		
ASME RTP-1	Reinforced Thermo set Plastic Corrosion Resistant		
ASIME IXTI - I	Equipment		
API RP 2000	Venting Atmospheric and Low pressure storage Tanks		
ASME Section II A&B/ ASTM	Materials Specifications		
ASME Section II PART C	Specification for welding rod, electrode & filler metal		
ASME SEC II PART D	Properties		
ASME Section V	Non-destructive Examination		
ASME Section IX	Welding Qualification		
ASME SEC X	Fiber-Reinforced Plastic Pressure Vessels		
EN-13121	For Fiber-Reinforced Plastic Pressure Vessels		
ASME B 16.5	For Flanges		
ASME B 16.47	For large diameter flanges		
ASME B 16.20	For Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral Wound, and Jacketed		
ANSI	Pipes, Flanges, Fittings and Valves		
IS: 875/SITE DATA	For wind load consideration		
IS: 1893 (Part 4) & IS: 1893 (Part	For seismic design consideration		



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#### DESIGN PHILOSOPHY-STATIC EQUIPMENT

1) / SITE DATA			
IS:4682 (Part-1) with Amendment	Code of Practice for Rubber Lining of Vessels &		
No. 3	Equipment for Chemical Process		
Factory Act, 1948 BS CP 3003	Factory Act & State Govt factory rules Code of Practice on		
(Part 1)	lining of Vessels and equipment for Chemical Process.		
PESO	Petroleum &Explosives Safety organization		

- 1.3 Complete mechanical design of Equipment as per latest code /standard of construction shall be the responsibility of the LSTK Contractor. Strict compliance with the requirement of codes/equipment specification & any other referred document shall be ensured. In addition, all statutory rules & regulations shall also be complied with.
- 1.4 Design conditions for all equipment shall be as per technical Specification and Material specification. Minimum required thickness is calculated based on design parameters considering different types of loadings including effect of static head of liquid column. Equipment shall also be designed for hydrostatic condition. Final thickness is decided giving due consideration for corrosion allowance.
- 1.5 Design pressure shall be at the top of vertical vessel or at the highest point of horizontal vessel. The design pressure at any lower point shall be determined by adding the maximum operating liquid head and any pressure gradient within the vessel.
- 1.6 Wind analysis shall be performed as per IS-875 (Latest Edition). Basic wind speed is 50 m/sec. Wind forces shall be increased by 20% (over & above design code requirement) to cater the effect of piping system, platforms and ladders etc.
- 1.7 Seismic analysis shall be performed by Response spectrum method (RSM) considering seismic zone-IV as per IS-1893 part-1 & IS-1893 Part 4 (Latest edition).
- 1.8 All carbon steel (CS) & low alloy steel (LAS) pressure parts shall have 3 mm corrosion allowance unless specified otherwise.
- 1.9 All internals CS/ LAS parts including low temperature materials shall have at least 1.5 mm corrosion allowance on either side unless otherwise specified.
- 1.10 Design of supports and anchor bolts shall be performed for compressive and tensile loading. In no case shall diameter of anchor bolts be less than M24 for skirt support and M16 for other type of support. Supply of anchor bolt required as per design for equipment shall be in bidder scope.
- 1.11 Each Lifting lug shall be designed with shock factor 2. Lifting lugs and tailing lugs shall be designed taking account of vessel weight and lifting method, etc. Supplier shall decide location of lifting lug/tailing lugs in order to avoid interferences between lifting wires and external attachments (such as platform, ladder, and nozzles) during erection. Materials, procedures of welding them to the shell and inspection method shall also be carefully checked.
- 1.12 Hydro testing of equipment shall be as per UG-99b of ASME Sec VIII Div-1. In order to safeguard against the risk of brittle fracture during hydrostatic test metal temperature during hydrostatic test be maintained at least 30°F (17°C) above the minimum design metal



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temperature, but need not exceed 120°F (48°C). Design pressure for each nozzle shall be sum of maximum allowable working pressure and static head of corresponding nozzles.

- 1.12.1 Maximum Allowable Working Pressure (MAWP) is the maximum gauge pressure at the top of a completed vessel, which is obtained from the calculations for every element of the vessel based on the actual thickness in the corroded condition. Supplier shall calculate the MAWP of each vessel, and the calculation shall be included in design calculations. MAWP shall not be assumed to be the same as the design pressure except for cases where MAWP cannot be determined by calculation to the applicable code. Accordingly calculate hydro test pressure as per UG-99b.
- 1.13 Bolt of size M48 and above shall be designed and spaced so as to permit tightening with a hydraulic stud-tensioner. The bolts shall have an extra threaded length at one end of approximately 1 bolt diameter, and shall be provided with threaded protection caps. Hex nuts shall have suitable holes for manual tightening. The requisite no. of hydraulic stud-tensioner device with necessary adopters/insertions based on varying sizes of studs shall be supplied by bidder as per mechanical design of the equipment.
- 1.14 Orientation of longitudinal seams and position of circumferential seams shall be clearly marked in the fabrication drawing. Nozzles, support and other attachments shall be located clear of welded joints.
- 1.15 All process equipments shall be supplied with Nitrogen filled. In case of equipment assembled and welded at site, it shall be filled with N2 after testing at site. Dry Nitrogen shall be filled at a pressure of 0.5 Kg/cm2g and equipment shall be fitted with a pressure gauge and valve.
- 1.16 Contractor shall guarantee the equipment & their components against faulty design with regard to their mechanical adequacy, improper material of construction & poor workmanship for the period specified in contract.
- 1.17 Contractors shall stand Performance Guarantee of equipment as per respective technical specifications/Process Data sheets.
- 1.18 Design conditions for all equipment shall be in accordance with the process data Sheets/specification .However, in any case design pressure shall not be lower than 10% over the maximum anticipated operating pressure and design temperature should be 25°C higher than the maximum anticipated operating temperature for all equipment unless otherwise specified.
- 1.19 Basic allowable stresses for shell, heads and other components etc.of vessels and shell, roof, etc. of tanks shall be the values specified in the design code.
  Maximum allowable "tensile stress" and "compressive stress" shall be as per UG-23 of ASME Sec VIII Div -1. These stresses may be increased by 20% for earthquake & wind combination case in line with UG-23 (d).
- 1.20 All blind flanges and man way covers weighing 35 kgs or more shall be fitted with handling Facilities such as davits.
- 1.21 As a General rule all nozzle attachment to shell/head shall be set in type.



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DESIGN PHILOSOPHY-STATIC EQUIPMENT

#### 1.22 Units

- -Unless otherwise specified, SI unit shall be applied as the measurement system for the drawing and documents to be submitted.
- 1.23 When post weld heat treatment is required for pressure vessels, all material for pressure holding components shall be simulation tested with minimum additional two (2) heat treatment cycles. Additional two heat treatments are; one for PWHT after shop repairing and the other for future PWHT at site.
- 1.24 For equipment designed as per IBR, materials/design/inspection e.t.c shall strictly comply with the requirement of the IBR code.
- 1.25 IBR Approval for Design Calculations drawings, documents. Testing as per IBR requirements & Certification shall be in the scope of Contractor (If Applicable). All vendors, sub-vendors, fabricators & welders etc should be IBR approved.
- 1.26 PESO Approval for Design Calculations, drawings, documents, testing e.t.c as per PESO requirements & Certification shall be in the scope of Contractor (If Applicable).
- 1.27 In case of conflict between this specification and other specification, codes and data sheets. It shall be referred to PDIL/ Owner for clarification and the decision of PDIL/Owner shall be final & binding on contractor without any cost & delivery implications. However, it shall be resolved considering the most stringent in the following order
  - Statutory requirement
  - Requirement specified in this specification
  - Process data sheet/ P&ID
  - Applicable codes & standards

#### 1.25 **REGULATIONS**

Besides codes & standards, LSTK Contractor shall follow National Laws and Regulations such as Indian Boiler Regulation and Department of Explosives, Nagpur, India together with Local by Laws for the state including statutory requirements as applicable. Static and Mobile Pressure Vessel (SMPV) rules as applicable shall also be complied with.

#### **PUBLICATIONS:**

WRC Bulletin # 107 Local Stresses in Spherical & Cylindrical Shells due to External

Loadings.

WRC Bulletin # 297 Local Stresses in Cylindrical Shells due to External Loadings on

Nozzles

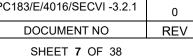
#### 1.26 **DESIGN DOCUMENTATION**

- 1.26.1 Detailed design calculations considering different loadings shall be made as per code/standards and the additional requirements as mentioned below:-
- 1.26.2 Design of equipment inside the offsite plant complex shall be in accordance with the process licensor's data sheets and specifications.

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#### DESIGN PHILOSOPHY-STATIC EQUIPMENT

- 1.26.3 LSTK Contractor shall consider the interfaces with other engineering disciplines w.r.t.
  - Piping Layout/Location Drawings
  - Civil / Structural Drawings
  - P & ID's
  - Materials
  - 3D PDS Model for Piping and Equipment Layout
  - Hazardous Area Classification
- 1.26.4 Design philosophy of other disciplines shall be observed and shall be relevant to the extent applicable.
  - Civil/Structural Design Criteria
  - Piping Design Criteria
  - Process Design Criteria
  - Electrical and Instrumentation Design Criteria

#### **QUALITY ASSURANCE & CONTROL**

- 1.27 1 The quality assurance shall be as per the approved procedures, test methods & facilities to be developed by the LSTK Contractor to ensure that the supplied equipment shall be of highest quality. The quality control shall mean that all the tests, measurements, checks & calibration which are to be carried out may be compared with the actual specified characteristics of the equipments/unit /system.
- 1.27.2 Quality Assurance (QA) shall mean the organizational set up, procedures as well as test methods and facilities developed by LSTK Contractor in order to assure that Equipment leaving LSTK Contractor's shop are of the highest possible quality i.e. either equal to or better than the requirement specified.
- 1.27.3 Quality Control (QC), shall mean all the tests, measurement, checks and calibration which are to be carried out in LSTK Contractor's shop in order to compare the actual characteristics of the equipment/unit/system with the specified ones, along with furnishing of the relevant documentation (certificates/records) containing the data or result of these activities.
- 1.27.4 LSTK Contractor shall submit a comprehensive description (manual) of QA/QC measures contemplated by him for implementation with regard to this specification. It is contractual obligation of the LSTK Contractor to develop and implement adequate QA/QC systems. QA/QC system shall cover all products and services required for the equipment as per scope of work including job sub contracted by the LSTK Contractor.

#### 2.0 **Material of Construction**

2.1 Material of construction for various equipment shall be as selected as follows for general Condition/service unless specified otherwise in respective process data sheet.

a) Pressure Vessel (KCS/CS)

Shell /Head plates	SA 516 Gr. 60/70 & SA 516 Gr 60 for caustic, amine ,
	hydrogen, sour ( Wet H2S) or lethal service
Nozzle Flange	SA 105
Nozzle Neck (Pipe/Plate)	SA 106 Gr. B (Nozzle size < 10"); SA 516 Gr. 60/70

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	(Nozzle size > 10")
Non standard forging	SA 266 Gr 2

b) Pressure Vessel (SS)

b) Pressure vessei (55)		
Shell /Head plates	: SA240 Gr*	
Nozzle Flange	: SA 182 Gr*	
Nozzle Neck (Pipe/Plate)	: SA 312 Gr* (Nozzle size < 10"); SA	
	240 Gr * (Nozzle size > 10")	
*SS grade as specified in datasheet		
c) Heat exchangers (KCS/CS)		
Shell /Channel plates	: SA 516 Gr. 60/70 & SA 516 Gr 60 for caustic, amine ,	
	hydrogen, sour ( Wet H2S) or lethal service tanks,	
	vessel and heat exchangers	
	:Tube sheet : SA266 Cl2 (Forged)	
	:Tubes : SA179 (Seamless)	
Nozzle Flange	: SA 105	
Nozzle Neck (Pipe/Plate)	: SA 106 Gr. B (Nozzle size < 10"); SA 516 Gr. 60/70	
	(Nozzle size > 10")	
d) Heat exchangers (SS)		
Shell /Channel plates	: SA240 Gr *	
Tube sheet	: SA336 Gr*(Forged)	
Tubes	: SA213 Gr* (Seamless)	
Nozzle Flange	: SA 182 Gr*	
Nozzle Neck (Pipe/Plate)	: SA 312 Gr* (Nozzle size < 10"); SA 240 Gr * (Nozzle	
	size > 10")	
Non standard forging	: SA336 Gr * / SA 965 Gr *	
*SS grade as specified in datasheet		
e) SS Tanks/ Non- Coded Vessel		
Shell/ Roof /Bottom Plates	: SA240 Gr *	
Nozzle Flange	: SA 182 Gr*	
Nozzle Neck (Pipe/Plate)	: SA 312 Gr* (Nozzle size < 10"); SA	
	240 Gr * (Nozzle size > 10")	
Non standard forging	: SA336 Gr *	
*SS grade as specified in datasheet		

- 2.2 The Additional material requirements as indicated below shall be considered by Bidder.
- 2.2.1 All raw materials including bought -out items, whatsoever required, to complete the supplies shall be procured and supplied with due identifiable mill material test certificates & inspection reports duly certified by third party inspection agency
- 2.2.2 For coarse grained and high tensile materials in carbon steel (UTS > 45 Kg/mm2) and low alloy steel, guaranteed impact strength shall be ensured at a temperature 15 degree C below envisaged hydraulic test temperature as a precaution against brittle fracture during hydraulic test.
- 2.2.3 Carbon steel plates shall be procured in fully killed & normalized condition. All plates above 50mm thickness shall be vacuum-degassed and examined by Ultrasonic Testing (UT) as per applicable material specification code/standard.



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- 2.2.4 All Stainless Steel (SS) plates shall be hot rolled & solution annealed and pickled as per SA-480.
- 2.2.5 All forgings except for flanges as per ANSI shall be UT tested as per ASTM A 388 for the thickness greater than 50mm and shall be procured in normalized / annealed condition acceptance standards shall be as per AM 203.2 of ASME Section VIII Div. 2. In case any defect is found, no repair by welding shall be allowed.
- 2.2.6 All forgings including nozzle flanges shall be examined for surface defects by MP/PT testing after matching as per applicable material specification code & standard.
- 2.2.7 All external / internal attachments, pads/cleats for support directly welded to the equipment shall be of same materials grade as that of equipment, unless specified otherwise.
- 2.2.8 All nozzles up to DN 10" size shall be made of seamless pipe. For sizes above DN 10" nozzle connection shall be rolled from plates with full radiography of plates.
- 2.2.9 Unless otherwise specified girth flanges shall be of forged quality and ultrasonically tested.
- 2.2.10 Unless more restrictive prescription given by material specification the max. Content for carbon steel used for fabrication as shown by ladle analysis shall be 0.23% for plates, pipes & tubes 0.25% for forging.
- 2.2.11 In order to minimise the effect of temper embrittlement for material to 21/4 Cr 1 Mo specifications in the temperature range of 375-575°C, the embrittlement factors 'X' & 'J' shall be limited to:

 $X = (10P + 5Sb + 4Sn + AS) / 100 \le 15$ The elements above are expressed as ppm

 $J = (Si + Mn) (P + Sn) x 10^4 < 160$ 

The elements above are expressed as percentages

A stimulated PWHT followed by step cooling shall be performed on a sample of material. Acceptable toughness shall be demonstrated by means of a Charpy V Impact Test.

- 2.2.12 Top portion of skirt (min. 500 mm height) welded to the bottom dished head shall be of same material as that of shell /head for LAS & SS materials.
- 2.2.13 Heat treatment of formed parts shall be carried out as per following:

#### For Carbon Steel:

- a. Cold formed dished ends or knuckles up to 16 mm nominal thickness shall be stress relieved.
- b. Cold formed dished ends or knuckles above 16 mm nominal thickness shall be normalised.
- c. For Low alloy Steel: Cold Formed Dish ends or Knuckles shall be stress relieved.
- d. Hot formed dished ends or similar parts, which have not been uniformly heated in the normalising range in the final stages of manufacture shall be normalised.



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- e. When the completed vessel involves post weld heat treatment, heat treatment recommended in (a) above shall not be applicable.
- Vessels in caustic service, Amine or Sour gas service shall be stress relieved.
- g. All internal and external attachments, clips, insulation studs, name plate bracket, and the like shall be welded to the vessel before post weld heat treatment.
- 2.2.14 PWHT of complete vessel shall be carried out in one go in a furnace. Local stress relieving of Weld joint in piece meal shall be avoided as far as possible.
- 2.2.15 All Nozzle Flanges & Gaskets size, rating & type etc. shall be as per applicable piping Specifications & instrument specification as applicable enclosed with the enquiry and Selected bolting shall match with corresponding companion flanges.
- 2.2.16 Equipment under Caustic service shall essentially be PWHT with 100 % radiography. The hardness of the parent weld, weld & HAZ shall be Limited to 200 BHN.
- 2.2.17 Pressure part plates having thickness 16 mm to 50 mm (both inclusive) shall be ultrasonically Tested (UST) as per ASTM A-435. Pressure part plates having thickness above 50 mm and all Plates to be used shall be UST as per ASTM A-578 Level B. No laminations or inclusions shall be permitted.
- 2.2.18 Steel for Hydrogen service at elevated Temperature & pressure shall be selected as per API 941 & API 934 .The following special requirements shall be met with for Hydrogen/Sour gas as per NACE standard.
  - a) All pressure parts shall be post weld heat treated.
  - All pressure retaining welds shall be 100% radiographed after final weld. However Root run shall be liquid Penetrant tested.
  - c) Hardness of base metals, weld and HAZ shall not exceed 22 HRC
- 2.2.19 Cladded plates shall be supplied as per ASTM A264 material specification. All clad plate shall be UT examined at the steel works in accordance with ASTM A578 level S8.
- 2.2.20 The minimum thickness of weld overlay material shall be 1/8 inch (3 mm) except clad or weld Overlay tube sheets and gasket surfaces.
- 2.2.21 Tube sheets shall have a nominal clad or weld overlay thickness of 3/8 inch (10 mm) but not Less than 5/16 inches (8 mm) regardless of shell side or tube side face. The minimum thickness of clad or weld overlay at a pass partition groove shall be 1/8 inch (3 mm) minimum
- 2.2.22 Unless otherwise specified Copper & Copper alloys shall not be used. Copper content up to 0.4% are acceptable in carbon steel & 0.6% in stainless steel.
- 2.2.23 The extent of radiographic examination of the shell and head seams shall be spot examination, Minimum.
- 3.0 **Technical Requirements**



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#### 3.1 PLATE TYPE HEAT EXCHANGER

- 3.1.1 The plate type exchanger shall be designed in accordance with "API 662"
- 3.1.2 All plates shall be pressed from a homogeneous single metal sheet in one placing and normal thickness of plate being pressed shall not be less than 0.5 mm
- 3.1.3 Nozzle neck attachments shall be with full penetration weld. Set on nozzles are not permitted.
- 3.1.4 Lock washers shall be provided for all rotated nuts.
- 3.1.5 SS plate shall be of SA 240 specification.
- 3.1.6 For gasket type PHE, vendor shall be responsible for the compatibility of gasket material & Glue, selected for specified fluids and design conditions.
- 3.1.7 All components in contact with process fluids shall be as per Process data sheets (PDS).
- 3.1.8 Equipment shall be hydro tested at test pressure limits (as differential pressure) for 30 Minutes minimum. Also mechanical strength of the frame shall be tested by raising the Pressure on both side equivalents to test pressure (i.e. 1.3 times design pressure) for 90 Minutes minimum.
- 3.1.9 All nozzles of Heat exchanger shall be of extended type. Studs connections are not acceptable.
- 3.1.10 The plate shall be fully supported by carrying bar and only guided by the guide bar.
- 3.1.11 The carrying bar shall be designed to support at least 1.5 times the total weight of movable cover and plate pack filled with water or process fluid whichever is having greater density.
- 3.1.12 Bidder shall furnish the complete details of the offered system like features, properties of the Descalant, system description, operating details etc.
- 3.1.13 Vendor to develop methodology or device to get the entrapped gases escaped during welding and also to ensure that no processed fluid should get entrapped during operation in such area otherwise it may lead to crevice Corrosion.

#### 3.2 Shell and Tube Heat Exchangers

- 3.2.1 Process Shell and Tube Exchangers will comply with the requirements TEMA (Latest) Class 'R'. The tube sheet shall be analysis by Appendix "UHX" of ASME Section VIII, Div. 1 & TEMA whichever is more stringent. (TEMA Class 'C' may be used for auxiliary heat exchangers for rotating and packaged equipment exchangers.)
- 3.2.2 ASME Section VIII, Div. 1, Appendix "S" shall be considered mandatory for bolted flange connections. All mandatory requirements are covered under Appendix 2 for different loading condition.
- 3.2.3 Mean metal temperature of tube & shell be considered in the design of fixed tube sheet exchangers.



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- 3.2.4 Parts such as tubes, tube sheets, floating heads etc. which simultaneously come in contact with both shell side and tube side fluids, shall be designed considering pressure acting on one side only or the combination of pressures, whichever results in higher thickness of parts.
- Exchanger saddle and foundation design shall include additional loadings generated from bundle pulling. The saddle and foundation design for all exchanger for which tube bundle pulling is foreseen during maintenance, shall be designed for longitudinal force acting at the exchanger axis. Pulling force shall be 1.5 times the bundle weights: Further wind load and piping load shall also considered on the exchanger supports and foundation.
- 3.2.6 Tube sheets in vertical exchangers shall be provided with drain and vent arrangement with threaded plug seal welded.
- Shell side "hot" nozzles shall be located at the top of the shell at the channel end whenever possible.
- 3.2.8 Lifting lug for heads or bonnets shall be provided wherever frequent dismantling is required.
- 3.2.9 Bundle weights shall be limited to 10 tonnes. In case the bundle weight increases by 10 Tones, Bidder shall take care necessary precaution in the design and fabrication of exchanger e.g. by Providing rollers arrangement, support plates etc. to avoid excessive loading on shell while Pulling of tube bundle, proper reinforcement in equipment support etc.
- 3.2.10 Saddle wear plate material shall be the same as the shell material.
- 3.2.11 Tube sheets and Girth Flanges shall be shall be of Forged Quality & Ultrasonically tested. It shall not have any segmental joint.
- 3.2.12 All heat exchanger tubes shall be seamless, cold drawn and formed from single length. CS tubes shall be normalized. LAS tubes shall be normalized and tempered.
- 3.2.13 The minimum radius of U tubes shall be not less than 2xOD of tube. Thickness of 2 inner most rows will be higher than other rows with minimum difference of 2 gauges.
- 3.2.14 For U tube bundle, the following requirements shall also be met:
  - Each U tube shall be formed from a single straight length
  - ii) All U tubes shall be cold bent
  - iii) All C.S, C-Mo, Cr-Mo tubes shall be heat treated after bending
  - iv) Bent portion of all U tubes shall be examined by PT and hardness check on four opposite points of bent portion shall be carried out
  - Unless otherwise specified, after bending each tube shall be tested hydraulically
- 3.2.15 Where fixed tube sheet heat exchangers are specified, thermal stress shall be checked in accordance with the TEMA standard to determine if an expansion joint is necessary.
- 3.2.16 Tube to tube sheets joints shall be leak tested with air & soap solution at pressure of 2.0 kg/cm2 g wherever specified leak testing with halogen shall be carried out.
- 3.2.17 Pass partitions shall be provided with a weep hole of about 6 to 12 mm in diameter at low points of pass partitions.



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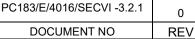
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- 3.2.18 Minimum SS 304 as MOC for tubes shall be used for Heat Exchangers having Cooling Water. All tubes shall be seamless only.
- 3.2.19 After testing, all exchangers shall be completely dried.
- 3.2.20 Gaskets used during testing shall be same as specified for operating conditions. However all Joint gaskets shall be replaced by new gasket which will be opened after Hydro testing.
- 3.2.21 Bidder shall check adequacy of tube bundle against flow induced vibration.
- 3.2.22 While deciding the location of heat exchanger in the equipment layout it should be ensured that there is no restriction in complete opening of the channel, shell and floating head cover, bundle removal e.t.c. sufficient unobstructed space shall be provided in between two exchangers so as to allow a man to pass through for maintenance.
- 3.2.23 Unless otherwise stated inlet nozzles on shell side shall be provided with impingement plate in Compliance with TEMA requirement. The flow area around solid impingement plate shall be at least equal to the inlet nozzle cross-section. In case of two phase flow impingement baffle shall be perforated. Impingement baffle plate shall extent at least 25 mm beyond the projection of the nozzle bore. The clear distance from the nozzle (at the inner surface) to the impingement plate shall be at least 0.25 x nozzle diameters. The nominal thickness of the impingement baffle shall be at least 6 mm.
- 3.2.24 Where heat treatment of U-bends is required, the heat treated portion shall extend at least 150 mm beyond the point of tangency.
- 3.2.25 All heat exchanger tubes shall be 100% eddy current tested in supplement to hydro test.
- 3.2.26 Tubes shall be flush with or extend by 3 mm beyond the face of each tube sheet, except that tubes shall be flush with the top tube sheet in vertical exchangers unless otherwise specified.

#### 3.3 Vessel

- 3.3.1 Design, materials, fabrication and inspection of welded pressure vessels shall comply with ASME Code Section VIII, Division 1 (latest edition) and Technical Specifications.
- 3.3.1.1 a) Tori spherical heads shall be used for Pressures up to 6.86 bar (g). For tori spherical heads, ratio of Knuckle to Inside Crown Radius shall not be less than 6%.
  - b) Beyond 6.86 bar g, heads shall be of ellipsoidal type having a ratio of major axis to minor axis 2:1 or hemispherical type. Alternatively, Hemispherical Heads with minimum weld joints may also be used.







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3.3.2 For vessels the minimum thickness of shell & heads, including corrosion allowance shall be as indicated below:

Sr. No	Shell Diameter( mm )	Thickness (Min.) mm	
		CS / LAS	HAS
1.	ID < 500	5	3
2.	501 < ID < 1200	5	4
3.	1201 < ID <2000	6	5
4.	2001 < ID < 2600	8	6
5.	ID > 2600	10	8
CS = Carbon Steel, LAS = Low-Alloy Steel, HAS = High-Alloy Steel			

- 3.3.3. All nozzles above 24" NB shall comply with ASME B16.47 Series B (API 605).
- 3.3.4. Minimum branch nozzle thicknesses shall be Schedule Extra Strong above 2" NPS, and Schedule 160 for 2" NPS and below.
- Stress calculations due to Local loads on vessel for external structural attachments, such as platform clips, pipe support clips and lifting lugs shall be performed.
- 3.3.6 Design of vessel skirt shall be based on seismic/wind/thermal considerations and fire proofing/insulation requirements.
- 3.3.7 Vessel skirts for carbon steel vessels shall be designed from the same material as the shell or the head. Vessel skirts for other than carbon steel vessels shall be the same material as the shell or the head for the top 500 mm.
- 3.3.8 Vessels with skirt support having eight or more anchor bolts shall be required to be supplied with an anchor bolt template. The template shall be an annulus 10 mm (minimum) thickness and 150 mm (minimum) wide, with bolt holes equal to bolt diameter plus 3 mm, stacked drilled with skirt base plate.
- 3.3.9 Maximum permissible deflection for columns when subjected to design wind loadings shall not exceed 0.005 x Vessel height.
- 3.3.10 Minimum man way size shall be equal to 24" nominal pipe size.
- 3.3.11 Manhole/hand hole/blind holes covers shall be equipped with davits or hinges to facilitate handling.



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- 3.3.12 Horizontal vessels of large size and thin wall shell on saddle supports shall be investigated for buckling, local circumferential bending and shear stress. The method of L. P. Zick (Supplement to Welding Research, 1971) may be used for this investigation.
- 3.3.13 Use of structural steel shall be limited to non-pressure parts only.
- 3.3.14 Local vessel stress calculations for external structural attachments, such as platform clips, pipe support clips and lifting lugs shall be performed.
- 3.3.15 Dimensional tolerances shall be in accordance with the design codes or standards, whichever is more stringent.
- 3.3.16 For vessel with diameter less than 900 mm and having removal internals, shell flange shall be provided.

#### 3.4 FRP/GRP TANKS

#### Codes

#### Construction

- ASME X Rule for Construction
- EN-13121-For Fiber-Reinforced Plastic Pressure Vessels

#### Materials and material testing

- ASTM C-581 Chemical resistance of Resins
- ASTM D-2150 Woven roving Laminated FRP
- ASTM D-2583 FRP hardness test
- ASTM D-2584 Ignition loss of cured FRP
- ASTM D-2990 Flexural creep and Creep-rupture
- ASTM D-2997 Machine made FRP pipe
- ASTM D-3299 Filament-wound reinforcing
- ASTM D-3892 Resin and FRP packaging
- ASTM D-4024 Machine made FRP flanges
- ASTM D-4097 Contact-molded FRP tanks
- ASTM D-5421 Contact-molded FRP flanges
- ASTM D-618 Plastics testing conditions
- ASTM D-638 Plastics tensile properties testing.
- ASTM D-695 Plastics compressive testing
- ASTM D-883 Plastics terminology
- ASTM F-412 Plastics piping terminology

#### **Equipment testing**

ASME V Non-destructive examination

#### Flange Drilling and bolting

- ASME/ ANSI B 16.5 Flanges and flange fittings
- ASME/ANSI B 16.47 Large diameter steel flanges
- 3.4.1 Graphite powder/ Resin paste shall be applied behind all welds to provide a permanent earth Path for spark testing. Permanent metal foil strips shall not be permitted.
- 3.4.2 Flange face (Front & back) shall be smooth & flat. If the flange faces are machined, the full Chemical liner shall be reinstated.

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- 3.4.3 The Barcol Hardness of FRP/GRP wall shall be tested according to ASTM D2583.
- 3.4.4 The difference in the glass content of FRP/GRP between the samples shall not be more then 5% wt.
- 3.4.5 All items shall be cured in accordance with the resin supplier's instruction s. wherever possible curing shall be done at Manufacturers works.
- 3.4.6 High frequency spark testing

All production thermoplastic welds shall be examined visually & by high frequency spark test Equipment at the following stages:

- · Completion of first weld run
- Completion of external run
- · After pressure or static head test
- After any boil out test
- 3.4.7 Reinforcing materials used on the inner surface shall be in compliance with the latest edition of ASTM D3299.
- 3.4.8 For FRP/GRP tanks, thickness of Corrosion barrier of the thermoplastic lining shall not be included in the thickness calculation, to withstand design condition.

#### 3.5 Safety

- 3.5.1 Safety standards and features which are inherent in the specific mechanical equipment design codes, standards and regulations are applicable.
- 3.5.2 Safety features to be incorporated into the design include, but are not limited to, the following features for equipment:
  - i) Ladder cages
  - ii) Safety chain across platform access
  - iii) Step-off platforms where necessary
  - iv) Platform grating
  - v) Toe plates

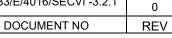
#### 4.0 Fabrication

- 4.1 The Bidder shall comply in all respects with the provision of the applicable codes, standards and specification during fabrication with respect to tolerances, welding, fabrication, forming of heads, radiography, heat treatment, inspection, testing and quality control etc. unless & otherwise specified.
- 4.2 Plates of different thicknesses shall be made flush with the inner surfaces of equipment unless otherwise stated.
- 4.3 Larger heads which cannot be formed in one piece shall be fabricated as follows with prior approval from Principle.
  - a) In two pieces, with the welding seam included in the middle third and preferably on the centre line



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- b) In petal construction, with meridianal seams and a central cap of diameter not larger than 0.75 times the vessel outside diameter
- 4.4 Due provisions must be kept for venting out entrapped gases during welding of pads, flanges and liner plates etc.
- 4.5 All welding shall be carried out by qualified welders using approved procedures in compliance with the requirements of codes, standards & specifications and shall be duly certified by the concerned inspecting authority. All welding procedures must be got approved from authorised inspecting authority before starting any fabrication job. Welding of all parts must be completed before heat treatment.
- 4.6 All welds shall be full penetration welds with back chipping and re-welding from the second side. For those joints which are inaccessible for back chipping the root run shall be carried out with TIG process. Single side welding with backing strips shall are not permitted.
- 4.7 All parts shall be fabricated in accordance with good shop practice and in uniformity so that all corresponding parts will be inter-changeable.
- 4.8 All sharp corners shall be rounded off with smooth radius. Inside edge of manhole and hand hole at the internal surface shall be rounded to minimum radius 5 mm.
- 4.9 All flange bolts & skirt-bolts shall straddle centre line unless otherwise stated.
- 4.10 In case of nozzle with butt-end construction, extra length shall be provided to facilitate hydraulic testing and subsequently cutting and edge preparation to suit piping welding at site.
- 4.11 All nozzles less than or equal to NB 65 mm shall be stiffened with three equispaced plate ribs of the same material as that of shell.
- 4.12 Flange facing and thread connection shall be protected against oxidation during HT.
- 4.13 Longitudinal and circumferential welded seams shall not interfere with nozzle openings, reinforcement plates, saddle pads, and other attachments as far as possible.
- 4.14 Welding wherever specified, is to be done by qualified and approved welders using the suitable fillers and fluxes recommended for the materials in the fabrication drawings.

#### 5.0 **Inspection & Testing**

- 5.1 Equipment shall be inspected and tested in accordance with the relevant codes, standards and specifications by TPIA. Cost of TPIA shall be under bidder scope. All equipment shall be inspected during various stages of manufacturing starting from identification of raw materials to final completion as per agreed Quality Assurance Plan (QAP) which shall be prepared by Successful Bidder after award of contract. In case of site fabricated/assembled equipment same inspection agency shall be responsible for inspection and testing at site. However all the bought-out items must be supplied with test certificate and inspection reports.
- 5.1.2 The equipment shall be inspected by Third party inspection agency (TPIA) (defined elsewhere in NIT) as inspection agency. It shall be the responsibility of the Bidder to make available to the



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inspector all the drawings, calculations and other documents. However the Principal shall have free access for inspection at vendor's/sub-vendor's shop and at site during project execution.

- 5.2. The equipment shall be considered acceptable for despatch only after final certification for acceptance is issued by concerned inspector.
- 5.2.1 All parent material (Primary & Secondary Components), welds and HAZ shall be impact tested at Minimum Design Metal Temperature (i.e. minimum service temperature or the temperature to be computed as per applicable codes, standards & specifications) by Bidder and shall have impact energy values as per the applicable codes, standards & specifications.
- 5.2.2 Production control coupons, when required as per codes & standards shall be subjected to impact test, corrosion test etc. in addition to mechanical tests as required. In case of heat treated equipment test coupons shall be given similar heat treatment as for the equipment.
- 5.2.3 Formed heads when fabricated in pieces shall be normalised and weld seams fully radiographed after forming.
- 5.2.4 Vessel containing lethal, toxic and highly inflammable substance shall be fully radiographed and stress relieved.
- 5.2.5 Tube to tube sheet joints in heat exchanger shall be leak tested with air & soap solution at 2 kg/cm2 g. Helium testing shall be carried out wherever required.
- 5.2.6 All nozzle reinforcing pads shall be tested pneumatically at 0.5 Kg/cm2g pressure with soap solution on attachment welds. Vent holes shall be plugged with non hardening mastic to prevent ingress of water.
- 5.2.7 All completed equipment shall be tested hydraulically as per the requirements of codes, standards & specifications in presence of the inspecting authority. Pneumatic test of completed equipment shall be carried out only when specially mentioned in the specification sheets. Chloride content in water used for testing shall not exceed 30 ppm for SS equipment and 40 ppm for CS and low alloy steel equipment. Min Duration of Hydrotest test shall be 60 min of as per applicable codes & standards whichever is higher.
- 5.2.8 The temperature of test water shall comply with requirement of Fabrication code.
- 5.2.9 Unless otherwise stated gaskets used during testing shall be same as specified for operating conditions. However all joint gaskets shall be replaced by new gasket which will be opened after Hydro testing.
- 5.3 The following NDT requirements are mandatory in addition to codes, standards & specification requirements:

#### A) UT examination

- i) All butt welds in thickness greater than 50mm as supplement to radiograph
- ii) FPW of nozzle attachments of thickness above 50mm as supplement to radiography
- iii) Clad Plates and formed heads from clad plates in all thicknesses
- iv) All forgings
- v) Weld overlay on tube sheet

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PC183/E/4016/SECVI -3.2.1	0
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SHEET 19 OF 38



DESIGN PHILOSOPHY-STATIC EQUIPMENT

#### B) MP / PT examination

- i) All edges of plates and opening in shell of CS having thickness equal to & above 40mm and LAS / SS having thickness more than 25mm
- ii) Root and final layer of all butt welds
- iii) Fillet welds of SS
- iv) All weld surfaces after PWHT
- v) Each layer of weld deposit in SS overlay
- vi) Knuckle surfaces of dished ends, expansion bellows and pipe bends
- vii) All forgings after machining
- viii) Skirt to head joint
- ix) Each pass of tube to tube sheet joint
- x) Bent portion of all U-tubes

#### C) Radiography:

- i) All weld seams of formed head, if made in more than one segment shall be full radiographed after forming
- ii) When spot radiography is specified, all T Joints & minimum 5% of total weld length excluding T joints shall be radiographed
- iii) All nozzles fabricated from plates shall be 100% radiographed
- iv) Radiography of welds in C 1/2 Mo & Cr Mo Steel be carried out after Hydrotest.

**Note:** If a vessel is not 100% radiographed and/or UT tested, then a minimum 10% RT (Spot radiography examination) of butt, corner & T-joints shall be made.

#### D) Rubber lining Inspection & Testing as per IS: 4682 (part 1)

#### 6.0 Pickling and Passivation

6.1 All SS material shall be Pickled & Passivated as per following procedures:

#### 6.1.1 Pickling

Aqueous pickling solution shall be as follows:

Nitric acid (Tech. grade) 10 to 25% plus Hydrofluoric acid 1 to 8% (to be used only for stabilised SS grades). Temperature 50 to 60° C for 10% Nitric acid and 20° C for 25% Nitric acid. When size and shape of product permit, total immersion in the pickling solution is preferred. Where immersion is impractical, pickling may be accomplished by wetting the surface by

- i) Swabbing or spraying
- ii) Partial filling the item with pickling solution and rotating or rocking so that all the surface receives the required chemical treatment.

The maximum period for which the pickling solution shall be allowed to remain on the surface is 30 minute. During pickling removal of oxides may be hastened by brushing with a hard fibre or SS wire brush. Over pickling shall be avoided.

FORM NO: 02-0000-0021F2 REV4



### DESIGN PHILOSOPHY-STATIC EQUIPMENT

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SHEET 20 OF 38

The pickling agent shall be washed off with plenty of water so as to leave no trace behind.

#### 6.1.2 **Passivation**

After pickling and water rinsing, an aqueous caustic permanganate solution containing NaOH 10 weight % and KMnO4 4 weight % shall be used for neutralising pickling solution. This shall be followed by thorough water rinsing.

Water used for pickling and washing shall not have chloride contents exceeding 30 ppm.

#### 7.0 **Painting**

- 7.1 All CS external surfaces of shop fabricated equipment shall be primer and final painted as per Section-7 of NIT.
- 8.0 **Insulation**
- 8.1 The equipment shall be insulated as defined elsewhere in NIT document.
- 9.0 Spares (Erection & commissioning, Mandatory spare parts (For 2 year operation) etc.)
- 9.1 COMMISSIONING SPARES
- 9.1.1 All Erection & commissioning spares shall be included by LSTK Contractor in their scope of supply and shall be part of the main equipment.
- 9.2 Mandatory spare parts (For 2 year operation)
- 9.2.1 Mandatory spare parts (For 2 years operation) shall be supplied by the contractor as per Section-5 of NIT document.

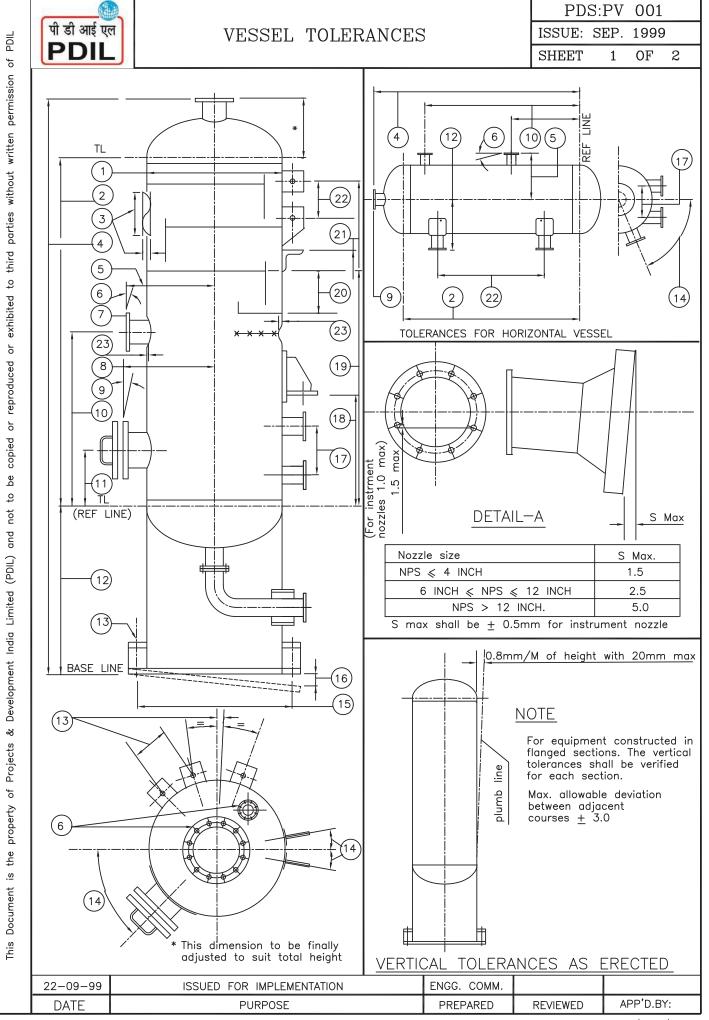
#### 10.0 **Documentation**

Documents shall be submitted as per "Documentation schedule" in Section-4 of NIT.

#### 11.0 Vendor List

All equipment shall be procured/ fabricated as per approved Sub vendor list (Section-8). Any equipment for which vendor list is not enclosed, the LSTK Contractor may furnish a list of their proposed vendors along with their references for supply of similar type of equipment along with bid. However all the additional proposed vendors shall have well proven track record and shall be subjected to consultant/owner's approval.

Further Integral static equipment within the package shall be fabricated by package vendor/ proven sub-suppliers. LSTK bidder to furnish list of proven sub-suppliers for static equipment within the package Item with PTR (proven track record) & requisite documents subject to owner's/ consultant approval during detail engg. Documents & PTR shall be in English language only.



FILE NAME :STD/NCR/PV001



#### VESSEL TOLERANCES

PDS:PV 001 ISSUE: SEPT 1999

SHEET 2 OF 2

Nom. vessel Diameter Tolerance Shell Tolerances 1) ± 2.5 600 & under Over 600 to 1200  $\pm$  4.0 Over 1200 to 2100  $\pm$  6.0 Over 2100 to 2700 7.0  $\pm$ Over 2700  $\pm$  8.0

- 2) Distance between top & bottom tangent lines,  $\pm 1.5$  mm/M height, max.  $\pm 12$
- 3) Linearity of cylindrical surface,  $\pm$  3mm/6M, max. of 20
- 4) Height from base line to face of top nozzle, + 5 max.
- 5) Face of nozzle from centre line of vessel,  $\pm$  3
- 6) Alignment of flange face of nozzle shall be as given in Table (Under Detail 'A')
- 7) Rotation of flange holes with reference to nozzle axis; 1.5 max. (Refer Detail 'A')
  In case of instrument connections this shall be 1.0 mm max.
- 8) Face of manhole from centre line of vessel, ± 6
- 9) Alignment of flange face of manhole shall be  $\pm$  6 in both vertical and transverse planes.
- 10) Location of shell nozzle from reference line, + 3
- 11) Location of manhole from reference line ,  $\pm$  12
- 12) Bottom of skirt base ring to the bottom tangent line of vessel, +0
- 13) Orientation of anchor bolts with respect to principal axes, + 6
- 14) Tolerance in orientation of nozzles and external clips, + 3
- 15) Distances of bolt holes from axis up to 2000 dia +3 & over 2000 dia + 6
- 16) Maximum deviation of skirt base

Nom. Vessel Diameter	Tolerance
1200 & under Over 1200 to 2000 Over 2000	±3 ±5 ±7

- 17) Distance between level control nozzles, + 1.0 mm
- 18) Distance between support bracket and reference line, + 6
- 19) Location of tray support ring from reference line, + 6
- 20) Tolerance between adjacent tray plates, + 3
- 21) Location of external clips and attachments from reference line,  $\pm$  6
- 22) Distance between adjacent clips for platform brackets, + 3
- 23) Irregularities in profile (checked by a 20° gauge) shall not exceed  $\delta < 0.05*e+0.002*D$  (Maximum 25 mm)

Where  $\hat{S} = \hat{M}$ aximum local irregularities e = Plate thickness

D=Shell outside diameter

#### Notes:

- 1) In case of difference between the values tabulated here and those shown in the drawings, the latter shall govern.
- 2) For fabrication & assembly tolerances on vessel internals, see ES: 3105
- 3) For vessels fabricated from pipe—diameter and out of roundness tolerance to be in accordance with relevant pipe specification.
- 4) All dimensions are in mm unless otherwise specified.

22-09-99	ISSUED FOR IMPLEMENTATION	ENGG. COMM.		
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:

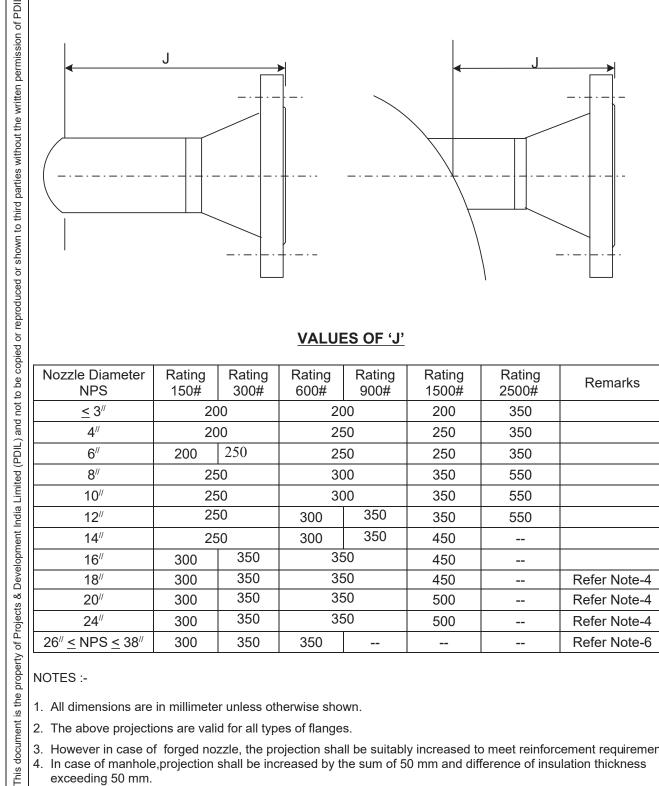


#### **PROJECTION OF NOZZLES**

**PDS: PV 002** 

**ISSUE: SEP. 1999** 

SHEET 1 OF 1



#### **VALUES OF 'J'**

Nozzle Diameter NPS	Rating 150#	Rating 300#	Rating 600#	Rating 900#	Rating 1500#	Rating 2500#	Remarks
<u>≤</u> 3″	200		200		200	350	
4"	20	00	25	50	250	350	
6"	200	250	25	50	250	350	
8"	250		300		350	550	
10″	250		300		350	550	
12"	250		300	350	350	550	
14″	25	50	300	350	450		
16″	300	350	35	50	450		
18″	300	350	35	50	450		Refer Note-4
20″	300	350	350		500		Refer Note-4
24"	300	350	350		500		Refer Note-4
26" ≤ NPS ≤ 38"	300	350	350				Refer Note-6

#### NOTES:-

- 1. All dimensions are in millimeter unless otherwise shown.
- 2. The above projections are valid for all types of flanges.
- 3. However in case of forged nozzle, the projection shall be suitably increased to meet reinforcement requirement.
- 4. In case of manhole, projection shall be increased by the sum of 50 mm and difference of insulation thickness exceeding 50 mm.
- 5. Projection from vessel axis to nozzle facing shall be rounded off to 10 mm.
- 6. Flanges ≥ NPS 26" will be as per ASME B 16.47 series 'B'.

30/09/99	ISSUED FOR IMPLIMENTATION			
DATE	PURPOSE	PREPARED	REVIEWED	APPROVED

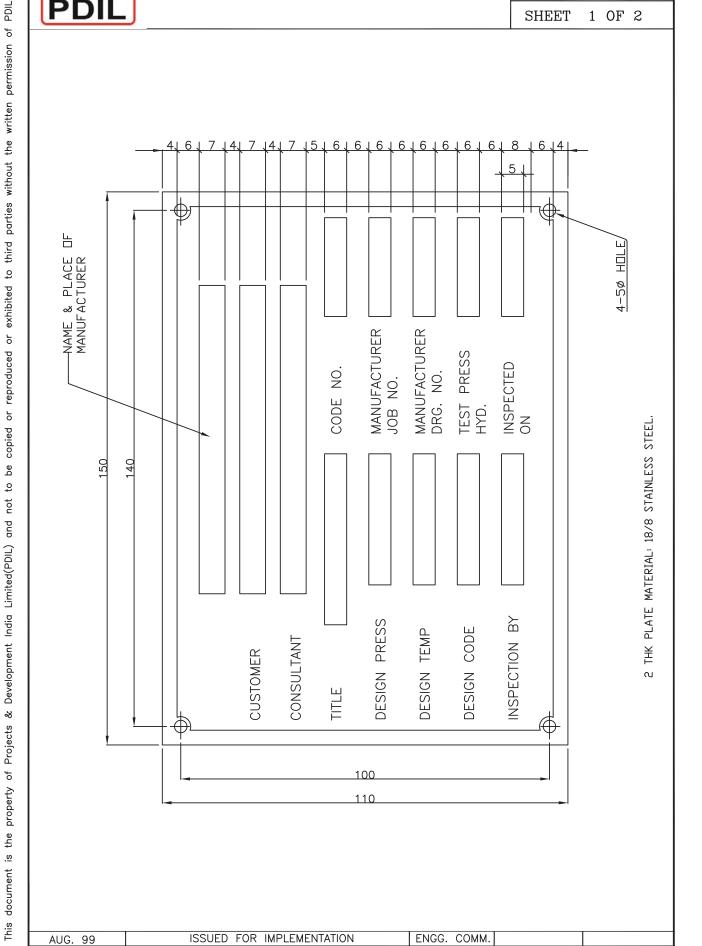


DATE

**PURPOSE** 

#### NAME PLATE FOR VESSEL & TOWER

PDS:PV 003
ISSUE: AUG. 1999
SHEET 1 OF 2



**APPROVED** 

REVIEWED

**PREPARED** 

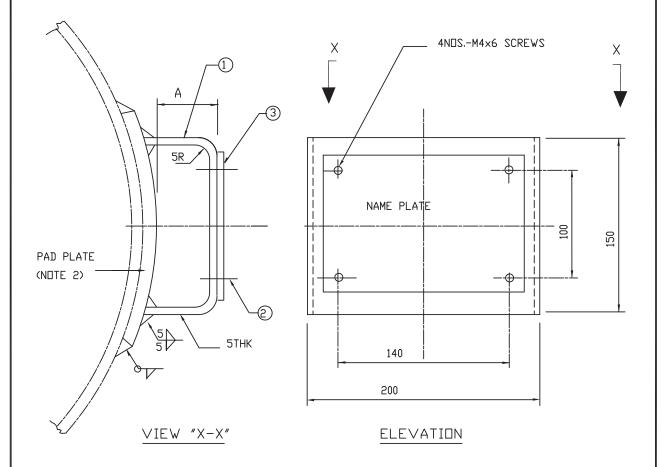


### NAME PLATE FOR VESSEL & TOWER

PDS:PV 003 ISSUE: AUG. 1999

SHEET 2 OF 2

#### NAME PLATE BRACKET



#### DIMENSION "A"

- a) VESSELS WITHOUT INSULATION = 25 mm
- b) VESSELS WITH INSULATION = INSULATION THK + 25 mm

#### NOTES:

#### MATERIALS:

**BRACKET** (1) IS 2062 Gr.A

SCREWS (2) S.S.304

NAME PLATE(3) S.S.304

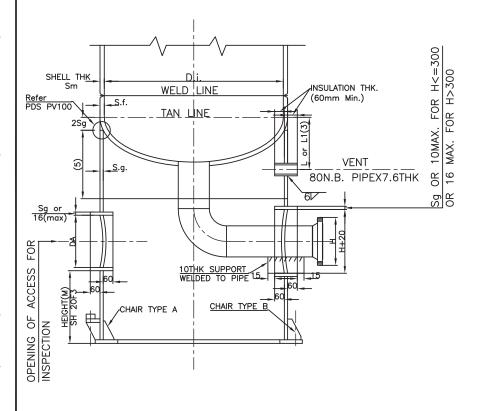
- 2 PAD PLATE OF SIMILAR COMPOSITION AS THAT OF SHELL SHALL BE WELDED ON VESSELS OF MATERIALS OTHER THAN CARBON STEEL AND THOSE UNDER LOW TEMPERATURE SERVICE
- 3 ALL DATA BLOCKS AND LETTERS MUST BE CHEMICALLY ENGRAVED ( 0.5 m.m.)

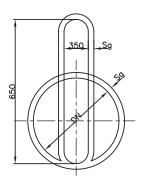
AUG. 99	ISSUED FOR IMPLEMENTATION	ENGG. COMM.		
DATE	PURPOSE	PREPARED	REVIEWED	APPROVED



#### SKIRT SUPPORT FOR VERTICAL VESSELS

PDS:PV 301
ISSUE: SEP 2014
SHEET 1 OF 3





OPENING OF ACCESS

SKIRT DIAMETER		OPENING OF	ACCESS	VENT			
DG	NO.	TYPE	DA	NO.	L	L1	
<=700	1	CIRCULAR	250	2	260	230	
701-1000	1	OVAL	350x650	2	290	250	
1001-2500	1	CIRCULAR	500	4	400	360	
2501-4000	2	CIRCULAR	500	8	550	450	
4001-6000	2	CIRCULAR	500	12	670	560	
>6000	2	CIRCULAR	500	16	700	600	

#### NOTES :-

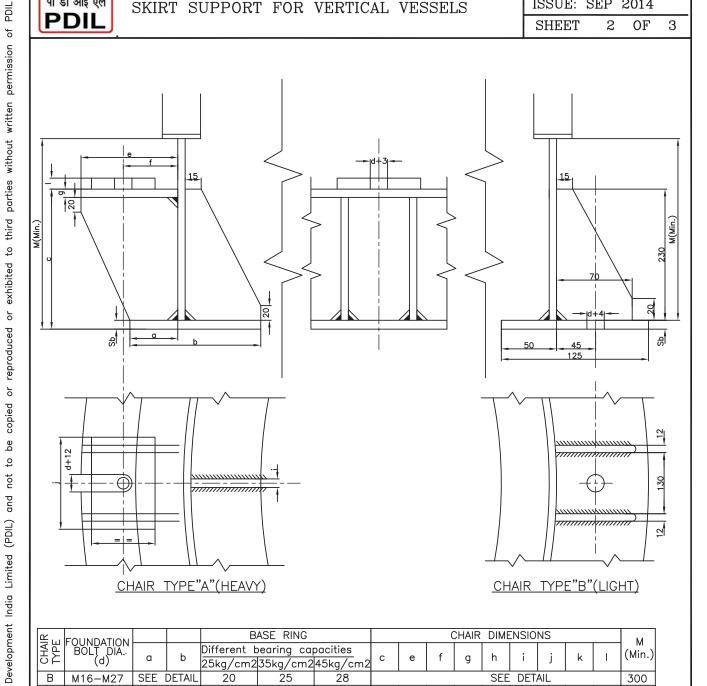
- 1. The No. dia and the type of bolt sahll be decided as per design. The bolt circle dia. 'DF' shall be fixed according to design , sheet 2 & 3 illustrate chair details (TYPE A, B & C)
- 2. For the skirt of conical(lapered) construction, the type and the no. of access opening and vent to be decided according to the dia. of skirt at corresponding elevation of centre line of opening.
- 3. The values of 'L' & 'L1' are adopted for insulation thickness <=90 mm. L for semielliptical head and 'L1' for torispherical head with r/D=0.1. For other types of head and insulation thickness >90 mm. 'L' & 'L1' shall be decided case by case.
- 4. 'M' the minimum height of each opening, shall be such that it allows for mounting of nut for type 'A' and welding of gussets for type 'B' foundation bolt chairs.
- 5. In case the head is made of S.S. or of special material and skirt in C.S., unless otherwise specified provide the skirt length ot the same material as that of head with minimum length of 250mm. For high temperature service, the length and the material of the skirt shall be decided according to design condition.
- 6. Where the skirt is attached to a stress relieved vessel the skirt to shell or head weld and at least 600mm of the skirt shall be stress relieved.

SEP. 2014	ISSUED FOR IMPLEMENTATION	ENGG COMM		
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:



#### SKIRT SUPPORT FOR VERTICAL VESSELS

PDS:PV 301 ISSUE: SEP 2014 2 SHEET OF 3



≃	FOUNDATION			E	ASE RING					CHAIR	DIME	NSIO	NS			I м I
CHAIR	BOLŢ DIA.	_	L .	Different	pearing co	apacities			ı,	_	L .	:		l.		(Min.)
100	(d)	(q)a	b	25kg/cm2	35kg/cm	245kg/cm2	2 c e		g	h	'	J	k		[	
В	M16-M27	SEE	DETAIL	20	25	28					SEE	DET.	AIL			300
	M30	50	130	20	25	28	250	125	75	14	70	12	105	80	32	420
	M33	50	130	20	25	28	250	130	76	14	75	12	110	90	32	436
	M36	55	140	22	28	32	280	145	84	14	80	12	115	100	36	480
	М39	55	140	22	28	32	280	150	84	16	85	14	125	110	36	490
	M42	60	150	25	28	32	300	160	92	16	90	14	130	110	40	525
Α	M45	60	150	25	28	32	300	165	92	18	95	16	140	120	40	535
	M48	65	170	25	32	36	330	180	100	18	100	16	150	130	45	580
	M52	70	180	28	32	36	360	190	110	20	105	18	160	140	50	625
	M56	70	180	28	32	36	360	200	110	20	110	18	170	150	56	645
	M60	80	200	32	36	40	400	220	122	22	115	20	180	160	56	700
	M64	90	200	32	40	45	440	235	134	25	120	20	190	170	63	760

#### NOTES :-

Projects &

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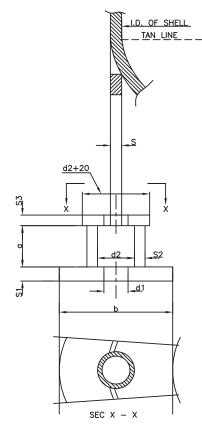
1. The fillet size of the welding shall be equal to minimum of the thicknesses to be welded.

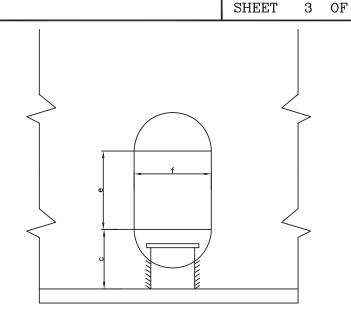
SEP. 2014	ISSUED FOR IMPLEMENTATION	ENGG COMM		
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:



### SKIRT SUPPORT FOR VERTICAL VESSELS

PDS:PV 301 ISSUE: SEP 2014





DIA. OF BOLTS	NO. OF HOLES	а	b	С	d1	d2	е	f	S1	S2	S3
20		55	80	70	24	48	70	80	20	7	12
24		55	80	70	28	48	70	80	20	7	12
27	7	55	80	70	32	60	70	85	20	9	12
30	1	60	110	75	35	60	80	90	22	9	16
33	띹	70	110	85	39	60	85	95	22	9	16
36	NOTE	75	110	90	42	73	95	105	22	10	16
39	SEE	90	130	105	45	73	105	110	22	10	16
42	S	100	130	115	48	73	115	115	22	10	16
45		115	130	130	51	90	125	120	22	12	16
48		125	150	140	54	90	135	130	25	12	20
52		140	200	155	58	90	140	135	30	12	20

#### NOTES :-

- 1. The base ring can also be manufactured in four equal parts and the relating welding must be ground on both sides. The ring dimensions must be checked case by case on the basis of the specific loads.
- 2. The number of the anchor bolts shall be determined case by case and at any rate in a number multiple of four the type to be selected is a designers choice..
- 3. The fillet size of welding shall be minimum of the thicknesses to be welded.

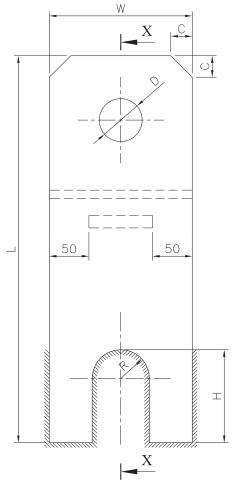
SEP. 2014	ISSUED FOR IMPLEMENTATION	ENGG COMM		
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:

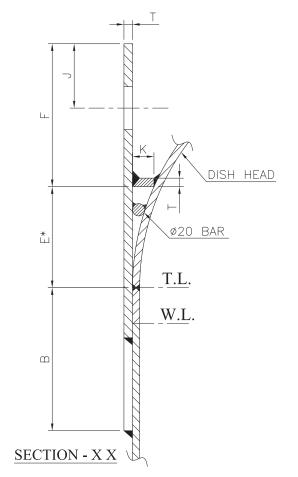
# पी डी आई एल **PDIL**

## LIFTING LUG

PDS : PV 302 ISSUE: SEP. 2014

SHEET 1 OF 2





MAX. ERECTION WT OF VESSEL (M TON)	10	25	45	90	140	180
THICKNESS OF PLATE (T)	12	28	40	50	70	80
WIDTH (W)	200	230	300	400	500	615
LENGTH (L)	400+E	460+E	580+E	750+E	900+E	1080+E
DIAMETER OF HOLE (D)	60	75	75	100	130	150
HEIGHT OF NOTCH & SIDE WELD (H)	130	130	150	200	250	300
RADIUS OF NOTCH (R)	40	40	50	75	90	100
WELD SIZE	10	14	20	30	38	46
BOTTOM OF BRACE TO TOP OF LUG (F)	200	230	300	400	500	600
BOTTOM OF BRACE TO T.L. OF HEAD (E)			see n	ote 2*		
T.L. OF VESSEL TO END OF LUG (B)	200	230	280	350	400	480
CHAMFER (C)	30	40	50	70	90	100
TOP OF LUG TO CENTER LINE OF LUG (J)	90	90	115	150	180	230
(K)	30	40	50	70	80	100
NO. OF LUGS (T)	2	2	2	2	2	2

#### NOTES:

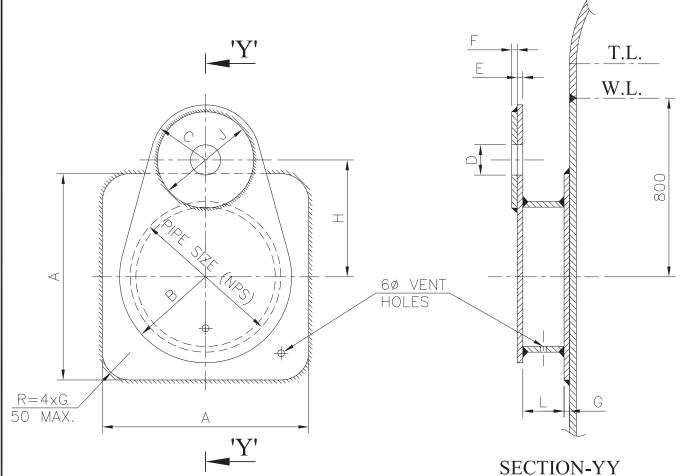
- 1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED.
- 2. DIMENSION 'E' TO BE DETERMINED BY SHAPE OF HEAD IN CONJUNCTION WITH DIMENSION 'K'.
- 3. DETAIL DIMENSIONS AND NOTES GIVEN IN DESIGN DRAWING TAKE PRECEDENCE OVER THOSE SHOWN HERE.

20-09-14	ISSUED FOR IMPLEMENTATION	ENGG. COMM.		
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:

### LIFTING LUG

PDS : PV 302 ISSUE: SEP. 2014

SHEET 2 OF 2

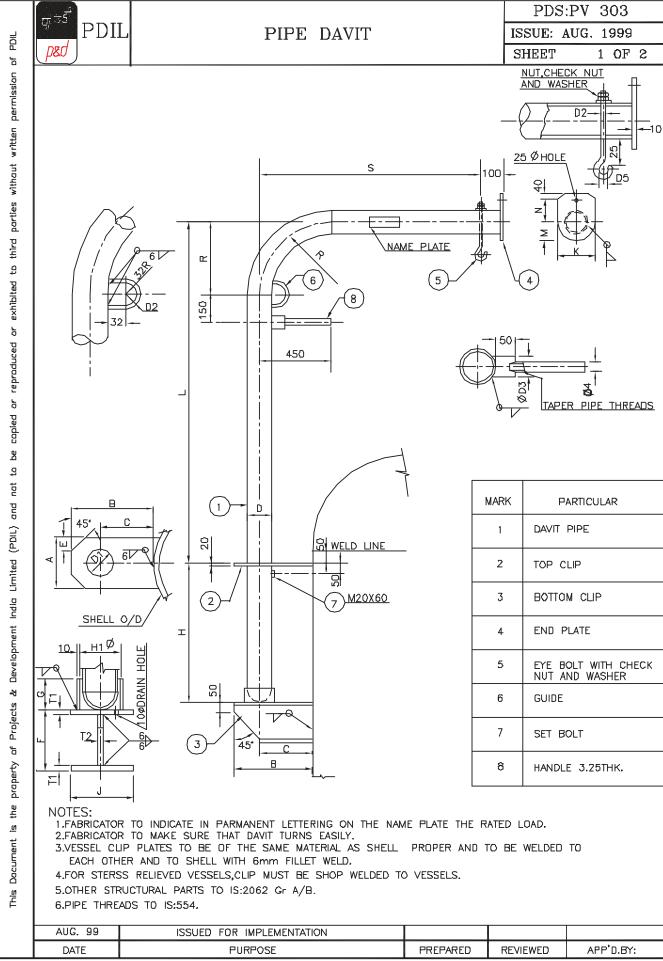


LIFTING		PIPE			PLATE							
CAPACITY PER LUG (M. TON)	NPS	MIN. THK.	L	A	В	С	D	Е	F	G	Н	J
<5	6"	7.11	60	25	100	50	27	8	_	8	130	_
>5 <10	8"	8.18	85	300	125	80	38	8	_	8	170	_
>10 <20	8"	8.18	85	300	125	80	44	10	8	10	170	140
>20 <25	10"	9.27	100	350	150	120	54	12	10	12	210	220
>25 <30	12"	8.38	110	400	175	160	60	12	10	10	250	300

#### NOTES:

- 1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE INDICATED.
- 2. LIFTING CAPACITY RELATES TO PER LUG. THIS TYPE OF LUGS MAY BE USED TO LIFT UPTO 60 TONS.
- 3. WELDING SIZE SHALL BE 0.7 OF THICKNESS BUT NOT LESS THAN 7 MM.
- 4. MATERIAL PLATES—SA 516 Gr. 70 OR EQUIVALENT (SEE NOTE 5). PIPE—SA 106 Gr. B OR EQUIVALENT.
- 5. THE PLATE WELDED TO SHELL FOR ALLOY STEEL EQUPMENT SHALL BE OF SAME MATERIAL OF THE SHELL.

20-09-14	ISSUED FOR IMPLEMENTATION	ENGG. COMM.		
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:



### PIPE DAVIT

PDS: PV 303

ISSUE: AUGUST 1999

SHEET 2 OF 2

Davit pipe size	IA	B-	C	D <sub>1</sub>	$D_3$	D <sub>4</sub>	E	F	G	Hı	J	K	M	N	T <sub>1</sub>	T <sub>2</sub>
DN 100	250	355	225	118	55	26.9	65	180	100	120	150	140	70	140	16	10
DN 150	300	400	250	172	70	42.4	75	200	100	175	200	190	95 '	160	16	10
DN 200	400	475	275	222	70	42.4	100	250	100	225	250	240	120	185	20	12

	Rated load 500 kg.		Rated load 1000 kg.									
Davi type		R	D <sub>2</sub>	D <sub>5</sub>	Davit type	D DN x Thk.	R	D <sub>2</sub>	D <sub>5</sub>	S	L	Н
1	100 x 7.9	500	16¢	40¢						600	2300	750
2	100 x 7.9	500	16 ¢	40¢						700	2300	750
3	150 x 7.11	750	16 ¢	40 ¢	103	150 x 9.52	750	20¢	50 <b>ø</b>	800	2500	750
4	150 x 7.11	750	16 ¢	40 ¢	104	150 x 9.52	750	20φ	50 Ø	900	2500	750
5	150 x 7.11	750	16 ¢	40 φ	105	150 x 9.52	750	20 φ	50 ¢	1000	2500	900
6	150 x 7.11	750	16 ¢	40 Ø	106	200 x 8.18	1000	20 φ	50 <b>ø</b>	1100	2500	900
7	150 x 7.11	750	16 ¢	40 ¢	107	200 x 8.18	1000	20 φ	50 Ø	1200	2500	900
8	150 x 7.11	750	16 <i>ф</i>	40 Ø	108	200 x 8.18	1000	20 φ	50 Ø	1300	2800	1100
9	150 x 7.11	750	15 φ	40 Ø	109	200 x 8.18	1000	20 φ	50 φ	1400	2800	1100
10	150 x 9.52	750	16 \$	40 Ø	110	200 x 8.18	1000	20 φ	50 Ø	1500	2800	1100
11	150 x 9.52	750	16 ¢	40 Ø I	111	200 x 11.13	1000	20 φ	50 Ø	1600	3000	1250
12	150 x 9.52	750	16 ¢	40 Ø I	112	200 x 11.13	1000	20 φ	50 Ø	1700	300C	1250
13	150 x 9.52	750	16 <i>ф</i>	40 Ø	113	200 x 11.13	1000	20 φ	50 Ø	1800	3000	1250
14	150 x 9.52	750	16 ¢	40 Ø	114	200 x 11.13	1000	20 φ	50 φ	1900	3000	1250
15	150 x 9.52	750	16 ¢	40 Ø	115	200 x 11.13	1000	20 φ.	50 ¢	2000	3000	. 1250
16	150 x 9.52	750	16 <i>ф</i>	40 Ø	116	200 x 11.13	1000	20 φ	50 Ø	2100	3300	1400
17	200 x 8.18	1000	16 $\phi$	40 Ø						2200	3300	1400
18	200 x 8.18	1000	16 <i>ф</i>	40 φ						2300	3300	1550
19	200 x 8.18	1000	16 $\phi$	40 Ø						2400	3300	1550
20	200 x 8.18	1000	16 Ø	40 Ø						2500	3300	1550
21	200 x 8.18	1000	16 Ø	40 Ø			~	rolle	1 0	2600 O <b>Py</b>	3300	1550

Copy Serial No. 01

Issued by: 5. K. Upod hyay

Dated:

Madeyay

09.09-99 (Signature & Name)

31: /08/99 DATE ISSUED FOR IMPLEMENTATION PURPOSE

PREPARED

REVIEWED

APPROVED

FURS NUMBER 02-0000-5021 F3 REV 0

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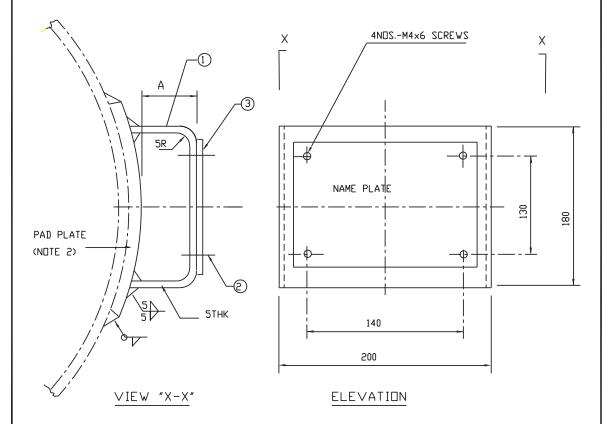
पी एंडडी -HE321 PDIL NAME PLATE FOR HEAT EXCHANGERS ISSUE:OCT.2003 be copied or reproduced or exhibited to third parties without the written permission of PDIL 1 OF 2 SHEET 130 6 6 6 3 6 3 6 3 6 3 6 6 5 NAME & PLACE C MANUFACTURER 4-5 Ø HOLE SIDE TUBE SHELL SIDE INSPECTED. ON CODE NO. MF.JOB NO. THK PLATE MATERIAL: 18/8 STAINLESS STEEL. 140 25 2 This document is the property of Projects & Development India Limited(PDIL) and not Kg/cm2g Kg/cm2g TEST PRESSURE HYD. DESIGN TEMPERATURE DESIGN PRESSURE REGISTRATON NO. ВҰ DESIGN CODE DESIGN VERIFIED BY INSPECTION CONSUL TANT MF.DRG.NO. CUSTOMER TITLE  $\Phi$ 6 6 5 6 6 6 3 2 63 5 140 ISSUED FOR IMPLEMENTATION TKC SUJEET AKG 21.10.03 DATE **PURPOSE PREPARED REVIEWED APPROVED** 



# PDIL NAME PLATE FOR HEAT EXCHANGERS

HE321
ISSUE:OCT.2003
SHEET 2 OF 2

#### NAME PLATE BRACKET



#### DIMENSION "A"

- a) VESSELS WITHOUT INSULATION = 25 mm
- b) VESSELS WITH INSULATION = INSULATION THK + 25 mm

#### NOTES:

#### MATERIALS:

BRACKET (1) SA283 Gr.C OR EQUIVALENT

SCREWS (2) S.S.304

NAME PLATE(3) S.S.304

2 PAD PLATE OF SIMILAR COMPOSITION AS THAT OF SHELL SHALL BE
WELDED ON VESSELS OF MATERIALS OTHER THAN CARBON STEEL AND
THOSE UNDER LOW TEMPERATURE SERVICE

3 ALL DATA BLOCKS AND LETTERS MUST BE CHEMICALLY ENGRAVED ( 0.5 m.m.)

21.10.03	ISSUED FOR IMPLEMENTATION	TKC	SUJEET	AKG
DATE	PURPOSE	PREPARED	REVIEWED	APPROVED



### LEG SUPPORT FOR VERTICAL VESSELS

PDS:SR 300 ISSUE: SEP. 2014

SHEET 1 OF

1800\*

2900\*

5100

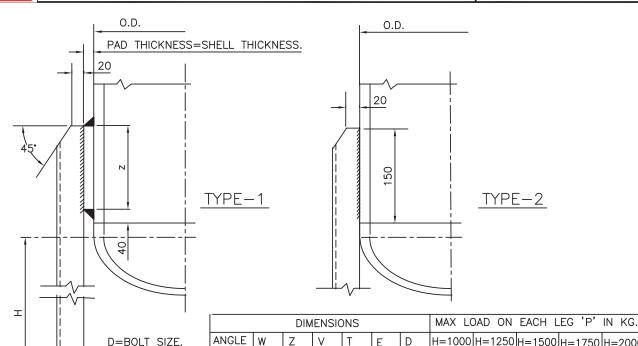
11600

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3900\*

9300

1



|H=1000|H=1250|H=1500|H=1750|H=2000 W Ζ D=BOLT SIZE. Ε 75x8 150 200 120 | 16 50 м16 2000 1300\* 200 130 50 M16 3600 2400\* 1700\* 80x12 160 16 90x10 180 200 140 20 50 M20 5000 3400 2400\* 100x12 200 250 160 20 50 M24 7700 5400 3900\* 250 300 180 25 60 M24 | 11800 9000 6700 130x10 150x16 300 350 240 25 80 M27 18400 18400 14800 D+4 100 200×16 350 400 290 32 M27 26500 26500 26500 22000 15500 100 |M27 |31000 |31000 | |31000|31000|26000 200x20|380 450 330 | 32 VALUES INDICATED WITH ASTERISK ARE NOT APPLICABLE IN PRESENCE OF ANY DYNAMIC LOAD. W=WIDTH OF REINFORCING PAD.

> THIS DIAGONAL SHALL BE TANGENT TO O/D OF VESSEL AT THE POINT OF INTERSECTION OF DIAGONALS OF BASE PLATE.

VESSEL O/D.

#### NOTES

- 1. WEIGHT ON EACH LEG 'P'>=Q/N+M/C IN KG, WHERE Q= WT OF VESSEL FULL OF LIQUID KG. N=NO OF LEG SUPPORTS M=WIND MOMENT IN Kg cm. C=0.75XP.C.D OF FOUNDATION BOLTS FOR 3 LEGS IN CM. C=P.C.D OF FOUNDATION BOLTS FOR 4 LEGS IN CM.
- 2. FOR VESSELS = < 1000 O/D ADOPT 3 NO OF SUPPORTS. AND VESSELS >1000 O/D ADOPT MIN. 4 NO. OF SUPPORTS
- SUPPORT TYPE 2 SHALL BE USED ONLY FOR TANK = < 600 O/D.
- 4. DIMENSION 'H' AND TYPE OF SUPPORT ARE TO BE DECIDED AS PER DESIGN CONDITION.
  5. REINFORCING PAD SHALL BE OF SAME MATERIAL AS THAT OF SHELL.
- 6. ALL CORNERS OF REINFORCING PAD SHALL BE ROUNDED TO RADIUS OF 20 MM. FOR CARBON AND NICKEL STEEL VESSELS OPERATING AT LOW TEMPERATURES, MINIMUM CORNER RADIUS SHALL BE OF 50 MM.
- 7. ALL WELDS SHALL BE CONTINUOUS, SIZE OF FILLET WELD SHALL BE EQUAL TO THE MINIMUM THICKNESS TO BE WELDED.

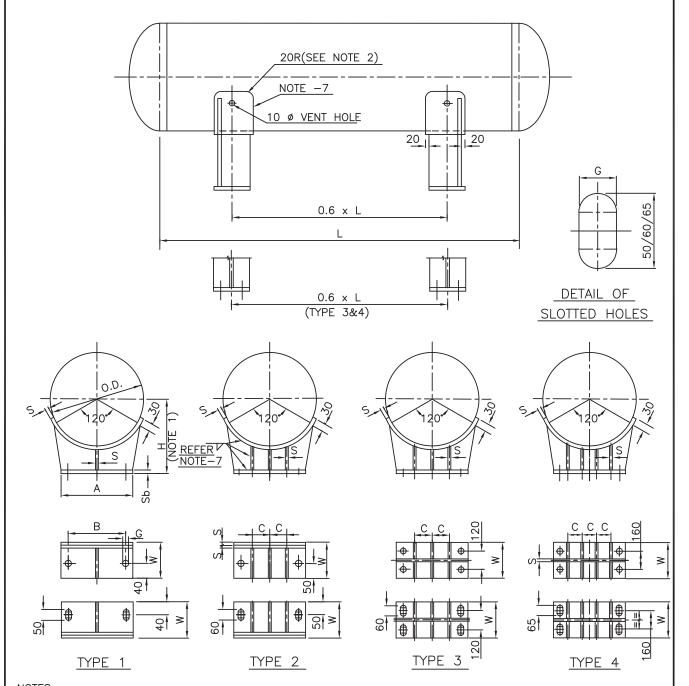
  8. ADOPT SKIRT SUPPORT (PDS:PV 301)PREFERABLY FOR VESSEL HAVING
- HEIGHT TO DIAMETER RATIO >5.

SEP. 2014	ISSUED FOR IMPLEMENTATION	ENGG. COMM.		
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:



#### SUPPORT SADDLE FOR HORIZONTAL VESSELS

PDS:SR 302 S ISSUE: SEP. 2014 SHEET 1 OF 2



#### NOTES:

- 1. DIMENSION 'H' TABULATED ASSUMES A MAXIMUM PROJECTION OF ANY PART BELOW THE SHELL 250mm. WHERE ANY PART PROJECTS BEYOND 250 mm, 'H' SHALL BE EQUAL TO MAXIUM PROJECTION PLUS 50 mm.
- FOR CARBON STEEL AND NICKEL STEEL VESSELS OPERATING AT LOW TEMP., CORNERS OF WRAPPER PLATE SHALL BE ROUNDED TO A RADIUS NOT LESS THAN 50mm.
- IN CASE OF VESSELS OF STAINLESS STEEL OR OTHER ALLOY MATERIALS, THE WRAPPER PLATE SHALL BE OF SAME MATERIAL AS THE SHELL.
- 4. IN CASE OF CONFLICT BETWEEN THE DIMENSIONS GIVEN HERE AND THOSE SHOWN ON THE DRAWINGS, THE LATTER SHALL GOVERN.
- 5. NUTS FOR BOLTS PASSING THROUGH SLOTTED HOLES SHALL BE LEFT LOOSE.
- 6. SLIDE PLATE SHALL BE PROVIDED BELOW THE BASE PLATE IN CASE OF VESSELS WHERE UNUSUAL EXPANSION IS EXPECTED. OR EQUIPMENT SUPPORTED ON STEEL STRUCTURE. SIZE OF SAME SHALL BE 100 mm HIGHER IN LENGTH AND WIDTH OF BASE PLATE.
- 7. FILLET WELDS SHALL BE CONTINUOUS & SIZE 0.7xTHK. OF THINNER PLATE MIN. 6mm.
- 8. FOR INTERMEDIATE DIAMETER THE SADDLE OF SMALLER SIZE SHALL BE USED.

SEP. 2014	ISSUED FOR IMPLEMENTATION			
DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:

PDIL	पी डी आई एल	SUPPORT SADDLE FOR HORIZONTAL			VESSELS		ISSUE:	SEP.	2014			
9	PDIL							DOLT.		SHEET	2	OF 2
permission		SHELL O.D.	Α	В	С	S	Sb	BOLT SIZE	G	Н	W	WT. IN KG.
) ermi		324	290	210	_	6	10	M16	22	460	110	15
	TYPE 1	355	320	240	_	6	10	M16	22	480	110	20
parties without written		406	360	280	_	6	10	M16	22	500	110	25
		508	450	370	_	6	10	M16	22	550	110	25
		600 TO 700	530	450	180	8	12	M20	26	650	130	40
		701 TO 800	620	540	210	8	12	M20	26	700	130	40
third		801 TO 900	710	610	240	8	12	M20	26	750	130	50
d t	TYPE 2	901 TO 1000	790	690	270	8	12	M20	26	800	130	55
exhibited		1001 TO 1100	880	780	320	10	12	M20	26	850	130	60
or ex		1101 TO 1200	960	860	360	10	12	M20	26	900	130	70
		1201 TO 1300	1050	950	400	10	12	M20	26	950	130	70
reproduced		1301 TO 1400	1140	1040	440	12	16	M20	26	1000	200	125
or rep		1401 TO 1500	1230	1130	480	12	16	M20	26	1050	200	130
		1501 TO 1600	1320	1200	520	12	16	M20	26	1100	200	135
copied	TYPE 3	1601 TO 1700	1400	1280	560	12	16	M20	26	1150	200	145
to be		1701 TO 1800	1490	1370	600	12	16	M20	26	1200	200	155
not		1801 TO 1900	1570	1450	630	12	16	M20	26	1250	200	160
and		1901 TO 2000	1660	1520	660	12	16	M20	26	1300	200	170
(PDIL)		2001 TO 2100	1750	1610	480	12	16	M24	30	1350	250	275
) pe		2101 TO 2200	1840	1700	510	12	16	M24	30	1400	250	285
Limited		2201 TO 2300	1930	1790	540	12	16	M24	30	1450	250	300
		2301 TO 2400	2020	1880	570	14	20	M24	30	1500	250	310
ent		2401 TO 2500	2100	1960	600	14	20	M24	30	1550	250	320
Development India		2501 TO 2600	2190	2050	620	14	20	M24	30	1600	250	390
		2601 TO 2700	2270	2130	650	14	20	M24	30	1650	250	400
its &		2701 TO 2800	2360	2200	670	14	20	M24	30	1700	250	415
Projects	TYPE 4	2801 TO 2900	2450	2290	700	14	20	M24	30	1750	250	430
<b>₽</b>		2901 TO 3000	2540	2330	720	14	20	M24	30	1800	250	440
property		3001 TO 3100	2620	2460	740	16	20	M24	30	1850	250	450
		3101 TO 3200	2710	2550	770	16	20	M24	30	1900	250	470
This Document is the		3201 TO 3300	2800	2640	800	16	20	M24	30	1950	250	485
		3301 TO 3400	2880	2700	820	16	20	M24	30	2000	250	500
		3401 TO 3500	2970	2780	840	16	20	M24	30	2050	250	510
		3501 TO 3600	3060	2870	870	16	20	M24	30	2100	250	520
=		3601 TO 3700	3140	2950	900	16	20	M24	30	2150	250	540
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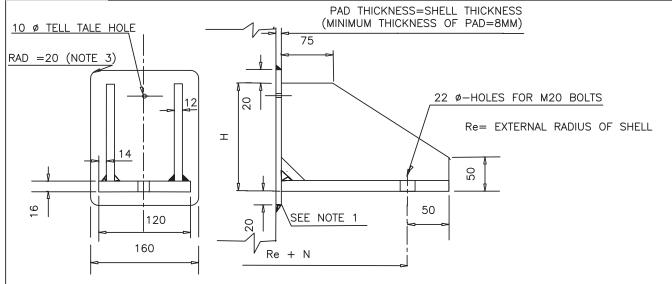
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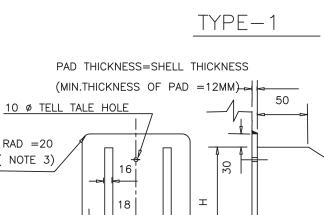
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## BRACKET SUPPORT FOR VERTICAL VESSEL

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TYPE BRAC		N	Н	MAX.LOAD FOR EACH BRACKET IN Kg	WEIGHT OF EACH BRACKET IN Kg
	Α	175	160	2500	8
1	В	250	220	2500	12
0	A	175	320	12500	22
2	В	250	400	12500	30

25 Ø-HOLES FOR M22 BOLTS 50 Re= EXTERNAL RADIUS OF SHELL

TYPF-2

30

## NOTES

1) IF THE SHELL IS MADE OF S.S. OR OF SPECIAL MATERIAL, PROVIDE A REINFORCING PAD OF THE SAME MATERIAL AS THAT OF SHELL. 2) ALL THE WELDS SHALL BE CONTINUOUS.THE FILLET SIZE SHALL BE EQUAL TO THE

SEE NOTE 1

Re+N

75

- MÍNIMUM OF THE THICKNESSES TO BE WELDED.
- 3) FOR CARBON AND NICKEL STEEL VESSELS OPERATING AT LOW TEMPERATURES, MINIUM CORNER RADIUS SHALL BE 50MM.

## RECOMENDATION FOR USE

200

250

- -IN GENERAL, THE BRACKET TYPE 1 SHOULD BE USED FOR VESSEL OF DIA < = 1000MM.
- -FOR LARGER DIA, USE BRACKET TYPE 2.
- -A OR B IS TO BE SELECTED DEPENDING UPON OBSTRUCTIONS (SUCH AS INSULATION, EXPANSION JOINT, STUB PIPE, ETC)
- -HOWEVER, THE TYPE AND NO.OF BRACKET SHALL BE DECIDED AS PER DESIGN.
- -VESSELS>600 O.D. SHALL HAVE MINIMUM 4 NO. OF BRACKETS.

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REV	DATE	PURPOSE	PREPARED	REVIEWED	APP'D.BY:



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**PART II: TECHNICAL** 

**SECTION - 3.2.2** 

## **DESIGN SPECIFICATION – ROTATING EQUIPMENTS**

# INSTRUMENT AIR / PLANT AIR SYSTEM AT TALCHER FERTILIZERS LIMITED

Р	22.02.2022	22.02.2022	ISSUED FOR REVIEW	AIN	YKG	RRK
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



**DESIGN SPECIFICATION- ROTATING EQUIPMENT** 

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1.0	SCOPE
2.0	DESIGN PHILOSOPHY FOR MACHINERY
3.0	DESIGN REQUIREMENTS
4.0	INSPECTION AND TESTING
5.0	MANDATORY SPARE PARTS (SPARE PARTS FOR TWO YEAR OPERATION & MAINTENANCE)
6.0	PAINTING
7.0	VENDOR LIST
8.0	DRAWING & DOCUMENTATION



**DESIGN SPECIFICATION- ROTATING EQUIPMENT** 

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## 1.0 SCOPE

#### 1.1 General

- 1.1.1 This Philosophy states that scope of work shall include basic & detailed engineering, procurement, supply, manufacturing, fabrication, transportation, loading, insurance during transit of all Mechanical Rotating Equipment with allied electrical, instrumentation and civil scope, obtaining all necessary statutory approvals from concerned government authorities as applicable, testing, mechanical completion, Erection, supervision/assistance in erection, Mechanical Completion, Pre-Commissioning, Commissioning, performance guarantee test runs of INSTRUMENT AIR / PLANT AIR SYSTEM for M/s TFL ORISSA.
- 1.1.2 In addition, all statutory rules & regulations shall also be complied with.

## 2.0 DESIGN PHILOSOPHY FOR MACHINERY

#### 2.1 Codes and Standards

The **Latest Edition** of codes and standards as listed below shall be followed for design and manufacturing of different machinery items. Generally, the manufacturer will comply with these codes and standards as indicated therein with minor deviations that are normally adopted by manufacturer and are reasonably accepted as per good engineering practice.

A list of such deviations, if any, may be furnished by the Bidder along with offer. Deviations / exceptions against codes & standards requirement/ guidelines, if any, furnished by successful bidder are subject to owner's review and approval during detail engineering.

Code	Description
API-672, 4 <sup>th</sup> Edition	Integrally-Geared Centrifugal Compressors for Industrial purpose
API 618	Reciprocating Compressors for Petroleum, Chemical and Gas Industry Services



**DESIGN SPECIFICATION- ROTATING EQUIPMENT** 

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## 2.2 Design Life

All equipment shall be designed for a minimum service life of 25 years and at least 3 years of uninterrupted operation under normal operating conditions. This requirement excludes specialised components requiring periodic maintenance and replacement.

## 2.3 Essential Project Reference Documents

The following documents shall be observed, and relevant aspects incorporated into specifications and datasheets:

- Process Description, Specifications and Data Sheets from Licensor
- Hazardous Area Classification
- Electrical and Instrumentation Design Criteria

## 2.4 Regulations

Besides codes & standards, Bidder shall follow National Laws and Regulations together with Local by Laws for the state including statutory requirements as applicable.

#### 2.5 Site Conditions

Site conditions shall be as defined elsewhere.

#### 2.6 Material of Construction

Generally Materials of construction shall be as per the process licensor's recommendation. However, relevant API guideline may be adopted to the extent applicable.

Use of equivalent & superior material may be selected & shall be furnished with the offer along with chemical composition.

## 2.7 Quality Assurance & Control

2.7.1 The quality assurance shall be as per the approved procedures, test methods & facilities to be developed by the Bidder to ensure that the supplied equipment shall be of highest quality. The quality control shall mean that all the tests, measurements, checks & calibration which are to be carried out may be compared with the actual specified characteristics of the equipments/unit /system.



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#### **DESIGN SPECIFICATION- ROTATING EQUIPMENT**

- 2.7.2 Quality Assurance (QA) shall mean the organizational set up, procedures as well as test methods and facilities developed by Bidder in order to assure that the machines & associated auxiliaries leaving Bidder's shop are of the highest possible quality i.e. either equal to or better than the requirement specified.
- 2.7.3 Quality Control (QC), shall mean all the tests, measurement, checks and calibration which are to be carried out in Bidder's shop in order to compare the actual characteristics of the equipment/unit/system with the specified ones, along with furnishing of the relevant documentation (certificates/records) containing the data or result of these activities.
- 2.7.4 Bidder shall submit a comprehensive description (manual) of QA/QC measures contemplated by him for implementation with regard to this specification. It is contractual obligation of the Bidder to develop and implement adequate QA/QC systems.
- 2.7.5 QA/QC system shall cover all products and services required for the complete machine unit as per scope of work including job sub contracted by the Bidder.

#### 3.0 DESIGN REQUIREMENTS

## 3.1 General

- 3.1.1 All machines shall be directly coupled to their prime movers. Drivers shall have rated output at least 10% greater than the power requirement at design operating condition of the driven equipment.
- 3.1.2 Copper (Cu) or Cu-alloy shall not be used for any components in Ammonia Plant & in other plant for ammonia services.
- 3.1.3 Special tools and wrenches required for installation and maintenance shall be provided.
- 3.1.4 Bidder have to submit the reference list for similar equipment's models (minimum 2 nos.) supplied in past for similar duty conditions. Reference list must contain at least the following: Fluid handled Capacity, Suction Pressure, Discharge Pressure, Model No., Power consumption, Client Name, Address, and Year of supply.
- 3.1.5 Noise level for all rotating equipment shall be limited to 85 dBA measured at 1meter distance from the equipment. Statutory guideline shall also be followed by contractor.

## 3.2 Centrifugal Compressors (for Air services)

3.2.1 All compressors shall be oil-free type and shall be supplied as per 'Special Duty Packages' meeting the requirements of API 672 4<sup>th</sup> Ed. & Addendum to API 672 4<sup>th</sup> Ed.



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#### **DESIGN SPECIFICATION- ROTATING EQUIPMENT**

- 3.2.2 Compressor filtration hood and suction piping including internals shall be SS material only. Air compressor suction to be provided with suitable measures to avoid moisture ingress during rainy season.
- 3.2.3 All machines shall have stable operating characteristics. The head generated shall rise continuously from choke point to surge point.

Vendor shall provide maximum range of capacity control without air venting. However a surge control shall also be provided so that the operation at low capacity is not limited.

Compressor shall be designed to deliver the rated head (i.e. rated discharge pressure) @ rated capacity without negative tolerance. Vendor to consider pressure losses in the air intake system & compressor discharge up to after cooler while performing compressor sizing.

The BKW at rated conditions shall be guaranteed with zero positive tolerance including all transmission losses in the bull gear.

Driver rating shall be at least 110% of Compressor rated BKW at rated condition or BKW at unthrottled min. ambient temp. & maximum Atm. Pressure whichever is higher.

Extra/ Over-design margin in Compressor capacity shall be as per process design philosophy of NIT.

- 3.2.4 Compressor package shall be provided with Hydrodynamic Radial & Thrust bearings and Pressurized lubrication system meeting requirements of API 672 & and API 614.
- 3.2.5 Couplings shall be non-lubricated, all metallic flexible type with spacer with a non-sparking coupling guard. The coupling shall conform to API-671 4th Ed. The coupling shall have min service factor of 1.5 over the maximum capability of compressor.
- 3.2.6 Following performance characteristics shall be furnished for compressor:
  - a. Discharge pressure vs Inlet capacity (i.e.actual inlet volume)
  - b. Polytropic head vs Inlet capacity (i.e.actual inlet volume)
  - c. Compressor BKW vs Inlet capacity (i.e.actual inlet volume)
  - d. Polytropic efficiency vs Inlet capacity (i.e.actual inlet volume)

The performance shall be shown from surge limits to choke limits.

Expected surge line and surge control line shall be shown on each performance map.

- 3.2.7 Torsional and lateral critical speed analysis shall be carried out and it shall be ensured that no critical speed (Torsional or lateral) shall be within 15% of any operating speed.
- 3.2.8 Casings shall be preferably centre line supported.
- 3.2.9 Compressors shall have such casing designed for easy withdrawal from the shells and easy reassembly for inspection or replacement of parts.
- 3.2.10 Impellers shall be welded or electrochemically eroded. Tip speed of the impeller preferably shall not exceed 310 m/s.
- 3.2.11 Labyrinths preferably made of stainless steel or manufacturer's well proven material shall be used. Reference documentation to be furnished by bidder for the same.



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#### **DESIGN SPECIFICATION- ROTATING EQUIPMENT**

- 3.2.12 Combined Force lubrication and seal oil system (as applicable) shall be provided for compressor and motor assembly. API-614 standards to be complied for lube oil system.
- 3.2.13 Shaft vibration monitoring instruments (both radial and axial) shall be provided to trip the machine in case of high radial vibration or axial movement. Complete vibration monitoring system to be provided by the bidder. Bidder to also refer instrumentation philosophy of NIT in this regard.

Machine health monitoring for each compressor package shall be done through PLC / DCS. Each compressor shall be provided with probes/detector for measuring vibration. Set points for Alarm (alert) and shutdown (danger) shall be provided for each of the monitored variables.

- 3.2.14 All the trip interlock shall be two out of three voting logic. Instrumentation design philosophy of NIT to also to be referred.
- 3.2.15 All the transmitters shall be smart type and suitable for communication with DCS.
- 3.2.16 Supply of first fill of lubricants, sealing fluid & other consumables for machines is also included in the vendor's scope of supply.

## 3.3 Reciprocating Compressors

The reciprocating compressors shall conform to API-618, latest edition. In addition to the above, the following shall be applicable:

- 3.3.1 Lateral and torsional critical speed analysis shall be carried out to ensure the elimination of any lateral and torsional vibration that may hinder the operating speed range.
- 3.3.2 Machine shall be balanced to minimise lateral loads.
- 3.3.3 The piston speed for lubricated cylinder shall not exceed 4 m/s and for non-lubricated cylinders it shall be limited to 3 m/s.
- 3.3.4 Distance piece of non-lubricated compressor shall of sufficient length to ensure that no oil is in contact with gland packing.
- 3.3.5 The design of compressor valve shall be such that the valve assembly cannot be inadvertently reversed e.g. Suction valve cannot be fitted into the discharge port.
- 3.3.6 Valve plates and springs shall be made of stainless steel. PEEK may be used for valve plates in case the vendor has experience of using it for similar service and duty conditions.



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<b>DESIGN SPECIFICATION-</b>	ROTATING FOUIPMENT

- 3.3.7 Cylinders shall be water cooled.
- 3.3.8 The maximum piston rod loading shall be calculated considering safety valve set pressure.
- 3.3.9 Non-lubricated compressors shall be provided with piston rings, packing made of carbon filled PTFE or equivalent.
- 3.3.10 The packing boxes shall be provided with atmospheric vents to minimize gas leakage.
- 3.3.11 Pulsation dampeners shall be provided for meeting the residual pulsation requirements as per API.
- 3.3.12 For API compressors the requirements for acoustic study shall be in accordance with the API recommendation.
- 3.3.13 To minimise the need for heavy overhead pipe structures, suction and discharge piping to and from the knockout drums should run close to grade, supported on sleepers.
- 3.3.14 Frame lubrication system shall be provided with auxiliary pump driven by electric motor for initial lubrication.
- 3.3.15 Cylinder lubrication, if required, shall be provided by a separate forced feed mechanical lubricator complete with necessary tubing/piping, check valve and sight flow indicator.
- 3.3.16 Manufacturer's standard can also be accepted for special duty like passivation Air Compressor and other Non-Critical smaller machines. However Bidder to follow the Vendor list attached with the ITB for the selection of Vendors.
- 3.3.17 Full flow twin oil filter shall be provided.

## 3.4 EOT Cranes

Bidder to provide EOT Cranes of adequate capacity in Compressor House and other location wherever required for ease in operation and maintenance activities. Cranes to be provided in nearest multiple of 5 Metric Tonnes considering maximum weight to be lifted. Relevant Indian/ ISO Standards to be applicable for EOT Crane. All statutory guidelines to be complied by the contractor/ sub-contractor.



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## **DESIGN SPECIFICATION- ROTATING EQUIPMENT**

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#### 4.0 INSPECTION & TESTING

Machines shall be inspected by Third Party Inspection Agency (Lloyds/BV/TUV/PDIL). The Inspection and testing shall be in accordance with the all relevant codes, standards, specifications.

- 4.1 All testing accessories, measuring instruments including NDT testing equipment, etc. shall be arranged by Bidder. DM water shall be used for hydro testing of the equipment.
- 4.2 In general, following tests shall be conducted for all rotating equipments:
  - Material test
  - Non-destructive test
  - Hydrostatic test for all the pressure containing parts
  - Dynamic balancing of rotor
  - Over speed test of impeller (only for compressors)
  - Helium leak test of compressor casing (if required)
  - Mechanical running test of compressor
  - Barring over check (for reciprocating compressor, if any)
  - NPSHR test (for pumps, if any)
  - Performance Test
  - Disassembly Test

The tests required to be conducted and witnessed shall be specified in the equipment data sheet. Disassembly test for small Pumps (if any, in the package) can be waived –off in case no problem occurs during mechanical / performance Test.

#### 5.0 SPARES

- 5.1 All erection & commissioning spares shall be supplied by Bidder & cost shall be included in the cost of main equipment.
- 5.2 Mandatory Spare parts (spare parts for two year operation & maintenance), recommended spares shall be supplied by the contractor as per NIT.

## 6.0 PAINTING

6.1 All exterior non-stainless steel surfaces subject to atmospheric corrosion with the exception of machined surfaces shall be epoxy painted.



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#### **DESIGN SPECIFICATION- ROTATING EQUIPMENT**

6.2 All exterior machined surfaces shall be coated with suitable rust preventives.

## 7.0 VENDORS LIST

All equipment shall be procured / fabricated as per approved vendor list. However, Bidder may have to furnish Proven track record / reference record of any vendor opted for specified services / equipment, if, owner desires.

Any equipment for which vendor list is not enclosed, Bidder may furnish a list of proposed vendors along with their references for supply of similar type of equipment along with bid. However all proposed additional sub-vendors shall have well proven track record and shall be subjected to owner's / consultant approval during detail engg.

#### 8.0 DRAWING & DOCUMENTATION:

Drawings & Documents of machinery items/ rotating equipment shall be as mentioned elsewhere in the NIT.



## PROJECTS & DEVELOPMENT INDIA LTD

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SECTION - VI 3.2.3

## **DESIGN SPECIFICATION - PIPING**

PLANT: INSTRUMENT AIR/PLANT AIR SYSTEM

PROJECT: INTEGRATED COAL BASED FERTILIZER COMPLEX AT TALCHER, ANGUL, DISTRICT- ODISHA, INDIA



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## LIST OF ATTACHMENTS

SL NO.	DOC.NO.	DESCRIPTION	NO.OF SHEETS
1	EM0000-PNMP-TS951	DESIGN PHILOSOPHY- PIPING	45
2	TFL-PDS-600	PIPING MATERIAL SPECIFICATION	162
3	PC183-0000-0001	PLOT PLAN (OVERALL)	1



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#### 1.0 GENERAL PIPING SCOPE OF WORK

- The detail scope of work includes such as, but not limited to, complete management, Design, Detailed Engineering, 3D modelling, Stress Analysis, to provide all the necessary data, drawings, documents required as per the project requirements, Procurement, Supply, Transportation of materials, shop & site Fabrication, Erection, Installation, Supporting, Non-Destructive Testing (NDT) & required Inspection, pre-heating, dye-penetrant test, Magnetic Particle Test, post weld heat treatment, radiography, Ultrasonic test, Testing, Flushing, Air drying, blowing, cardboard-blasting, seal/leak-testing, Pre-Commissioning, Trial run, Commissioning and Guarantee of all the associated works pertaining to complete piping system and related facilities for Instrument air/Plant air system package at TFL, TALCHER.
- 1.2 Design, material, fabrication and erection shall be in accordance with latest edition of ASME B31.3 chemical plant and petroleum refinery piping code. The dimensions, manufacturing tolerances shall conform to applicable standards.
- 1.3 All works described in this package shall be performed in accordance with the designbasis, specifications, drawings, and other requirements of NIT and shall be subject to Owner's review and approval.
- 1.4 MATERIAL OF CONSTRUCTION

Materials as per internationally acceptable code shall be used for piping based on service requirement. All materials for piping Components shall conform to ASTM or API Specifications as per enclosed piping specifications. All piping materials and valves shall be procured from the approved suppliers/vendors.

- 1.5 Cost of piping job shall also include the cost of supervision, Labour, overheads / profits, materials, consumables, scaffolding and all other associated arrangements required to execute the related activities of this package.
- 1.6 PIPING INTER CONNECTION

Piping lines as per P&ID shall be provided at battery limit which shall be indicated later by Owner. Bidder shall provide valve at battery limit for respective piping system of the package unit.

1.7 SPARES

Mandatory spares shall be quoted by bidder as per spares section of NIT.

## 2.0 DESIGN AND DETAILED ENGINEERING BY BIDDER

- 2.1 Collection of all data/ information furnished in the NIT and additionally collected/ generated by Bidder.
- 2.2 Finalization of design data/ basis for carrying out design, detailed Engineering for complete scope of work as per project specifications, contained in the NIT.
- 2.3 Performing design and detailed engineering of the following:
- a) Complete piping system for the package unit.
- b) Carry Out all necessary calculations in accordance with approved design basis, drawings / documents and requirements of the NIT.
- c) Finalization of layouts for the unit and preparation of construction drawing, preparation of piping drawings, equipment layouts, piping general layout drawings (GAD's), pipe supports, piping isometrics. Typical indicative sketches/drawings included in NIT document shall be taken as broad basis for developing the layouts. Since the availability of free space is limited, Bidder shall plan its piping layouts in such a way so as to minimize the area requirement while giving due importance to ease of access, operation and maintenance of the facilities installed by the Bidder. The fabrication/erection & all other piping jobs shall be carried out as per drawings/documents approved by Owner.



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- d) Carrying out Material Take Off for the entire piping system for the package unit.
- e) The detail design shall take into consideration of local Statutory Regulation, if any, for the package unit.

## 3.0 PROCUREMENT & SUPPLY BY BIDDER

- 3.1 Bidder shall procure and supply all materials whatsoever required for temporary/permanent installation of piping system in sequence and at appropriate time. All equipments, materials, components etc shall be suitable for the service and the design life of the system.
- 3.2 Bidder shall procure all materials, components, equipments, consumables etc required for successful completion of the piping system. Bidder shall also procure spares required for pre-commissioning and commissioning/start-up as recommended for all the items supplied by him as per specifications provided in the NIT. Where no specifications are available in the contract, the same shall be prepared by the Bidder, and shall be subject to Owner's approval.
- 3.3 Material take-off (linewise and consolidated) with complete description of size, rating, material, thickness and specifications.
- Preparation and finalization of data sheets for all piping materials e.g. all valves etc. All data-sheets shall be subject to review and approval by Owner.
- 3.5 Preparation of Material requisitions, Request for Quotation & its evaluation and recommend Bidders for Owner's approval. Preparation of purchase requisitions, review of Bidder's drawings and calculations, approval of manufacturing procedures wherever necessary, and the party inspection at manufacturer's works of the materials by reputed agencies as required. Quality control and expediting of all procured items at Bidder's shop or at fabrication yard.
- 3.6 Bidder shall procure materials as per specifications and list of approved Vendors/Suppliers (for major Items) included in the bid document.
- 3.7 Carry out proper documentation of inspection and quality assurance programs for all equipment and bulk materials duly approved by Owner. Bidder shall maintain an accurate and traceable listing of procurement records for the location, quality and character of all permanent materials in the Project.
- 3.8 Bidder shall immediately report to the Owner of all changes which will affect material quality, and take necessary corrective actions. Purchase requisitions including Purchase Orders of all major items shall be approved by Owner. For balance items, records shall be furnished for information only.
- 3.9 Compliance with Bidders and supplier's instructions and recommendations for transportation, handling, installation and commissioning.

## 4.0 INSPECTION

- 4.1 Inspection authority means the Third Party Inspection Agencies (TPIA) approved by the Owner to carryout inspection of materials.
- 4.2 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.
- 4.3 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 dispatch only after final certificate of acceptance is issued by the Inspector.



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- 4.4 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.
- 4.5 Quality Assurance plan (QAP) / Inspection Test Plan (ITP) shall be submitted by bidder for approval by Third Party Inspection Agency (TPIA).
- 4.6 Scope of Inspection by TPIA:
  - Review of Chemical composition report, MTC (all batches)
  - Positive Material Identification (PMI) for Alloy/Stainless steels (10% random witness)
  - Hydrostatic test (10% random witness)
  - Non Destructive Examination- Report review
  - Dimensional check, Marking, Visual check for surfaces, external appearance (10% random witness)
  - Packing: Report review

## 5.0 PAINTING

Painting shall be as per specification attached elsewhere in NIT.

## 6.0 CONSTRUCTION

All construction works be carried out as per "Approved for Construction" drawings, procedures, specifications and applicable codes and standards. Any changes at site shall also need prior approval from the Owner/PMC and revision of drawings.

Bidder shall procure and supply all materials whatsoever required for temporary/permanent installations of piping system in required and at appropriate time. All equipment, materials, components etc. shall be suitable for the intended service and the design life of the system. Wherever no specification is available in the contract, the same shall be prepared by the Bidder and shall be subject to Owner approval.

After completion of erection jobs, all piping system will be suitably hydraulically tested as per the test pressure indicated in the line list / relevant document approved by owner.

#### 7.0 BIDDER'S RESPONSIBILITY

All works shall be carried out by Bidder in accordance with the drawings / documents / specifications indicated in the subsequent paragraphs.

- 7.1 Specifications
- 7.2 Standards
- 7.3 Piping Support Standards
- 7.4 Drawings
- 7.5 Design Review
- 7.6 Bidder shall submit all proposal designs, analysis, drawings, installation and testing procedure for review & approval by Owner as mentioned in the scope work. Bidder shall as a minimum, provide above deliverables for Owner's information / records & review / approval.
- 7.7 Typical Plot Plan drawing of package unit is attached in the NIT. This drawing is INDICATIVE only and is furnished for Bidder's information. Issued for construction (IFC) drawings shall be prepared by Bidder after detailed engineering being done by him and shall be subject to approval by the Owner.



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- 7.8 The Bidder shall submit separately, the material take off for piping, valves, fittings and all other accessories as per requirements.
- 7.9 Bidder shall obtain statutory approval from various authorities having jurisdiction over the area, as necessary, for construction of the unit package.

#### 8.0 DRAWINGS/ DOCUMENTATION SCHEDULE

Bidder shall furnish all the drawings/ documents to Owner for comments/ approval. He shall incorporate all comments/modification suggested by Owner. The drawings/documents should be properly organised, supplied & submitted as per documentation schedule of NIT.

Number of sets shall be as stipulated elsewhere in the tender document. Final documentation shall be supplied in hard copies (4nos.) as well as soft copies.

#### 9.0 PACKAGING

- 9.1 Items shall be thoroughly dried, cleaned and shall be free from moisture, dirt & loose foreign materials, with ends protected from mechanical damage during transportation, shipment & storage.
- 9.2 For transportation overseas, protection and packing shall be adequate to prevent damage from sea atmosphere.

#### 10.0 DOCUMENTATION WITH BID

Following drawings/documents must be submitted along with the bid.

i) Proposed equipment layout drawing.



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## **DESIGN PHILOSOPHY - PIPING**

## **PACKAGE UNITS**

INTEGRATED COAL BASED FERTILIZER COMPLEX AT TALCHER, ANGUL, DISTRICT- ODISHA, INDIA



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1.0	Scope
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3.0	Codes, standards and supplementary specifications
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5.10	Line Strainers
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5.14	Mechanical Handling
6.0	Materials
7.0	Painting
8.0	Welding



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## LIST OF ATTACHMENTS

DOCUMENT/ANNEXURE NUMBER	DESCRIPTION
1	Table Of Basic Span
2	Accessibility For Valves & Instruments
3	Vertical And Horizontal Guides Spacing
4	Clearances
5	Design Philosophy For Stress Analysis
5A	Criteria for Identifying Extremely Critical Lines (Level I)
5B	Criteria for Identifying Moderately Critical Lines (Level II)
5C	Minimum allowable nozzle loadings: Vessels and S/T heat exchangers



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## 1.0 SCOPE

The scope of this document is pertaining to the design philosophy, norms and specific requirements which shall be adhered to by contractor or his associates and representatives during the course of the project in designing, procurement & construction of piping material.

## 1.1 APPLICABLE STANDARD & CODES

ARD & CODES
Title
Steel Pipe Flanges and Flanged Fittings
Steel Butt-Welding Fittings
Face to Face and End to End Dimensions of Valves
Forged Fittings Socket Welded and Threaded -
Metallic Gaskets for Pipe Flanges – Ring Joint, Spiral
Wound, and Jacketed.
Non-Metallic Flat Gaskets for Pipe Flanges
Butt-Welding Ends
Valves – Flanged, Threaded Welding End.
Large Diameter Steel Flanges
Power Piping
Process Piping
Refrigeration Piping
Welded and Seamless Wrought Steel Pipe.
Stainless Steel Pipe
Specification for Pipe Line Valves (Gate, Plug, Ball and
Check Valves).
Fire Test for Valves
Specifications for Metallic Gaskets for Refinery Piping
Check Valves:, Wafer-Lug and double flanged type
Valve Inspections and Testing
Steel Plug Valves, Flanged and Butt-weld ends
Steel Gate Valves, Flanged and Butt-welding ends, Bolted Bonnets
Gate, Globe, and Check Valves for Sizes DN 100 (NPS 4) and
Smaller for the Petroleum and Natural Gas Industries
Class 150 – Corrosion Resistant Flanged End gate valves.
Ductile Iron gate valves – flanged ends.
Compact C.S. Gate Valve extended body.
Fire Test for soft seated Ball Valve.
Metal Ball Valves, Flanged, Threaded & BW Ends.
Butterfly Valves, Lug type & Wafer type
Steel Globe Valves—Flanged and Butt-welding Ends, Bolted
Bonnets
Indian Boiler Regulations
Large Dia. Steel Flanges (Ring Type).
Expansion Joints Manufacture Association
Standard Finishes for Contact Faces of Pipe Flanges and
Connecting End Flanges of Valves and Fittings
Standard Marking System for Valves, Fittings, Flanges & Unions
Wrought Stainless Steel Butt-weld Fitting



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MSS SP 45 By-pass and Drain Connection

NACE MR0175-94 Sulphide Stress Cracking resistant Metallic Material

NFPA National Fire Protection Association

EN 10204 Metallic Products - Types of Inspection documents

ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR)

Based on Controlled Outside Diameter

ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE)

Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

## 2.0 **DESIGN PHILOSOPHY**

2.1 Piping systems shall be in accordance with Clause 1.1, which permits the use of the following specifications:

ASME B31.1 Power Piping

ASME B31.3 Process Piping

Materials, design, construction, testing and inspection shall be fully in accordance with the selected specification.

- The dimensions, manufacturing tolerances and marking of ferrous and non ferrous piping components shall conform to the applicable standards. The design shall comply with all applicable codes, laws and statutory regulations. The Contractor shall optimize the layout with the approval of the owner and include any changes resulting from HAZOP studies and taking into consideration the following:
  - i) General site layout taking into account the topographical geo-technical aspect of the site.
  - ii) Access for maintenance and fire appliances.
  - iii) The interdependency of units and buildings with each other within the complex.
  - iv) Safety escape routes for personnel based on emergency or disaster management plans in the event of environmental upset or fire.
  - v) Suitable drainage system of Project site.
- 2.3 Material of construction shall be suitable for specified process duty (both normal and abnormal operations) and have a projected life and corrosion/ erosion allowance in excess of minimum life of the project. Piping materials specified in piping materials specification shall be used for selection of material of construction of major services.

All materials under steam service shall be supplied with proper certificates in prescribed forms.

## 3.0 CODES, STANDARDS AND SUPPLEMENTARY SPECIFICATIONS

- 3.1 The latest edition of codes shall be applicable for piping system design, materials, fabrication, manufacture, erection, construction and inspection etc. For any item not covered in the list of codes and standards / International Standards / proven design may be finalized based on discussion with OWNER/Consultant.
- 3.2 Where conflict occurs, the order of precedence shall be:
  - a) Statutory Regulations
  - b) National, International and Industry Standards and Codes of Practice.
  - c) Technical Specifications
- 3.3 Standards, Codes and Supplementary Specifications for piping design shall be applied as follows:



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i) Process and utility piping to ASME B31.3 Process Piping

ii) Power Plant piping to ASME B 31.1
 Fire protection system shall be designed and installed in accordance with applicable NFPA (National Fire Protections Associations) Codes.

#### 4.0 GENERAL DESIGN

- 4.1 Flanges for process and utility piping shall be in accordance with ANSI B16.5 and ANSI B16.47.
- 4.2 Wherever possible all purchased equipment shall be supplied with flanges that comply with ANSI B16.5/B16.47.
- 4.3 The minimum size of piping to be used in pipe-racks shall be 2" NB.
- 4.4 With the exception of equipment connections the minimum size of piping shall be ½" NPS.
- 4.5 Pipe sizes 1 ¼", 2 ½", 3 ½" 5" and 22" NPS shall not be used except as connections to purchased equipment.
- 4.6 Threaded pipe nipples between headers and vent, drain and instrument isolation valves shall be Schedule 160 for CS and Schedule 80S for SS in the size range ½" to 2" NPS.
- 4.7 Piping 2" NPS and above shall be butt-welded. All weld joints in piping 1½" NPS and below shall be socket welded using socket weld fittings.
- In Class 900 and higher pressure rating double block valves shall be used for systems open to atmosphere, such as vents and drains. Piping in hazardous service shall have vents, drains and bleeds routed to a safe location. Category 'M' substances shall be vented to the flare system.
- 4.9 When a line of one material specification is connected to a line of higher material specification, the connecting line shall be constructed of the higher material specification or pressure rating up to & including the first block valve.
- 4.10 As a minimum, piping systems shall have isolation facilities as follows:

ASME B31.3 Category 'M' service and Normal service (Class 900 and above) shall have double block isolation valves with a downstream drop-out spool.

ASME B31.3 Normal service (upto Class 600) shall have a valve and downstream spectacle blind.

ASME B31.3 Category 'D' service shall have a valve and downstream spectacle blind.

Generally, equipment shall have provision for isolation of piping to each equipment connection by means of valving and /or blinds as determined by service conditions.

#### 5.0 DESIGN PHILOSOPHY / GENERAL CRITERIA

## 5.1 **Equipment Layout**

## 5.1.1 **Basis of Equipment Layout**

Equipment Layout shall be finalised based on the following data:

- a) Overall Plot Plan
- b) P&I Ds
- c) Equipment Data Sheets
- d) Wind Direction
- e) Safety Distance and Specific Distance mentioned in Piping Design Basis and as



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per statutory requirements.

## 5.1.2 **Development of Equipment Layout**

The following aspects shall be considered during development of equipment layout.

- a) Process Requirement -Proper interconnection between equipment as per P&I Ds to achieve the intended process parameters.
- b) Economy of piping material- Minimize the quantity of costly piping.
- c) Erection & Construction requirements:

Erection scheme and schedule of all equipment must be considered during equipment layout to have smooth erection mainly in case of tall columns, heavy equipments like thick walled reactors, space for laying tall columns, approach roads for cranes / derricks for lifting the column or reactors and requirement of special foundation / pile etc.

- d) Operation and Maintenance Requirement
  - Overhead and side clearances for exchangers and pumps
  - Horizontal & overhead clearances for easy movement of working personnel.
  - Crane approaches for air coolers/fired heaters.
  - Provision of monorail for pumps and exchangers
- e) Similar equipment grouping All columns, exchangers, pumps etc. should be grouped together for convenience of maintenance and safety wherever feasible.
- f) The technological structures should be interconnected for easy movement of operational personnel.
- g) U/G piping corridors for main headers should be marked in equipment layout for all under ground piping.

## 5.1.3 Plant Layout & Design guidelines

#### 5.1.3.1 **General**

The plant layout shall be based on ensuring adequate access, to allow construction, inspection, maintenance and operation to be performed in a safe and efficient manner. The alignment of equipment and pipe shall offer an organised appearance. The layout shall be in accordance with, but not limited to the design practices described in this criteria.

Where dynamic loading, limited pressure drop or other severe service condition applies, particular care shall be taken in routing pipe lines.

Flushing connections shall be provided on all lines containing flammable or toxic material, slurries, and materials which solidify- when the line is dead. Sufficient Nitrogen purging points shall also be provided. Supply piping of fuel gas shall be arranged for equal flow distribution.

Trolley beams, pipe davits, shall be provided with appropriate removable hoists mechanism for charging and discharging catalysts, chemicals, packing rings etc.

Piping and all other services shall be arranged so as to permit ready access of Cranes for removal of Equipment for inspection and servicing.



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All utility and process piping shall be located above ground, and major lines shall be located in overhead pipe ways.

Lines that must be run below grade, and must be periodically inspected or replaced, shall be identified on the P & ID's; these lines must be placed in covered concrete trenches. Sleeperways shall not be used in process areas where they may block access for personnel and equipment.

Drip legs and dead ends shall be avoided, especially for piping where solids or fluids may congeal from corrosive condensate.

Where sleeper ways are used the elevations shall be staggered to permit ease of crossing or change of direction at intersections. Flat turns may be used when entire sleeper ways change direction. Flat turns must not be used within pipe racks.

Spacing and routing of piping shall be such that expanding/contracting lines (including insulation) will not clash with adjacent lines, structures, instruments and electrical equipment during warm up and cool down.

Piping to be sloped shall be indicated on the P&I D's.

## 5.1.3.2 **Pipe-Rack/T-Post/Small Portals**

In general, equipment layout shall be prepared considering straight pipe rack, however other shapes like L / T / U / H / Z etc can also be considered based on area available.

The width of the rack shall be 4M, 6M, 8M, 10M or 12M for single bay having four (4) tiers maximum. In general, the spacing between pipe rack portals (span) shall be taken as 8 M for main rack. However it can be decreased to 6 M depending on the size/number of the pumps to be housed below pipe rack. Intermediate Beams between two portals shall be provided to support smaller pipes <= 2". 20% extra space shall be provided on the pipe rack and portals on each tier for future expansion/modifications.

- -Clearance beneath pipe rack shall be 3.8 M minimum.
- -Height between two pipe rack tiers shall be 2.0M minimum.
- -Road clearance shall be 9 M minimum wherever heavy duty crane movement is required during construction and future maintenance.
- -Road clearance shall be 7.5 M minimum for main roads.
- -Road clearance shall be 5 M minimum for secondary roads.
- -T-Portal's width shall not be more than 2.5 M and height shall not be less than 3.0 M

## 5.1.3.3 **Pumps**

Wherever practical, pumps shall be arranged in rows with the centre line of the discharge on a common line. In general, pumps shall be kept inside the pipe rack. However in case of smaller racks, pumps shall be kept on one side or outside the pipe rack to provide clear access under the rack as per clause applicable.

Pump foundation height shall be 300 mm above H.P.P.

Gap between each pump foundation / and foundation of technical structure should be sufficient for easy removal of equipment after piping. Clearance between two adjacent pumps shall be such that clear 900 mm aisle is available.



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All pumps not open to sky with motor rating >= 45 KW shall be provided with monorail. No monorail should normally be provided for pumps outside rack and sufficient space below rack shall be available for pump maintenance.

## 5.1.3.4 Clearance and Accessibility

## **5.1.3.4.1 Access to Pumps**

Clear access of 3.8M vertically and 4.5M horizontally shall be provided centrally under main pipe rack for small mobile equipment to service pumps, wherever these are put under pipe ways with prior specific approval. Pumps outside rack shall be approachable by small cranes etc. from under the pipe rack.

## 5.1.3.4.2 Access to lower items to grade (Lowering Area)

Clear access shall be provided at grade on the access side for lowering external and internal fittings from tall elevated equipment by providing pipe davits.

## 5.1.3.4.3 Layout & Access Requirements for Platforms ladders and Stairs

For providing platform ladder & staircase following guidelines shall be followed.

- Two means of access (i.e. two ladders or one ladder and one stair case) shall be provided at any elevated platform which serves three or more vessels & for B/L valves operating platform.
- Platforms, ladders and stairways shall be the minimum, consistent with access and safety requirements.
- Stairway for tanks to be provided on upstream of predominant wind direction.
  - i) Platform at elevated structure
    - a) Dual access (i.e. one staircase and one ladder) shall be provided at large elevated structure if any part of platform has more than 22.65M (75 ft) of travel.
- ii) Platforms with stair access shall be provided for:
  - a) Location at which normal monitoring (once a day or more) is required or where samples are taken.
  - b) Locations where vessels or equipment items need operator attention "such as compressors, heaters, boilers etc.
- iii) Platforms with ladder access shall be provided for:
  - a) Points which require occasional operating access including valves, spectacle blind and motor operated valves, heater stack sampling points.
  - b) Man ways above grade on equipment.
- iv) Ladder location
  - a) Wherever practicable, ladder shall be so arranged that users face equipment or platform rather than facing open space.
  - b) Landings shall be staggered. No ladder shall be more than 6 M in one flight.

#### 5.1.3.5 **Clearances**

Minimum clearances shall be as indicated in Annexure.



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5.2 Unit Piping

## 5.2.1 **Basis of Unit Piping**

- Piping & Instrument Diagram
- Equipment layout
- Equipment Data sheet & Setting plan
- Line list
- Instrument Data sheet
- Structural & building drawings
- Topography of the plant
- Piping material specification
- Overall plot plan
- Tie in point drawing.

The following objective shall be ascertained during piping layout.

- Proper access to all operating points including valves, and for all orifice tapping points and instruments in particular.
- Proper access to interrelated operating points for specific purpose and for maintenance.

## 5.2.2 Pipe Ways/Rack piping

- 5.2.2.1 Racks shall be designed to give the piping shortest possible run and to provide clear head rooms over main walkways, secondary walkways and platforms.
- 5.2.2.2 Predominantly process lines are to be kept at lower tier and, utility & hot process lines on upper tier.
- 5.2.2.3 Generally the top tier is to' be kept for Electrical (if not provided in underground trench as per electrical design basis) and Instrument cable trays. Cable tray laying to take care of necessary clearances for the fire proofing of structure.
- 5.2.2.4 Generally the hot lines and cold lines shall be kept apart in different groups on a tier. .
- 5.2.2.5 Generally the bigger size lines shall be kept nearer to the column.
- 5.2.2.6 Minimum spacing between adjacent lines shall be decided based on O.D of bigger size flange'(minimum rating 300# to be considered), O.D of the smaller pipe, individual insulation thickness and additional 25 mm clearance, preferably. Wherever even if flange is not appearing the minimum spacing shall be based on above basis only.
- 5.2.2.7 Actual line spacing, especially at 'L' bend and loop locations, shall take care of thermal expansion / thermal contraction / non expansion of adjacent line. Non expansion / thermal contraction may stop the free expansion of the adjacent line at "L' bend location.
- 5.2.2.8 Anchors on the racks are to be provided on the anchor bay, if the concept of anchor bay is adopted. Otherwise anchors shall be distributed over two to three consecutive bays.
- 5.2.2.9 Anchors shall be provided within unit on all hot lines leaving the unit.
- 5.2.2.10 Process lines crossing units (within units or from unit to main pipe way) are normally provided with a block valve, spectacle blind and drain valve. Block valves are to be grouped and locations of block valves in vertical run of pipe are preferred. If the block valves have to be located in an overhead pipe way, staircase access to platform above the lines shall have to be provided.



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- 5.2.2.11 Provision of block valves, blinds etc. shall be as per Process Design Basis and P & IDs.
- 5.2.2.12 All small bore piping shall be designed in a way so as to ensure adequate space for maintenance and operation. For small bore piping intermediate support shall be provided in between portals.
- 5.2.2.13 Stubs on saline water (if applicable) service shall be from top of main header.
   Minimum branch size for tapping including for instruments e.g. PG/PTI TE etc. shall be of 3" NPD and 150 mm height on internal cement lined pipes.
- 5.2.2.14 Aboveground lines shall be grouped to run on pipe racks or sleepers in so far as practicable.
- 5.2.2.15 Hot lines on pipe racks or sleepers shall be grouped and expansion loops shall be nested together. The number of expansion loops shall be kept to a minimum.
- 5.2.2.16 Piping handling corrosive fluids shall be run under piping handling non corrosive fluids, and shall not, where possible, be run overhead across walkways or normal passages for personnel.
- 5.2.2.17 All process and utility piping will be located aboveground within the plant battery limit, except water mains.
- 5.2.2.18 All piping shall be arranged in horizontal banks, where possible, to facilitate supporting.

  Banks running north-south shall be at different elevations from banks running east-west.

  Exceptions are permitted to avoid unnecessary change in elevation at change of direction or where essential to avoid pockets.
- 5.2.2.19 All piping shall be routed for the shortest possible run and have the minimum number of fittings consistent with provision for expansion and flexibility. All piping shall be arranged in a neat manner, providing free access around all operating equipment.
- 5.2.2.20 Vertical lines at vessels shall run close to the vessel shell to facilitate supporting. The line shall be arranged and grouped to allow the use of single support.
- 5.2.2.21 Lines carrying molten solids, slurries or highly viscous liquids shall have a sufficient slope for each gravity flow.
- 5.2.2.22 The shortest and most direct layout possible shall be provided for gravity flow lines, especially when the fluid is subject to solidification and when the differential pressure is small.
- 5.2.2.23 Piping shall be arranged to facilitate handling of equipment for inspection or maintenance.
- 5.2.2.24 Vapor collecting system shall be routed so that the vapor rises continuously from the vessel being vented to a higher point without pocketing.
- 5.2.2.25 Pockets shall be avoided in lines, particularly those carrying corrosive chemicals, slurries, vents, blow down lines, etc.

## 5.2.3 Column / Vessel Piping Control Valves

- 5.2.3.1 Piping shall be supported from cleats welded on the vessel as far as possible.
- 5.2.3.2 Proper guides at intervals shall be provided for long vertical lines.
- 5.2.3.3 Access platforms/ladders shall be provided along the column for valves and instruments.



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5.2.3.4 For ease of operation and maintenance, column and vessels which are grouped together, shall have their platforms at the same elevation interconnected by walkways wherever feasible. However each column \ vessel shall have an independent access also. Column vessel platforms should be designed in such a way so that all the nozzles should be approachable from platforms.

- 5.2.3.5 Unless specifically indicated in P&ID's control valves shall preferably be kept at grade instead of platform.
- 5.2.3.6 Piping intended for vacuum services shall be routed as short as possible, with minimum bends and flanged joints.
- 5.2.3.7 Piping support cleats shall be designed for safety valves considering impact loading during popping off.

## 5.2.4 **Pump Piping**

- 5.2.4.1 Pump drives shall have clear access.
- 5.2.4.2 Pump suction piping shall be as short as possible and shall be arranged with particular care to avoid vapor pockets.
- 5.2.4.3 Reducers immediately connected to the pump suction shall be eccentric type flat side up to avoid the accumulation of gas pocket. For end suction pumps, elbows shall not be directly connected to the suction flange. A straight piece minimum 3 times the line size shall have to be provided at the suction nozzle.
- 5.2.4.4 Pump discharge check valve if installed in vertical lines shall be fitted with a drain connection as close as possible downstream of the valve.
  - When a suction vessel operates under vacuum, the vent connection of the pump has to be permanently connected to vapour space of the suction vessel to allow possible filling of the pump with liquid before it is started.
- 5.2.4.5 Unless otherwise specified T -type strainers shall be used on pump suction piping for sizes 2" and above.
- 5.2.4.6 Y-type strainers to be used for all sizes in steam services and for pump suction lines 1½ and below.
- 5.2.4.7 All small bore piping connected to pump (drain to OWS & CBD, seat and gland leak drain) shall have provision for break up flanges for removal of pumps.
- 5.2.4.8 Piping shall be so arranged that forces and moments imposed on the pump nozzle do not exceed the allowable values as per API 610.
- 5.2.4.9 Pump discharge should preferably be routed away from the pump rather than towards the motor side.
- 5.2.4.10 Pump cooling water connection shall be taken from the top of circulating cooling water header.

## 5.2.5 Steam Header & Supply Lines / Steam and Condensate Systems

- 5.2.5.1 Steam piping shall be designed to have complete condensate removal. Drip legs shall be provided with steam traps at low points in the system.
- 5.2.5.2 All steam branch connections shall be taken from the top of the header.



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- 5.2.5.3 Return exhaust steam / condensate lines shall connect to the top of the exhaust steam Condensate header.
- 5.2.5.4 Where block valves have been installed in the main steam header such that condensate can collect either side of the valve when closed, a safe means of draining the condensate prior to opening the valve shall be provided.
  - Steam header shall be located generally on the upper tier and at one end of the rack adjacent to columns.
  - Branch lines from horizontal steam header, except condensate collection points, shall be connected to the top of the pipe header.
  - Isolation valves (if provided) on the branch line shall preferably be provided on the horizontal run and outside the pipe rack.
  - All branch lines shall be drainable.
  - Drip legs & steam traps shall be provided at all low points and dead ends of steam header. Drip legs at low points shall be closer to downstream riser and shall be provided to suit bidirectional flows, if applicable.
  - All turbines on automatic control for startup shall be provided with a steam trap in the steam inlet line.
  - All traps shall be provided with strainers if integral strainers are not provided.
  - Steam traps discharging to atmosphere shall be connected to storm water drain/storm sewer, in case of open system. In case of condensate recovery, traps shall discharge into condensate header.
  - Expansion loops are to be provided to take care of the expansions within units.
  - Wherever condensate is to be drained, proper condensate draining facility shall be provided.

## 5.2.6. Water Piping

- 5.2.6.1 Water piping shall be designed to minimize the possibility of water hammer.
- 5.2.6.2 Water main headers may run underground to prevent freezing.
- 5.2.6.3 Unless local code or regulation prohibits, firewater lines shall be underground to prevent freezing. Firewater piping system shall conform to egulations of the competent governmental authorities.

## 5.2.7 **Instrument Air Piping**

- 5.2.7.1 Instrument air lines shall not be connected to process lines, service lines, and other equipment.
- 5.2.7.2 Instrument air shall not be used as plant air or service air.
- 5.2.7.3 Branch lines form the instrument air header shall be taken from the top of the header and shall be provided with a block valve close to the header. Also in the upstream of Instrument manifold, Gate valve has to be provided.

## 5.2.8 **Supports and Anchors**

5.2.8 1 Supports and/or anchors shall be provided close to changes in direction of lines, branch lines



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5.2.8 2 Allowable spans between pipe supports shall be determined to keep the maximum deflection within 16 mm.

and, particularly, close to valves to prevent excessive sagging, vibration and strain.

- 5.2.8 3 In cases where periodic maintenance requires removal of equipment, such as pumps and relief valves, and where lines must be dismantled for cleaning, piping shall be supported to minimize the necessity of temporary supports.
- 5.2.8.4 Spring-loaded hangers may be used on piping subject to thermal expansion or contraction. In cases where the movement is very large, or the limitation of reaction and stress are very severe, constant support spring hangers shall be used.
- 5.2.8.5 Suction and discharge lines of rotating equipment shall be supported as close as possible to equipment nozzles, and shall be relieved of excessive strains by using proper pipe supports.
- 5.2.8.6 Supports shall not be directly welded to pipes. Where welding is unavoidable, supports having the same chemical composition as pipe shall be carefully welded.
- 5.2.8.7 All piping shall be properly supported to minimize vibration.
- 5.2.8.8 Outlet piping of safety and relief valves shall be supported so that the inlet piping is capable of withstanding the reaction caused by operation of safety and relief valves. Furthermore, the supports shall be designed to minimize the stresses due to thermal expansion and the stresses in the valve body due to the weight of piping.
- 5.2.8.9 Expansion joints shall be guided and anchored to the extent necessary for their proper operation and alignment.
- 5.2.8.10 Anchors shall provide sufficient fixation to substantially transmit all load effects into the foundations.
- 5.2.8.11 Underground piping shall be given special anchoring consideration for differential settlement.

## 5.2.9 **Utility Stations**

Requisite number of utility stations shall be provided throughout the unit to cater for the utility requirement. Utility stations shall have four connections one for LP steam (SL), one for Plant Air (AP), one for Service Water (WS) and one for nitrogen each of 1.0" with isolation valves unless otherwise specified in P&ID.

Utility connection with nitrogen shall be provided with NRV along with isolation valve kept at a separate location other than this cluster @ 15 M.

Air and water lines shall have quick type hose connection and steam line shall have flanged type hose connection. All connections shall be directed downward. All connections shall have globe valve for isolation purpose. An inter connection with valve shall be provided between steam and service water lines shall be provided. Inert gas hose, when required, shall have built in non return valve in quick connection coupling of piping end.

Number of utility stations shall be such that all equipments shall be approachable from at least one utility station. The approach of utility station shall be considered 15 M all around the station location.

The Utility stations shall generally be located adjacent to pipe-rack column.

The utility stations shall also be provided on elevated structures like - technological structure, operating platforms of vertical equipments etc.



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Operating platforms having manholes must have a utility station. Utility station locations shall be limited to a height of 35 M from H.P.P.

## 5.3 Offsite & Yard Piping

In general, offsite piping (except tank ages area), electrical cable and instrumentation cable shall also be laid either on pipe rack or pipe sleepers.

Wherever piping is laid on pipe sleepers, it shall have hard surfacing below it keeping a gap of 300 mm from the bottom of the pipes. Hard surfacing should be completed before start of pipe laying. Width of hard surfacing shall be about 1.0 meter more than the piping corridor. This extra hard surfacing shall be for movement of operating personnel along the piping corridor.

Pipes at road crossing shall be under culverts in general. Overhead pipe bridges may be used for areas where pipe racks are provided. Where culverts are not provided, pipe sleeves shall be used for underground road crossing. Culverts / overhead pipe bridges shall be adequately designed to take care of future requirements. Minimum 20% extra width shall be provided in all such structures.

Clearances between lines shall be minimum "C" as given below:

 $C=(Do+D_f)/2 + 25 \text{ mm} + \text{Insulation thickness(es)}$  where,

Do - outside diameter of smaller pipe (mm)

D<sub>f</sub> - outside diameter of flange of bigger pipe (mm)

However this 'C' spacing between the offsite piping on the rack/sleeper can be suitably increased so that the lines should not touch each other after insulation / lateral thermal expansion.

Adequate clearance shall be provided for every long & high temperature lines to avoid clashing at the bends. See 5.2.2 also for line spacing at 'L' bends and loops.

Expansion loops for all lines shall generally be kept at the same location.

Vents shall be provided on all high points & drains shall be provided at all low points. Drain valves at sleeper piping shall be kept outside the sleeper way if the same is not accessible and valves shall be put in horizontal only.

Places where piping is extended to make drain valves accessible - 2 nos. of stiffeners, irrespective of pipe rating, shall be provided as per 5.13.1. Spacing of guides on each line on a pipe bay shall not exceed the value given in clause 5.13.1

## 5.4 Flare Piping

Flare header shall be sloped towards flare knock-out drum. Only horizontal loop shall be provided as per requirement to accommodate thermal expansion. The desired slope shall be ensured throughout including flat loop. Flare header shall be supported on shoe of height ranging from 100mm to 300mm.

Proper thermal analysis temperature shall be established including the possibility of temperature gradient along the line before providing expansion loops. Efforts shall be made to minimize the number of loops. Flare line between knock out drum and water seal drum shall be designed for pressure fluctuations and adequately supported to avoid vibrations.

## 5.5 Underground Piping



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- 5.5.1 Underground steel piping shall be protected from electric corrosion.
- 5.5.2 Underground piping passing under loaded areas, such as main roads in the plant, shall be protected from heavy traffic by casing pipes or covers extending at least 1 m on either side of the area or having the wall thickness sufficient to bear earth pressure.
- 5.5.3 Underground piping shall be sloped to all drain points with a downward slope of not less than 1 m in 150 m.
- 5.5.4 Expansion elbows or joints of underground piping for hot fluids, such as steam or heated heavy oil, shall be enclosed in a conduit from which they are separated to allow free longitudinal expansion.
- 5.5.5 Where it is impossible to run pipe aboveground or underground, trenches may be used.
- 5.5.6 Trenches for piping close to process equipment should be avoided, whenever possible.
- 5.5.7 All underground pipe work shall be provided with following protection:
  - a) At location where Underground Piping becomes above ground, INSULATING GASKET with material Glass Filled Teflon or equivalent shall be provided.
  - b) CATHODIC PROTECTION (CP) shall be provided to all underground piping. Specification shall be submitted by the CONTRACTOR & shall be approved by the OWNER.
  - c) Underground piping shall be wrapped & coated by "PYP KOTE" or equivalent tapes / sheets, 4.00 mm thick & shall be "HOLIDAY TESTED" before Hydro Test.
  - d) All underground pipes shall have Sand Bed, at least 150 MM all around the pipe.
  - e) All road crossings by Underground piping shall be through Hume Pipe Sleeves.

## 5.5.8 **Buried Pipes**

The following points to be considered in designing of buried pipes

- All underground metallic piping shall be coated and wrapped and provided with cathodic protection system. If sacrificial metal is used, permanent testing arrangement shall be provided.
- ii) All cooling water distribution headers 18" and higher shall be laid underground.
- iii) All Sewage lines (oily and chemical) from catch basin to mains and manholes shall be laid underground.
- iv) Underground pipe crossing roads, access ways and rails shall have casing pipe (R.C.C or C.S).
- v) Valve chamber wherever required shall be made of brick or concrete. Valve chamber should be spacious to attend valves during operation/Maintenance.
- vi) All U.G. headers shall clear equipment foundations as far as possible. Under special cases, the C.W. header may be laid over the footing of foundations.
- vii) Provide break flange at + 500 MM from floor level connection with cathodic protection to isolate underground pipe from above ground piping with insulating gasket KIT.
- viii) Pipes shall be laid below electrical cables if any.



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ix) Top of underground piping shall be below grade level at least 1 meter deep in case of open areas and 1.5 meter deep for roads.

## 5.5.9 Piping in Trenches

The following points to be considered in designing of trench pipes

- i) Piping located below grade, requiring inspection, servicing or provided with protective heating.
- ii) Fire water lines/Process lines.
- iii) Drain lines requiring gravity flow trenches.
- iv) Sump for valves and trenches shall be provided.
- v) Suitable draining scheme for trenches shall be provided.

## 5.6 Air Systems

- 5.6.1 Branch connections shall be taken from the top of the header.
- 5.6.2 Low points shall be fitted with drains.

#### 5.7 In-Line Instruments

- 5.7.1 Liquid level controllers and level glasses shall be located so as to be accessible from grade, platform or permanent ladder. The level glass shall be readable from grade wherever possible.
- 5.7.2 Relief valves shall be accessible. Relief valves with a centre line elevation over 4.5 M above grade (expect in pipe racks) shall be accessible from a platform or permanent ladder.
- 5.7.3 Relief valves that discharge to a closed system shall be installed higher than the collection header, with no pockets in the discharge line.
- 5.7.4 Relief valves that discharge to atmosphere shall have tail-pipes extended to a minimum of 3.0 M above the nearest operating platform that is within a radius of 8 M.
- 5.7.5 Provide steam traps at pocketed low points and at dead ends of steam headers. Provide steam traps on excessively long runs of steam piping to ensure dry quality steam at destination. Steam traps located more than 4.5 M above grade, except in pipe racks, shall be accessible from a platform.
- 5.7.6 Control valves shall be accessible from grade or platforms. In general, the instruments or indicators showing the process variables shall be visible from the control valve.
- 5.7.7 Orifice runs shall be located in the horizontal. Orifice flanges with a centre line elevation over 4.5m above grade, except in pipe racks, shall be accessible from a platform or permanent ladder.
- 5.7.8 Orifice taps shall be located as follows:
  - i) Air, Gas and steam

Top vertical centreline (preferred)

45 degrees above horizontal centreline (alternate)

- ii) Liquid
  - Horizontal centreline (preferred)
  - 45 degrees below horizontal centreline (alternate)
- iii) Tap orientation shall be shown on piping isometrics.



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5.8 **Sample Connections** 

Sample connections shall be accessible from grade or platforms. In general, where liquid samples are taken in a bottle, locate the sample outlet above a drain funnel to permit free running of the liquid before sampling.

## 5.9 **Vents and Drains**

5.9.1 The minimum size of vent and drain connections shall be as follows:

For process & utilities lines:

4" & Below NPS 3/4"

6" & 10" NPS 1"

12" & above NPS 11/2"

Vent & Drain shall be provided with the valve & blind flange. For all vents / drains of process lines / utilities lines, double valves shall be required for 600 # & more rating.

Process vents and drains shall be indicated on the P&ID's

- 5.9.2 Vent, drain and sampling valves on process lines, not connected to a piping system, shall be provided with appropriate end closures.
- 5.9.3 Vents shall be located at high points of pipelines when necessary.
- 5.9.4 Drains shall be located at low points to empty pipelines or equipment after testing or during maintenance (i.e for every loop).
- 5.9.5 All drains and vents shall be provided with valve, except that vents for test purpose for flare liens (header), may be plugged. Exposed threads shall generally be seal welded.

Low-point hydrostatic drains and high-point hydrostatic vents shall be added as required; locations to be determined during the design review.

- 5.9.6 Vent valves shall be the globe or gate type and drain valves the gate type.
- 5.9.7 Valved bleeds shall be provided at control valve stations, level switches, level controllers, and gauge glasses.

## 5.10 Line Strainers

- 5.10.1 Provide temporary conical type strainers in 2" NB and above butt weld pump suction lines for use during start-up. Arrange piping to facilitate removal.
- 5.10.2 Provide permanent Y-type strainers for pump suction piping below 2" NB Thd or SW.
- 5.10.3 Provide temporary basket type strainers located at the suction pulsation device inlet for startup of reciprocating compressors. Arrange piping to facilitate removal of the filter.
- 5.10.4 Provide temporary basket type strainers and locate them as close as possible to the compressor inlet flange for start-up of centrifugal compressors. Arrange piping to facilitate removal of the filter.
- 5.10.5 Allowable pressure drop when specified shall be certified by vendor along with the offer. If asked specifically, vendor shall furnish pressure drop calculations
- 5.10.6 All 2" & higher sized Y type strainers shall be provided with 3/4" threaded, tap and solid threaded plug as drain connection. For less than 2", this shall be ½ " size.



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5.10.7 Bottom flange of Y-type strainer shall not have tapped hole. Full length standard size studs shall be used for joining blind flange.

5.10.8 For fabricated strainers, all BW joints shall be fully radiographed and fillet welds shall be 100% DP/MP checked.

5.10.9 All the strainers shall be hydrostatically tested at twice the design pressure.

#### 5.11 Spectacle Blinds

- 5.11.1 Spectacle blinds shall be provided to isolate equipment. In hazardous service flanged dropout spools shall be provided for safety purposes. Both shall be shown on the P&ID's.
- 5.11.2 Spectacle blinds shall be accessible from grade or platforms. Blinds located in a pipe-rack are considered to be accessible. Blinds that weigh over 40kg shall be accessible by mobile equipment. Where this is not possible davits or hitching points shall be provided.

# 5.12 Flexibility Analysis and Supporting

#### 5.12.1 Pipe Supporting Criteria & General Guidelines.

Piping system shall be properly supported taking into account the following points:

- 1. Load of bare pipe + fluid + insulation (if any).
- 2. Load of bare pipe + water fill.
- 3. Load of valves and online equipment and instrument.
- 4. Thermal loads during operation.
- 5. Steam-out condition, if applicable.
- 6. Wind loads for piping at higher elevation, e.g. transfer lines, column over head lines, flare headers, etc.
- 7. Forced vibration due to pulsating flow.
- 8. Vibration due to two phase flow.
- 9. Loads due to internal pressure.
- 10. Any external loads/concentrated loads and cold load of springs.

Pipe supporting shall preferably follow the minimum basic span as given in Annexure-1 except for flare line in off site on trestles in which case the maximum basic span shall be restricted to 18.0 meters, irrespective of line size.

For sizes not covered in Annexure-1, basic span shall be established based on project requirement. For piping on rack or sleeper, as a minimum, providing resting support on every grid of pipe rack / sleeper is mandatory. Depending on the pipe size, as a rule, guides shall be provided on straight run of pipes at intervals as specified in Annexure-3 unless specifically becomes non-viable due to flexibility problems.

Additional supports, guides, anchors, special supports like spring supports and sway braces shall be provided after detailed analysis of piping system to restrict the forces experienced on nozzles of critical items like pumps, compressors, turbines, exchangers, air fin coolers etc.

For lines which do not need any support otherwise but become unsupported by opening of flange, etc, during maintenance and thereby may transfer the total load on a small branch



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off, a permanent support shall be suitably provided which may be a spring support also. Bare pipes of size 14" and above on elevated structures shall be supported with pad or shoe. While bare pipes of size 6" and' above, on sleepers, corrosion pads shall be provided.

Pads shall be provided for insulated pipes before welding the shoes for sizes 8" & above.

Adequate stiffening shall be provided for the following:

- a) Lines in above 600#,
- b) Lines having two phase flow,
- Lines having Pulsating flow such as discharge of reciprocating compressors & reciprocating pumps,

For pulsating flow lines detailed thermal and vibration analysis by analog study shall be done to decide location of anchor supports and guides etc. Pulsating flow lines shall be as identified by licensor/owner.

Wherever two phase flow in piping is expected, piping design shall be checked by dynamic analysis to prevent vibrations.

Pipe support design shall be such that deflection in piping systems due to sustained loads shall not exceed 15mm, in any case, between two adjacent supports.

As far as possible long trunnion types of supports (more than 0.5 metre) are to be avoided. In case long trunnion support is unavoidable in straight length of pipe, trunnion height to be restricted to 0.5 M and balance height to be made up by providing extended structure.

In the heaters where steam air decoking provision is there, the main lines and decoking lines should be supported in a way so that either of the lines should not be in the hanging position while connected to other one. Same philosophy shall be adopted for similar type of switch over arrangement.

Piping passing through the technology structure or passing near the concrete column etc. should have adequate annular space to avoid restriction of line movement during thermal expansion. The gap should take care the thermal expansion along with insulation thickness.

High density PUF blocks shall be considered for cold piping supports. Use of wood blocks shall be avoided.

All pipes supports shall be so designed that there is no undue tension on equipment flanges. Flange joints should not move away from each other in case of unbolting of the joint.

#### 5.12.2 Flexibility Analysis Criteria & General Guidelines

- 5.12.2.1 Formal flexibility analysis by computer program of piping system shall be performed on latest version of CAESAR-II software as per Annexure 5, 5A & 5B.
- 5.12.2.2 The directions of forces and moments shall be in accordance with Welding Research Council Bulletin 107 (WRC 107), with the exception that the radial force (P) shall be away from the vessel. All forces and moments shall be assumed to act simultaneously and apply at the nozzle/vessel interface.
- 5.12.2.3 Air coolers to API 661 shall be specified with Fx forces and Mz moments increased to 1.2 times the value shown in Figure 8 of API 661 for nozzle sizes 6"NPS and larger to simplify piping flexibility analysis and facilitate piping layout.



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5.12.2.4 Piping stress analysis and equipment nozzle loading analysis shall be in accordance with ASME B31.3 and the relevant API, ANSI/ISO and NEMA Codes.

#### 5.12.2.5 API 610 Pumps

The allowable nozzle loads on centrifugal pumps shall meet the load criteria of API 610. Heavy duty base plate shall be specified where the pump design temperature is in excess of 150°C.

ASME or Manufacturer's Standard Pumps

The allowable nozzle loads on horizontal centrifugal pumps design to ASME B73.1 shall be specified by the manufacturer. For preliminary layout and analysis NEMA SM 23 criteria shall be used for individual nozzles.

Other Horizontal Centrifugal Pumps

The allowable nozzle loads shall meet the load criteria specified by the manufacturer.

Vertical Turbine, Can-Types Pumps

The combined bending and tensional thermal stress in the piping attached to the nozzle shall be limited to 25 percent of the allowable stress range shown in ASME B31.3. The combined stress due to dead load and other sustained loads shall be limited to 25 percent of the allowable hot stress.

- 5.12.2.6 For piping design purposes, differential settlement between items of major equipment on separate foundations shall be taken as 10 mm.
- 5.12.2.7 Cold springing in piping shall not be permitted without written permission from the Owner. Cold springing of piping directly connected to rotating equipment is not permitted under any circumstances.

Piping shall be analyzed for expansion, contraction, differential settlement, relief, valve reaction and effects mentioned at Cl. 5.12.1.

The design of piping systems shall take into account the different conditions expected during operation, start-up, shut-down, cold branch in case of standby pump, tracing, etc. Hydrocarbon lines shall be designed for steam-out conditions, if specified in line schedule. The use of expansion joints shall be considered only when space oar pressure drop

limitation does not permit pipe bends. Expansion joint of axial type shall be avoided.

Forces and moments due to weight, thermal loads and other imposed loads on the equipment nozzle must not exceed the allowed loads for the equipment.

Minimum analysis temperature shall be the design temperature of the line as per line list.

#### 5.12.3 **Method of Analysis**

Formal computer analysis shall be performed on piping systems as per design philosophy for stress analysis

The package used shall be latest version of CEASER / AUTO PIPE / SIMPLEX / CAEPIPE. Only one of these packages shall be used for the project & not a combination of the above packages.

All lines shall be analyzed at design *I* analysis temperature. In the absence of analysis temperature lines shall be analyzed at design temperature.



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However in case of wide difference in design and operating temperature, temperature for analysis shall be established in process documents. (e.g. flare line)

All non-critical lines may be analyzed using other methods.

Special analysis methods shall be followed for lines involving pulsating flow such as those connected to reciprocating pumps & compressors which require acoustical plus analog study by approved agencies and shall require entire system analysis along with piping *I* equipments.

Seismic analysis shall be done for line sizes 12" and above.

- 5.13 Personnel Protection
- 5.13.1 Eyewash and emergency safety showers shall be provided in areas where operating personnel are subject to hazardous sprays, emissions or spills.
- Personnel protection shall be provided on un-insulated lines and equipment operating above 70 deg C when they constitute a hazard to the operators during normal operation of the facility.
- 5.13.3 Leakage indicating tape and spray impingement shrouds shall be provided at flanged joints in hazardous service.
- 5.14 Mechanical Handling
- 5.14.1 Handling facilities such as davits and monorails shall be provided on vessels over 10m in height where the weight of removable internal and/or external equipment is greater than 35 Kg.

#### 6.0 MATERIALS

- 6.1 **General**
- 6.1.1 Basic material selection of particular line depending on its service, temperature and corrosivity shall be spelt out in process package. Material specification shall follow the requirements as per process parameters & attached PMS / VMS.
- Only piping materials listed in ASME B31.3 shall be used for Category 'M' and Normal Service piping. Unless otherwise specified in PMS, For Category 'D' utility piping, where scaling and impurities are to be avoided (such as instrument air, potable water and deluge water) hot dipped galvanised and threaded fittings may be used in sizes up to and including 4" NB. Galvanised piping shall not be used in environments containing acids or other corrosive commodities. In corrosive environments stainless steel piping material shall be used for such utility systems.
- 6.1.2 All items/parts of Austenitic Stainless Steel shall be supplied in solution annealed condition.
- In absence of specific requirement, Natural Rubber shall be used for lining in rubber lined piping items, wherever applicable. The Vendor shall confirm the suitability of Rubber Material for specified service. Unless otherwise specified, rubber lining shall be in accordance with IS4682 Part-I.
- 6.1.4 Unless otherwise specified, HDPE pipes & fittings shall be in accordance to ASTM D3035/ ASTM D3261/ASTM D3350 or equivalent.
- 6.1.5 **Specification for FRP material**
- 6.1.5.1 Anticorrosion Barrier of Polymer veil having minimum thickness 2.5 mm shall be provided for



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chemical resistance. Mechanical resistance to be sustained by FRP.

- The selected nominal pipe wall thickness will include manufacturers full under tolerance, and the specified corrosion and/or erosion allowance. The pipe thickness will be adequate to resist all external loads from thermal, mechanical and other sources in addition to the process pressure-temperature requirements. However the pipe thickness will be according to vendor's norms and standard calculations but not be lower than indicated in DIN 16965 Part 4. External FRP layer shall be protected against ultra-violet light.
- 6.1.6 Cast Iron shall not be used as Material of Construction for any piping items like Pipes, fittings, flanges, valves, fasteners, gaskets, etc.

#### 6.2 Pipe

- 6.2.1 Calculation of pipe thickness and branch reinforcement shall be based on requirements of ASME B31.3. Proper corrosion allowance and mill tolerance shall be considered to achieve the selected thickness.
- 6.2.2 Unless specifically exempted, welded pipes shall be acceptable only with longitudinal weld made employing automatic welding. 100% radiography for all welds except for pipes for category D service.
- 6.2.3 Double seam 180° apart is allowed for sizes 36" and larger only.
- 6.2.4 Galvanized Pipes shall be only Hot Dip galv. to ASTM A53.
- 6.2.5 Hydrostatic tests shall be applied to each length of pipe and be in accordance with the requirements of ASTM A530/A530M, unless otherwise specified.

#### 6.3 **Fittings**

- 6.3.1 Type of fittings shall be equivalent to pipe type in construction.
- 6.3.2 Thickness of fittings at ends to match pipe thickness for BW fittings. For reducing BW fittings having different wall thicknesses at each end, the greater one shall be employed and the ends shall be matched to suit respective thickness.
- 6.3.3 Unless and otherwise specified in the requisition all socket weld and screwed fittings shall be in accordance with ANSI B16.11 to the extent covered in the specification except for unions which shall be in accordance with MSS-SP-83.
- 6.3.4 Special fittings like Weldolet, Sockolet, Sweepolet etc. which are not covered in ANSI, MSS-SP shall be as per Manufacturer's Std. Contours of these fittings shall meet the requirements of ANSI 31.3. Manufacturer shall submit drawings/catalogues of these items along with the offer & also shall be submitted for approval before manufacturing.
- 6.3.5 All pipes employed for manufacturing of fittings shall be required to have undergone Hydro test to ASTM A530.
- 6.3.6 All welded fittings shall be 100% Radio-graphed by X-Ray on all welds.

#### 6.4 Flanges

- 6.4.1 All flanges shall be of forged one piece material (seamless), and plate may not be substituted without written approval from the Purchaser.
- All flange joints on piping system including flanges on the equipment, manholes, etc shall be tightened using Torque wrench / hydraulic bolt tensioner depending upon service criticality.

#### 6.5 Gaskets



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Gaskets shall be as per piping material specification/ applicable standard.

#### 6.6 Stud, Bolts, Nuts and Jack Screws

- All bolting shall be as per ASME/ANSI 818.2.1 for Studs, M/C Bolts and Jack screws, and ASME/ANSI B18.2.2 for nuts. Machine Bolts shall not be used in piping flange joint, except for Butterfly Valves, which shall be lug type, having UNC Threads in lugs facilitating opening of flanges from both sides.
- 6.6.2 Screw threads of bolting shall be unified coarse threads in accordance with ANSI / ASME B1.1 having Class 2A for bolts and Class2B for nuts. Screw threads in sizel-1/8 and larger shall be 8 threads per inch.

#### 6.7 Valves

#### 6.7.1 **General**

All flanged valves (except forged) shall have flanges integral with the valve body.

Yoke material shall be at least equal to body material.

Forgings are acceptable in place of Castings but not vice-versa.

No cast iron material valves to be used in any service.

Valves in saline water (if applicable) service shall be with non ferrous trims and all wetted parts other than trims shall be epoxy coated.

Valve body basic MOC shall be equivalent or above basic MOC of connecting pipe.

#### 6.7.2 Ball/Plug/Butterfly Valves

Use of soft seated ball/plug/butterfly valves shall be suitably selected based on temperatures handled.

Butterfly valves shall be suitable for throttling application.

Lug type Butterfly valves shall be with threaded lugs only. Each butterfly valve shall be provided with the Bolts to be installed from both sides separately.

PN equivalent rating for Class150# valves shall be minimum PN16.

Ball valves may be used in place of gate or plug valves with the following limitations:

- i) Operating conditions are within the permissible pressure temperature range of seat materials
- ii) Fire safe type to be used for hydrocarbon services.

#### 6.7.3 **Valve Dimensions**

Face-to-Face/End-to-End dimension shall be as per ANSI B16.10. In case the same is not covered under B16.10, the dimension shall be as per BS 2080/manufacturer standard.

Hand wheel diameter shall not exceed 750mm and lever length shall not exceed 500 mm on each side. Effort to operate shall not exceed 35 kgf at hand wheel periphery. However, failing to meet the above requirement, vendor shall offer gear operation.

Quarter-turn valves shall have "open" position indicators with limit stops.

#### 6.7.4 Non Destructive Testing of Valves



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6.7.4.1 Radiography procedure, areas of casting to be radiographed, and the acceptance criteria shall be as per ASME/ANSI B16.34.

All valve castings shall be of radiographic quality.

The minimum requirement of radiography shall be as under:

Class	Size	Qty
150	Up to 24"	5%
150	26" & above	100%
300	Up to 16"	10%
300	18" & above	100%
600 & above	All	100%

- 6.7.4.2 The welds of body-to-bonnet and body-to-end flange shall be subjected to 100% NDT; both radiographic and magnetic or liquid penetrant examinations.
- 6.7.4.3 Beveled ends on each butt welding end valve shall be subjected 100% magnetic particle or liquid penetrant examination.
- 6.7.4.4 Each valve shall be pressure tested in accordance with API 598.

#### 6.7.5 Criteria for Isolation Valves

Installation	Installation Process Isolation		Pressure	Level	Flow	Safety	Control
mstallation			Taping	Taping	Element	Valve	Valve
150 / 300#	150 / 300# Single		Single Single		Single Single		Single
600 #	600 # Single		Double	Single	Double	Single	Single
Above 600#	Above 600# Double		Double	Double	Double	Double	Single

Note: For S/D & at battery limit, it will be as per process requirements.

# 6.8 Traps

Vendor shall also furnish the performance curve indicating the capacity in mass/hour at various differential pressures across the trap.

Parts subject to wear and tear shall be suitably hardened. Traps shall have integral strainers.

All traps shall be hydrostatically tested to twice the design pressure.

#### 6.9 Hoses

Manufacturer shall guarantee suitability of hoses for the service and working conditions specified in the requisition, if the material is not specified in the Material Requisition for any particular service.

All hoses shall be marked with service and working pressure at minimum two ends clearly.

Hoses shall be resistant to ageing, abrasion and suitable for outdoor installations.

Complete Hose assembly shall be tested at two times the design pressure

Steam hoses shall be subject to steam resistance test.

#### 6.10 **Expansion Joints (Metallic)**

The applicable codes are ASME B31.3 and EJMA (Expansion Joint Manufacturer's Association).



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Bellows shall be formed from solution annealed sheet conforming to the latest ASTM Spec. Any longitudinal weld shall be 100% radiographed. The finished longitudinal weld must be of the same thickness and same surface finish as the parent material.

Circumferential welds are not permitted. Bellows are to be hydraulically or expansion (punched) formed. Rolled formed bellows are not acceptable. Noticeable punch or die marks resulting from expansion operation are not acceptable.

No repairs of any kind are allowed on the bellows after forming. Deep scratches and dents are not acceptable.

The out of roundness shall be limited to  $\pm$  3mm. This is the max deviation between the max & min diameter.

The actual circumference of the welding end shall be maintained to  $\pm$  3mm of the theoretical circumference.

Apart from the usual requirements, the vendor shall also furnish

- a) Design calculations to justify stiffness and fatigue life.
- b) Axial, lateral stiffness, angular stiffness, effective pressure thrust area.
- c) Installation/maintenance manual.

#### 6.11 Supports & Spring Assemblies

The Material, Design, Manufacture and Fabrication shall be generally as per MSS-SP-58/MSS-SP-89 and/or BS 3974.

Testing of springs shall be as per BS1726.

#### 6.12 **Non Destructive Examination**

10% radiography of butt welds and 10%DP/ MP test of fillet welds shall be done for pipe Classes in 150# & 300#.

100% radiography on butt weld joints and 100% DP/MP for fillet welds test shall be done for Pipe Classes in 600# & above.

#### 7.0 **PAINTING**

Painting shall be as per attachment provided elsewhere in NIT.

#### 8.0 **WELDING**

Welding shall be as per ASME BPV- Sec. IX



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# ANNEXURE - 1

# **TABLE OF BASIC SPAN**

		PIF	PE- VAPO	R	PIF	PE- LIQU	IID	BARE	PIPE	BARE	PIPE	
Dina	CCLI/Th	IN	SULATIO	N	IN	SULATIO	N	EMI	PTY	WATER	FILLED	Pipe size
Pipe	SCH/Th	BASI	C SPAN (	L)M	BASI	C SPAN	(L)M					in.
Size	k (in)		176 <sup>0</sup> C	316 <sup>0</sup> C		176 <sup>0</sup> C	316 <sup>0</sup> C					
ln.	(in)	UPTO	ТО	то	UPTO	то	ТО	SPAN(L)	WEIGHT	SPAN(L)	WEIGHT	
		175 <sup>0</sup> C	315 <sup>0</sup> C	400°C	175 <sup>0</sup> C	315 <sup>0</sup> C	400°C	М	KG/M	М	KG/M	
3/4"	SCH 40	3.5	3.5	2.5	3.5	3.0	2.0	4.5	1.68	4.0	2.04	3/4"
1"	SCH 40	4.5	4.0	3.0	4.5	3.5	3.0	5.0	2.52	4.5	'3.07	1"
1- 1/2"	SCH 40	5.0	5.0	4.5	5.0	4.5	3.5	6.0	4.08	5.0	.5.4	1-1/2"
2"	SCH 40	5.5	5.0	4.5	5.0	4.5	3.5	8.5	5.47	5.5	7.65	2"
2- 112"	SCH 40	6.5	6.0	5.0	6.0	5.5	4.5	7.5	8.7	6.5	11.79	2-112"
3"	SCH 40	7.5	6.5	5.5	6.5	6.0	5.0	8.0	11.35	6.5	16.15	3"
4"	SCH 40	8.0	7.5	6.5	7.5	7.0	6.0	9.0	16.2	7.5	24.45	4"
6"	SCH 40	10.0	9.5	8.5	9.0	8.0	7.5	10.5	28.3	9.0	46.7	6"
8"	SCH 40	12.0	11.0	10.0	10.0	10.0	9.0	12.0	42.84	10.0	75.22	8"
10"	SCH 40	13.5	13.0	12.0	11.5	10.5	10.5	14.0	60.74	11.5	111.9	10"
12"	3/8" w	14.5	13.5	13.0	12.0	11.5	11.0	15.0	74.40	12.0	147.5	12"
14"	318"w	15.0-	14.5	13.5	12.0	12.0	11.5	16.0	82.5	12.5	172.05	14"
16"	318"w	16.0	15.5	14.5	13.0	12.5	12.0	17.0	94.5	13.0	213.15	16"
18"	3/8" w	17.0	16.5	15.0	135	13.0	12.0	18.0	106.5	13.5	258.3	18"
20"	318" w	18.0	17.5	16.0	14.0	13.5	12.5	19.0	118.5	14.0	307.5	20"
24"	3/8"w	20.0	19.0	17.5	14.5	14.5	13.0	21.0	1425	15.0	418.2	24"
3/4"	SCH 80	3.5	3.5	2.5	3.5	3.0	2.0	45	2.20	4.0	2.49	3/4"
1"	SCH 80	4.5	4.0	3.0	4.5	3.5	3.0	5.0	3.25	4.5	3.72	1"
1- 112"	SCH 80	5.0	5.0	4.5	5.0	4.5	4.0	6.0	5.45	5.0	6.60	1-112"
2"	SCH 80	6.0	5.0	4.5	5.5	5.0	4.0	6.5	7.53	6.0	9.45	2"
2- 112"	SCH 80	6.5	6.0	5.5	6.0	6.0	5.0	7.5	11.49	6.5	14.25	2-1/2"
3"	SCH 80	7.5	6.5	6.0	6.5	6.5	6.0	8.0	15.37	7.0	19.66	3"
4"	SCH 80	8.0	8.0	7.0	7.5	7.5	6.5	9.0	22.47	8.0	29.94	4"
6"	SCH 80	10.5	10.0	9.0	9.5	9.0	8.5	10.5	42.90	9.5	59.85	6"
8"	½" <b>W</b>	12.0	11.5	10.5	10.5	10.0	10.0	12.0	65.10	11.0	94.8	8"
10"	½" <b>W</b>	13.5	13.0	12.0	11.5	11.5	10.5	14.0	82.20	12.0	130.69	10"
12"	½" <b>W</b>	14.5	13.5	./, 3.0	12.5	12.0	11.5	15.0	98.13	13.0	168.64	12"
14"	½" <b>W</b>	15.0	14.5	13.5	13.0	12.5	12.0	16.0	108.15	13.5	194.4	14"
16"	½" <b>W</b>	16.0	15.5	15.0	13.5	13.0	13.0	17.0	124.2	14.0	240.0	16"
18"	½" W	17.5	17.0	.16.0	14.5	14.0	13.5	18.0	140.25	14.5	286.64	18"



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		PIF	PE- VAPO	)R	PIF	PE- LIQU	IID	BARE	PIPE	BARE	PIPE	
Pipe	SCH/Th	INSULATION		ATION INSULATION			EMPTY		WATER	Pipe size		
Size	k	BASI	C SPAN (	(L)M	BASI	C SPAN	(L)M					in.
In.	(in)	UPTO 175 <sup>0</sup> C	176°C TO 315°C	316 <sup>0</sup> C TO 400 <sup>0</sup> C	UPTO 175 <sup>0</sup> C	176 <sup>0</sup> C TO 315 <sup>0</sup> C	316 <sup>0</sup> C TO 400 <sup>0</sup> C	SPAN(L)	WEIGHT KG/M	SPAN(L) M	WEIGHT KG/M	
20"	½" W	18.0	17.5	:.17. 0.	15.0	14.5	14.0	19.0.	157.5	15.0	341.8	20"
24"	½" <b>W</b>	20.0	19.0	. 18.5	16.0	15.0	15.0	21.0	188.25	16.0	458.44	24"
1"	10S	4.0	3.5	3.0	4.0	3.0	2.5	4.5	2.08	4.0	2.7	1"
1- 112"	10S	5.0	4.5	3.5	4.5	4.0	3.0	5.5	3.12	5.0	4.57	1-112"
2"	10S	5.0	4.5	3.5	4.5	4.0	3.0	6.0	3.94	5.5	6.33	2"
2- 112"	10\$	6.5	5.5	4.5	5.5	5.0	4.5	7.0	5.26	6.0	8.85	2-1/2"
3"	10S	7.0	6.0	5.0	6.0	5.5	5.0	7.5	6.45	6.0	11.91	3"
4"	10S	7.5	7.0	6.0	6.p	6.0	6.0	8.0	8.34	7.0	17.87	4"
6"	10S	9.5	9.0	8.0	8.0	7.5	7.5	10.0	13.82	8.5	34.54	6"
8"	108	11.0	10.5	10.0	9.5	9.5	8.5	11.5	19.94	10.0	55.5	8"
10"	108	12.5	12.0	11.0	10.5	10.0	9.5	13.0	27.S3	11.0	83.4	10"
12"	10S	14.0	13.0	12.0	11.0	11.0	10.0	14.5	36.00	11.5	114.6	12"
14"	105	14.5	14.0	13.0	11.5	11.0	11.0	15.5	41.18	11.5	132.6	14"
16"	10S	16.5	14.5	14.0	12.0	11.5	11.5	16.5	47.33	12.5	172.2	16"
IS"	10 S	16.5	15.5	14.5	12.5	12.5	11.5	17.5	53.18	13.0	212.1	18"
20"	10 S	17.5	16.5	15.5	13.0	13.0	12.0	18.5	68.50	13.0	264.5	20"
24"	10 S	19.0	18.0	17.0	14.0	13.5	12.5	20.5	94.37	14.0	376.8	24"



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# ANNEXURE - 2

#### **ACCESSIBILITY FOR VALVES AND INSTRUMENTS**

VALVES INSTRUMENTS	CENTRELINE OF ITEM TO BE	CENTRELINE OF ITEM TO BE
VALVES, INSTRUMENTS, EQUIPMENT TO BE OPERATED	OPERATED, LOCATED LESS THAN	OPERATED, LOCATED MORE
EQUIT MENT TO BE OF ENATED	3.6m ABOVE GRADE, 2.75 m ABOVE	THAN 3.6m ABOVE GRADE,
	FLOOR OR PLATFORM OR 1.8m	2.75m ABOVE FLOOR OR
	ABOVE WING PLATFORM	PLATFORM OR 1.8m ABOVE
		WING PLATFORM
EXCHANGER HEADS	NIL	PLATFORM
OPER.VALVES 2" & SMALLER	FIXED LADDER	FIXED LADDER
OPER. VALVES 3" & ABOVE	PLATFORM	PLATFORM
MOTOR OPERATED VALVES	PLATFORM	PLATFORM
CONTROL VALVES	PLATFORM	PLATFORM
RELIEF VALVES 2" & SMALLER	FIXED LADDER	FIXED LADDER
RELIEF VALVES 3" & ABOVE	PLATFORM	PLATFORM
BLOCK VALVES 2" & SMALLER	PORTABLE LADDER	PLATFORM
BLOCK VALVES 3" & ABOVE	PLATFORM (NOTE-1)	PLATFORM (NOTE-1)
BATTERY LIMIT VALVES	PLATFORM	PLATFORM
PRESSURE INSTRUMENT	FIXED LADDER IF ABOVE 2.2m	FIXED LADDER
	HEIGHT	
TEMPERATURE INSTRUMENT	FIXED LADDER IF ABOVE 2.2 M Ht	FIXED LADDER
SAMPLE POINTS	PLATFORM	PLATFORM
GAUGE GLASSES	FIXED LADDER	FIXED LADDER
LEVEL CONTROLLERS	PLATFORM	PLATFORM
PROCESS BLINDS AND SPACERS		
PROCESS BLINDS AND SPACERS	PORTABLE LADDER / PLATFORM	PLATFORM
2" & SMALLER	PORTABLE LADDER / PLATFORM	PLATFORM
	PORTABLE LADDER / PLATFORM PLATFORM	PLATFORM PLATFORM
2" & SMALLER		
2" & SMALLER PROCESS BLINDS AND		
2" & SMALLER PROCESS BLINDS AND SPACERS 3" & ABOVE	PLATFORM	PLATFORM
2" & SMALLER PROCESS BLINDS AND SPACERS 3" & ABOVE MANWAYS/MANHOLES	PLATFORM	PLATFORM PLATFORM
2" & SMALLER PROCESS BLINDS AND SPACERS 3" & ABOVE MANWAYS/MANHOLES HANDHOLES/INSPECTION HOLES	PLATFORM PLATFORM	PLATFORM PLATFORM
2" & SMALLER PROCESS BLINDS AND SPACERS 3" & ABOVE MANWAYS/MANHOLES HANDHOLES/INSPECTION HOLES NOZZLES (process)	PLATFORM PLATFORM PLATFORM	PLATFORM PLATFORM PLATFORM

NOTE -1:-BLOCK VALVES / ORIFICE FLANGES, IF LOCATED, WITH CENTRE LINES GREATER THAN 2 METER FROM THE OPERATING FLOOR / OPERATING PLATFORM, SHALL BE PROVIDED WITH PORTABLE PLATFORM OR CHAIN FOR OPERATION.

NOTE -2: PLATFORM SHALL BE PROVIDED FOR THE ORIFICE FLANGES ON PIPE RACK.



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# **ANNEXURE-3**

#### **MAXIMUM SPACING OF GUIDES FOR VERTICAL & HORIZONTAL PIPES**

NOM PIPE SIZE	VERTICALSPACING	HORIZONTAL SPACING
IN INCHES	METRES	METRES
1	6.0	6.0
1 ½	6.0	6.0
2	6.0	6.0
3	8.0	12.0
4	8.0	12.0
6	8.0	12.0
8	8.0	12.0
10	12.0	18.0
12	12.0	18.0
14	12.0	18.0
16	12.0	18.0
18	12.0	18.0
20	16.0	18.0
24	16.0	18.0
26 & ABOVE	16.0	18.0

#### **NOTES:-**

- 1. These spacings may be varied to suit column spacing of rack. The above spacing is for straight runs of pipe & does not include guides which are used for control of thermal movements, as decided by stress group.
- 2. The guide spacings given in the above table are indicative only.



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# ANNEXURE - 4

# **CLEARANCES**

Minimum clearances for piping, equipment, structures, platforms, and supports shall be in accordance with the following table:

Item	Description	
Roads	Headroom for primary access roads wherever heavy duty crane movement is required.	9 M
	Headroom for primary access roads	7.5 M
	Width of primary access roads excluding shoulders.	Refer Civil
	Headroom for secondary roads	5 M
	Width of secondary roads excluding shoulders.	Refer Civil
	Clearance from edge of road shoulders to platforms, equipment, pipe associated with equipment, or similar features.	1.5 M**
Maintenance Aisles at Grade	Horizontal clearances for equipment maintenance by hydraulic crane (12t capacity)	3 M
	Vertical clearance for equipment maintenance by hydraulic crane (12t capacity)	3.6 M
	Horizontal clearance for fork lift and similar equipment (2500 kgs capacity)	2.4 M
	Vertical clearance for fork lift and similar equipment (2500 kgs capacity)	2.4 M
	Horizontal clearances for equipment maintenance by portable manual equipment (A-frames, hand trucks, dollies or similar equipment)	
	Vertical clearances for equipment maintenance by portable manual equipment (A-frames, hand trucks, dollies or similar equipment)	2.4 M
Walkways	Horizontal clearance (not necessarily in a straight line)	750 mm
	Headroom (except for hand wheels)	2.2 M
Platforms	Minimum width	1200mm
	Headroom from stairwell treads.	2.2 M



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Item	Description	
	Minimum clearance around any obstruction on the platform.	500 mm
Platforms	Headroom	2.2 M
	Maximum vertical distance between platforms	6 M
	Minimum toe clearance behind a ladder.	210 mm
	Minimum handrail clearance.	100 mm
Equipment	Minimum maintenance space required between flanges of exchangers or other equipment arranged in pairs.	500 mm
	Minimum maintenance space required for structural members or pipe.	300 mm
	Clearance from edge of road shoulder (the extreme projection)	1.5 M
Fired Equipment	Horizontal clearance from hydrocarbon equipment (shell to shell)	15 M
	Exception: Reactors or equipment in alloy systems shall be located for the most economical piping arrangement.	
	Clearance from edge of road to heater shell.	3 M
Valve Hand wheels	Clearance between the outside of the hand wheel and any obstruction.	25 mm*
Pipe (aboveground)	Clearance between the outside diameter of the flange and the outside diameter of pipe insulation.	25 mm*
	Clearance between the outside diameter of the pipe, flange or insulation and a structural member.	50 mm*
	Clearance between the outside diameter of the flange and the outside diameter of bare pipe.	25 mm*
	Minimum distance from underside of pipe to grade or platform.	300 mm
Control Valve Arrangement	Centreline of control valve above grade or platform.	450 mm
	Minimum centreline of control valve from face of column or wall.	600 mm
	Where process conditions require steam or hydrocarbon	



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Item	Description	
	the tail pipe shall terminate as below:	
	Distance above nearest operating platform.	3 M
	Within radius of nearest operating platform.	7.5 M
** Verify conformation	ance with local regulations.	
* With full conside	eration of thermal movements	



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### <u>ANNEXURE – 5</u>

#### **DESIGN PHILOSOPHY FOR STRESS ANALYSIS**

#### 1.0 PURPOSE

This design basis deals with the subject of Identification of Stress Critical pipelines and preparation of Critical line list. This procedure also defines the minimum requirements for performing stress analysis, design and location of spring, support and level of system

Analysis with the extent of documentation required for flexibility analysis.

Purpose of piping stress analysis is to ensure:

Safety of piping and piping components

Safety of connected equipment and supporting structure

Piping deflections are within the limits

#### 2.0 SCOPE

This specification covers the supply of engineering services to perform a complete piping and pipe support analysis for piping systems.

#### 3.0 DEFINITIONS

#### 3.1 Critical Lines / Critical Line List

Critical lines or Critical Line List as referred to in this procedure relates to Piping Stress Critical Lines and does not include or refer to process critical lines.

# 3.2 Stress Analysis Temperature

Stress Analysis Temperature refers to either "Maximum Operating Temperature" or "Steam-out temperature / hot nitrogen purging temperature" of the lines under review whichever is higher. In absence of the above values, it refers to the Design Temperature of the line under review. The Line List should be strictly followed in obtaining the above temperature values.

#### 3.3 Design Pressure

Design Pressure refers to the "Design Pressure" of the line under review as indicated on the Line List. Design Pressure is as defined in clause 301.2 of ASME B 31.3.

#### 3.4 Temperature for Flexibility Analysis

The temperature to be used for the flexibility analysis shall be taken as the maximum / minimum temperature which the pipe will see under any combination of different normal / abnormal operating conditions, as defined in clause 301.3 of ASME B 31.3. Where piping is exposed to direct sunlight, solar radiation temperature of 70 °C is considered in establishing the maximum temperature of piping. Even, for non-critical piping exposed to direct sunlight on pipe rack or elsewhere, expansion loops, wherever essential, are provided to take care of pipe movements resulting from piping skin temperature due to solar radiation.

In general, unless there is a difference of more than 50  $^{\circ}$ C between working Temperature and the design temperature, the design temperature should be taken as Flexibility temperature. Ambient Temperature shall be considered as 21 $^{\circ}$ C the assumed piping installation temperature. The displacement stress range from this installation temperature to the minimum recorded ambient temperature of 0 $^{\circ}$ C being less than the same from installation temperature



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to the maximum operating temperature of hot piping in most cases, the later governs as per clause 319.2.3 of ASME B 31.3

The temperature under fire condition is normally not considered for flexibility analysis.

#### 1.0 SELECTION

A line is selected and listed as a Critical Line provided it falls under any one of the categories defined below and is intended to include the special requirements of Piping Stress Engineer. It is hence defined as any line for which a flexibility review is required or where pipe supporting is deemed to be critical and needs review by a Stress Engineer. Line DN 50 and smaller is inherently flexible and is not normally considered critical unless built from non-metallic or non-ferrous materials. In case of more than one applicable line size, larger line size governs. Lines are classified as Level I, Level II & Level III according to the criteria listed below.

#### 4.1 Level I [Extensive Analysis]

Piping systems or lines that meet Annexure 5A criteria are deemed to be extremely critical. These lines are categorized as Level I and require careful study to ensure that the code compliance is met and the accurate determination of nozzle and support loads have been made. The routing of these lines is very important. They must be analyzed in the early stages of the project during routing studies so that the impact on the location of less critical lines is minimized. Normally, these systems require computer analysis. The general intent of the Level I analysis criteria is to study lines size DN 80 & larger that are affected by thermal expansion and / or a dynamic response, and that can't be evaluated by a weight-only analysis (as per the general intent of Level II analysis). Consideration has to be given to other special situations that augment the Level I general intent guidelines such as for lines that are excessively large and stiff.

#### 4.2 Level II [Normal Analysis]

Piping systems or lines that meet Annexure 5B criteria are moderately critical lines and often do not require such rigorous study to ensure code compliance or accurate determination of nozzle and support loads. These lines are smaller in size and operate at lower temperatures (in general) than the lines to be analyzed using Level I Criteria. Normally, only manual calculations, by use of appropriate monographs are required for analysis of these systems.

#### 4.3 Level III [Minimum Analysis]

All lines that are outside the purview of Level I or Level II criteria will be classified as level III and shall be reviewed by the Piping Engineer during the squad check of the piping drawings and or fabrication Iso's. If more detailed analysis is required, the Piping Engineer may change the level of analysis during the squad check as applicable. Normally, only visual analysis is required for these systems.

# 4.4 Lines Deemed To Be Support Critical

Lines subjected to two-phase flow.

Cross country pipelines.

Lines with pipe thickness Sch 160 or greater.

Lines DN 400 and above with pipe thickness less than 8 mm.

Lines DN 250 and above with corrosion allowance 3 mm and above.

Lines with high concentrated loads such as heavy valves or fittings etc.

Lines downstream of Relief Valve / letdown Control Valves / bursting (rupture) discs.



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Connecting to vent or flare systems or discharging to atmosphere

Liquid Blow down Lines.

Lined pipes

Non-metallic pipes

#### 4.5 Lines Needing Dynamic Analysis

There are instances where in the frequency of the applied load is comparable to the natural frequency of the piping system. Such systems tend to store the energy and release it according to certain scientific laws. Such a system is dynamic in nature and the study of the response of such a system is referred to as "Dynamic Analysis". Examples of such kind of systems are Relief Valve discharge lines, water hammer and surge in pipe lines, two phase flow in pipelines, reciprocating pumps and compressor piping, submarine piping etc.

# 4.6 Special Piping

Special piping forming part of reformer tubes, heater internal piping, etc. are treated as proprietary piping and nozzle loading at the Interface connections are to be co-ordinate with vendor.

#### 5.0 RELATED DOCUMENTATION

#### 5.1 Critical Line List Format.

The critical line list shall be prepared from the project line list document by inserting following relevant fields such as Stress level, stress package no., stress analysis temperature, support critical nature of the line, dynamic loadings, steam out / purge temperature etc.

The list shall reflect analysis status of line that includes its input received date from design & output handover date to design and specific remark if any.

#### 5.2 Lines Affecting the Flexibility of Critical Lines

Non-critical Lines found to affect the flexibility of critical lines which have not been included during the initial review are subsequently added to the Critical Line List.

Non-critical Lines on which advice may be sought by the Lead Piping Engineer are not normally entered into the Critical Line List but covered verbally, or by a memorandum if a record is required.

#### 6.0 PIPE STRESS ANALYSIS AND SUPPORTING

#### 6.1 Piping system shall be properly supported taking in to account of the following points:

Piping stress analysis shall follow ASME B 31.3 and shall be complete to prevent overstressing of the pipe during operating conditions with wind and seismic loadings. During sustained, occasional (wind and seismic) & thermal expansion loading on piping,

The material allowable stresses shall be as per ASME B 31.3 for ASTM materials. For DIN material specifications the allowable stress values shall be calculated as per ASME

B 31.3 clause 302.3.2(d), wherein yield strength and ultimate strength values at temperature shall be taken from DIN material standards. For DIN material specifications, the other material properties viz. elastic modulus, density, coefficient of thermal expansion shall be taken from the respective DIN material standards.



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Analysis shall include, but not be limited to the following; thermal, dead weight, internal pressure, wind and seismic, and a combination of these based on ASME B 31.3.

6.3 Piping shall be designed in accordance with the Indian Standard criteria for earthquake resistance design for structures IS: 1893 for seismic zone-IV (refer project design basis). As a minimum, two (2) orthogonal horizontal components and a vertical component of ground motion will be considered in the seismic analysis. For American standard, loading applied to piping would be in accordance with uniform building code (UBC).

The equivalent horizontal static force method shall apply in general .The contractor shall also carry out special designs and provisions as necessary for piping which is considered to be dynamically sensitive to earthquake.

Seismic analysis to be performed for lines equal to and above 12". Seismic load case shall ALGEBRIC combination with operating cases.

Heavy rigid masses like valves shall be restrained in their vicinity to avoid large seismic movements. Guides or snubbers as the case may be used for this purpose.

Horizontal seismic coefficient (Ah) to be considered as 0.26 and Vertical (Av) to be considered as 0.173.

6.4 Wind loads shall be calculated in accordance with IS-875 code of practice for structural safety of building – Loading Standards for Indian code requirement using basic wind speed as mentioned in project design basis. For American standard, wind load in accordance to ASCE 07 shall be calculated. Reduction in velocity pressure due to apparent shielding afforded by buildings and structure or terrain shall not be permitted.

Wind loading shall only be considered for lines larger than 20" OD at elevation higher than 10m above grade. Displacements due to wind and earthquake should be limited to 50 mm.

Both the horizontal directions shall be analyzed independently in two cases

$$+X, -X, +Z, -Z$$

Wind and seismic loading will not occur simultaneously.

- Analysis of all nozzles loading on vessels within the piping boundaries is covered in this specification. Nozzle analysis shall follow the guidelines of ASME Section VIII, Division 1, and WRC 297 & 107 (latest editions). Nozzle stresses shall fall within the allowable per ASME.
- 6.6 Piping system shall have sufficient flexibility to avoid leakage at joints. Flanged joints imposed by external moments may be analyzed and the stresses evaluated by using the methods of equivalent pressure given in the ASME boiler and pressure code section III. Flange leakage shall be assessed as per "Pressure Equivalent Method". In case of Failure in Pressure Equivalent Method, the Flanges shall be checked for leakage using Caesar Flange leakage Module. Flange leakage shall be assessed for all PSV flanges, Control valve flanges, High Pressure lines, all steam lines and also for equipment flanges where loads are high.



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- 6.7 All forces on connections to equipment shall not exceed maximum allowable as specified by equipment vendor.
- Pipe supports loads shall be based on the maximum loads determined by the piping analysis.

  Adjustments shall be made to the piping system and model such that the pipe supports loads are within a reasonable uniformity throughout the piping system.
- Various Load cases built in Caesar II to check stress in piping system are listed below.

1	WW+HP	HYD	
2	W+T1+P1	OPE	
3	W+T2+P1	OPE	
4	W+T1+P1+U1	OPE	
5	W+T1+P1+U2	OPE	
6	W+T1+P1+U3	OPE	
7	W+T1+P1-U1	OPE	
8	W+T1+P1-U2	OPE	
9	W+T1+P1-U3	OPE	
10	W+T1+P1+WIN1	OPE	
11	W+T1+P1+WIN2	OPE	
12	W+P1	SUS	
13	W+P2	SUS	
14	L2-L12	EXP	
15	L3-L12	EXP	
16	L4-L2	OCC	
17	L5-L2	OCC	
18	L6-L2	OCC	
19	L7-L2	OCC	
20	L8-L2	OCC	
21	L9-L2	OCC	
22	L10-L2	OCC	
23	L11-L2	OCC	
24	L12+L16	OCC	
25	L12+L17	OCC	
26	L12+L18	OCC	
27	L12+L19	OCC	
28	L12+L20	OCC	
29	L12+21	OCC	
30	L12+L22	OCC	
31	L12+L23	OCC	

P1- Maximum Operating Pressure W- Dead Weight

T1- Maximum Operating Temperature WW- Water Weight

P2- Design Pressure WIN- Wind Load

T2- Design Temperature U- Uniform Load

HP- Hydro test Pressure L2- Load case

SUS, EXP, OCC, HYD, OPE- Various load types, viz., sustained, occasional, hydro test, operating etc.



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#### 7.0 CODES AND STANDARDS

The following codes and standards shall apply in the design and analysis of the piping systems covered under this specification:

Allowable Stress ASME B 31.3

Piping ASME B 31.3

Nozzle Loadings PMC's Standard, WRC297/107(Welding Research Council) /

Allowable Vendor

Wind Analysis ASCE 7 – 98

#### 8.0 SOFTWARE USED

The package used shall be latest version of CEASER-II 5.2. Only one of these packages shall be used for the project & not a combination of the above packages.

#### 9.0 DOCUMENT REQUIREMENT

9.1 A written report shall be submitted on the piping and equipment analysis. The report shall include all pertinent information that shall include but not be limited to the following.

Location and type of pipe supports with loads and movements.

Location of expansion joints and movements.

Vertical and horizontal loads including moments at all support points.

Vertical and horizontal loads including moments on all equipment and

Vessel connections.

Caesar II analysis report, which shall include as a minimum, restraint forces, movements and stresses for all load cases. For flange connection, loaded with high bending moments and/or tensile forces in piping or at equipment connections, Caesar II flange leakage report will be provided. For piping analyzed, if subjected to hydro test, hydro test load case will be made in Caesar II to check for loading under hydro test & the requirement of any additional temporary supports for hydro test.

Detailed nodal model used for the stress analysis

All assumptions and limitations applied to the analysis

- 9.2 All dimensions and analysis shall be performed using metric and SI units.
- 9.3 The final report / stress package folder shall be submitted as follows:
  - 1. Front sheet with Approval status
  - 2. Isometrics with following information
    - Node numbers
    - Type of supports selected by stress engineer
    - Springs / Bellows data required for procurement like spring rate, loads, tide/untied information and SM (special material) identification.
    - Maximum Expansion and sustain stress values with node number
    - Nozzle/Anchors initial movements and piping imposed forces and moments on the same
    - Support loads (anchors, guides or rest) only they are above limit (The limit is defined in



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the beginning of the project in consultation with civil)

- Design and maximum operating conditions
- Coordinate axis system considered for inputs
- Dimensional details for piping designer to locate supports in piping model/layout.
- 3. Checklist as per Work instructions.
- 4. Following outputs
  - Load Cases
  - Restraint summary
  - Spring hanger report, if any
- 5. Stress critical line list extract for the lines analysed
- 6. Piping material specifications
- 7. Equipment drawings with allowable loads, if available
- 8. PID



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#### **ANNEXURE-5A**

# **CRITERIA FOR IDENTIFING EXTREMELY CRITICAL LINES (LEVEL I)**

Temperature T, Degree C	Pipe Diameter DN (mm)	Piping Material	Service and Description
All	All	All	Piping which will undergo hydraulic shock, auto-ignition or is in service.
All	DN≥80	All	Category M (Lethal) fluid service per ASME B31.3 (No cyclic service).
All	DN≥80	All	Piping which is openly exposed to winds> 75 mph.
T<-29	DN≥80	Carbon Steel	All Services.
T<-45	DN≥80	All	All Services
T≥65	DN≥80	Non-Metallic	All Services
T≥65	DN≥80	All	Lines with pressure≥900 psig.
T≥150	DN≥80	All	All Services
ALL	DN≥400	All	All Services.
T≥260	ALL	ALL	ALL Services.
-29≥T≥65 OR -7≥T≥50	DN≥80 DN≥100	All	Piping connected to nozzle load sensitive equipment, air-cooled exchangers and rotating equipment (see note 1).
ALL	ALL	All	Lines requiring expansion joints or flexible connectors.
DELTA T≥27 (NOTE 2)	DN≥80	All	Jacketed piping.
-29≥T≥65	DN≥100	All	Internally lined pipe (except glass).
All	ALL	All	Glass lined piping.
All	DN≥80	All	Differential Tank Settlement (Upto 3 supports from nozzle).
-40≥T≥80 -29≥T≥70	DN≥100 DN≥200	Metallic Metallic	Underground Piping

#### NOTES:

- 1) Load sensitive equipment include fired heaters, reformers, lined vessels with lining of brittle material, non-ferrous equipments, graphite heat exchangers, plate & frame heat exchangers, etc.
- 2) This criterion is not to be applied to auxiliary piping such as seal flush; bearing cooling, etc. delta T refers to the differential temperature between the process piping and jacket.



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ANNEXURE-5B

# **CRITERIA FOR IDENTIFYING MODERATELY CRITICAL LINES (LEVEL II)**

Temperature T, Degree C	Pipe Diameter DN (mm)	Piping Material	Service and Description
All	DN<80	All	Lethal fluid service.
T<-29	DN<80	Carbon Steel	All Services.
T<-46	DN<80	All	All Services
95 <t<150< td=""><td>80<dn<200< td=""><td>All</td><td>All Services</td></dn<200<></td></t<150<>	80 <dn<200< td=""><td>All</td><td>All Services</td></dn<200<>	All	All Services
T≥65	DN<80	Non-Metallic	All Services
T≥65	DN<80	All	All Services
T≥65	DN<80	All	Lines with pressure≥900 psig.
T≥150	DN<80	All	All Services
ALL	200 <dn<400< td=""><td>All</td><td>All Services.</td></dn<400<>	All	All Services.
T≥260	ALL	ALL	ALL Services.
ALL	ALL	ALL	Piping connected to nozzle load sensitive equipment, air-cooled exchangers and rotating equipment (see note 1 of Table-1).
DELTA≥27(NOTE 2 of Table-1)	DN<80	All	Jacketed piping.
All	ALL	All	Internally lined pipe (except glass).
All	DN<80	All	Differential Tank Settlement (Upto 3 supports from nozzle).
All	ALL	All	Underground Piping
All	ALL	All	Piping connected to pressure relief
All	ALL	All	Close coupled interconnecting piping between equipment with differential movement greater than 6.0mm.



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# **ANNEXURE-5C**

# MINIMUM ALLOWABLE NOZZLE LOADINGS- VESSELS AND S/T HEAT EXCHANGERS

NOZZ. SIZE	FLANGE RATING			FORCES N)			NOZZLE N (N	MOMENTS m)	
(in)	(lbs)	FL	FA	FC	F	MT	ML	МС	М
1.5	150#	2250	2250	1688	2385	253	219	169	238
1.5	300#	2250	2250	1688	2385	253	219	169	238
1.5	600#	3750	3750	2813	3975	422	366	281	397
1.5	900#	4500	4500	3375	4770	506	439	338	476
1.5	1500#	6000	6000	4500	6360	675	585	450	635
2	150#	3000	3000	2250	3180	450	390	300	423
2	300#	3000	3000	2250	3180	450	390	300	423
2	600#	5000	5000	3750	5300	750	650	500	705
2	900#	6000	6000	4500	6360	900	780	600	846
2	1500#	8000	8000	6000	8480	1200	1040	800	1128
3	150#	4500	4500	3375	4770	1013	878	675	952
3	300#	4500	4500	3375	4770	1013	878	675	952
3	600#	7500	7500	5625	7950	1688	1463	1125	1586
3	900#	9000	9000	6750	9540	2025	1755	1350	1904
3	1500#	12000	12000	9000	12720	2700	2340	1800	2538
4	150#	6000	6000	4500	6360	1800	1560	1200	1692
4	300#	6000	6000	4500	6360	1800	1560	1200	1692
4	600#	10000	10000	7500	10600	3000	2600	2000	2820
4	900#	12000	12000	9000	12720	3600	3120	2400	3384
4	1500#	16000	16000	12000	16960	4800	4160	3200	4512
6	150#	9000	9000	6750	9540	4050	3510	2700	3807
6	300#	9000	9000	6750	9540	4050	3510	2700	3807
6	600#	15000	15000	11250	15900	6750	5850	4500	6345
6	900#	18000	18000	13500	19080	8100	7020	5400	7614
6	1500#	24000	24000	18000	25440	10800	9360	7200	10152
8	150#	12000	12000	9000	12720	7200	6240	4800	6768
8	300#	12000	12000	9000	12720	7200	6240	4800	6768
8	600#	20000	20000	15000	21200	12000	10400	8000	11280
8	900#	24000	24000	18000	25440	14400	12480	9600	13536
8	1500#	32000	32000	24000	33920	19200	16640	12800	18048
10	150#	15000	15000	11250	15900	11250	9750	7500	10575
10	300#	15000	15000	11250	15900	11250	9750	7500	10575
10	600#	25000	25000	18750	26500	18750	16250	12500	17625
10	900#	30000	30000	22500	31800	22500	19500	15000	21150
10	1500#	40000	40000	30000	42400	30000	26000	20000	28200
12	150#	18000	18000	13500	19080	16200	14040	10800	15228
12	300#	18000	18000	13500	19080	16200	14040	10800	15228
12	600#	30000	30000	22500	31800	27000	23400	18000	25380
12	900#	36000	36000	27000	38160	32400	28080	21600	30456
12	1500#	48000	48000	36000	50880	43200	37440	28800	40608
14	150#	21000	21000	15750	22260	22050	19110	14700	20727
14	300#	21000	21000	15750	22260	22050	19110	14700	20727
14	600#	35000	35000	26250	37100	36750	31850	24500	34545
14	900#	42000	42000	31500	44520	44100	38220	29400	41454
14	1500#	56000	56000	42000	59360	58800	50960	39200	55272



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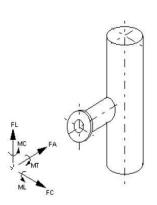
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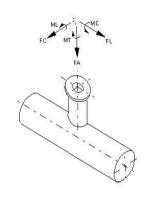


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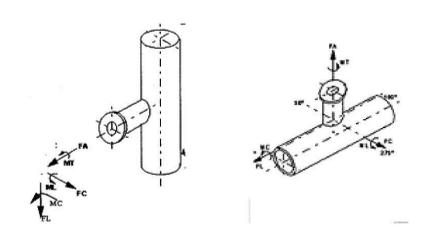
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ORIENTATION OF THE FORCES AND MOMENTS AS PER WRC BULETTIN107



ORIENTATION OF THE FORCES AND MOMENTS AS PER PD 5500



# **PROJECTS & DEVELOPMENT INDIA LTD**

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# PIPING MATERIAL SPECIFICATION AMMONIA UREA COAL BASED FERTILIZER PROJECT. TALCHER FERTILIZER LTD., ODISHA.

5	22.02.2022	22.02.2022	ISSUED FOR USE	NAZ	NS	GL/HOD
4	12.10.2021	12.10.2021	ISSUED FOR COMMENT	NAZ	NS/RK	GL/HOD
3	03.02.2021	03.02.2021	ISSUED FOR COMMENT	VINEETA	NS/RK	GL/HOD
2	28.12.2020	28.12.2020	ISSUED FOR COMMENT	VINEETA	NS/RK	GL/HOD
1	25.15.2020	28.12.2017	ISSUED	VINEETA	NS/RK	GL/HOD
0	09.03.2020	09.03.2020	ISSUED	VINEETA	NS/RK	GL/HOD
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD

FORM NO: 02-0000-0021 F3 REV4

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- Branch Tables
- Valve Data Sheets
- Strainer Data sheets
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		of Piping Material Classes	DOCUMI	REV. NO.		
SL.NO.	PMC	SERVICE	RATING, FACE ,D.TEMP.	BASIC MATERIAL	CORROSION ALLOW. (MIN.)	REV. NO.
1	B14	AG,AL,FG	CLASS 150, RF,250°C Max, - 33°C Min.	LTCS	1.5 MM	1
2	B20	CW (UG)	CLASS 150, RF, 70°C Max	cs	1.5MM	1
3	B22G	DW	CLASS 150, RF, 70°C Max	CS (GALV)	1.5MM	1
4	B22IS	CONST.WATER	CLASS 150, FF, 80°C Max	CS	1.5 MM	1
5	B22ISG	FW	CLASS 150, FF, 80°C Max	CS (GALV)	1.5 MM	0
6	B24	BD,CW,CWS,CWR,DO,ES,FG,FN,FO,FW,IAW,NI,,PA,PG,PN,PV,PW,SA,SC,SW,TC,WW.	CLASS 150, RF, 200 °C Max	CS	1.5 MM	1
7	B24D	WASTE EFFLUENT	CLASS 150, FF, 50°C Max	HDPE	0.0 MM	0
8	B24FL	EFFLUENT,ACIDIC H2O ETC.	CLASS 150, FF, 80°C Max	CS FRP LINED	1.5 MM	0
9	B24G	FW	CLASS 150, FF, 200 °C Max	CS (GALV)	1.5 MM	0
10	B24P	ETP	CLASS 150, FF, 80°C Max	CPVC	0.0 MM	0
11	B24RL	EFFLUENT, WASTE H2O, CHLORINATED H2O	CLASS 150, FF, 80°C Max	CSRL	1.5 MM	0
12	B24S	SL,SC (IBR)	CLASS 150, RF, 240°C Max	CS	1.5 MM	0
13	B24Z	FLARE	CLASS 150, RF, 400 <sup>0</sup> C Max	cs	3.0 MM	1
14	B40	CD,FG,HG,PA,PC	CLASS 150, RF,150°C Max	304L SS	0.0 MM	0
15	B50	AF, AW, CD, DW, HZ, IA, MDA, PC, PH, VS	CLASS 150, RF,150°C Max	304 SS	0.0 MM	1
16	B52	UL, WET ACID FLARE GAS	CLASS 150, RF,150°C Max	316L SS	0.0 MM	2
17	D14	AG,AL,FG	CLASS 300, RF,70 <sup>o</sup> C Max, - 35 <sup>o</sup> C Min.	LTCS	1.5 MM	1
18	D24	AG,AL,AW,FG,FN,HG,IAH,IAW, PA	CLASS 300, RF,280°C Max	CS	1.5 MM	0
19	D50	AW,PH,PC	CLASS 300, RF,200°C Max	304 SS	0.0 MM	0
20	D52	UL	CLASS 300, RF,150°C Max	316L SS	0.0 MM	2
21	F24	AW,HG,PA,PC,PN,SG	CLASS 600, RF,425°C Max	cs	1.5 MM	0
22	F24S	BB,BF,SC,SM	CLASS 600, RF,425°C Max	CS(IBR)	1.5 MM	0
23	H24S	BB,BF,SC,SH	CLASS 1500, RJ,340°C Max	CS(IBR)	1.5MM	0
24	J36S	sc,sh	CLASS 2500, RJ,540°C Max	AS(IBR)	1.5 MM	1
Ahhrey	Service	i e	1	Δhhrev	Service	

Service Antifoam solution Ammonia Gaseous Ammonia Liquid Abbrev.
AF
AG
AL/LA
AW
BB
BD
BF
CD
CW
CWS
CWS
CWR
DM
DW Ammonia water Boiler BlowDown Blow Down Boiler feed water CO2/Steam mixture Cooling water
Cooling water supply
Cooling water return
DM water Drinking Water DO Diesel Oil

Exhaust steam Fuel gas Fuel oil Fuel Naphtha ES FG FN FW HC HG HZ IAH IAH IAW IG NG NI PA PC PG Fuel Naphtha
Fire Water
Mixed Hydrocarbons
Hydrogen Gas
Hydrazine
Instrument air
Instrument air(High pressure)
Instrument air(Wet)

Inert gas Natural gas Nitrogen Process Air Process condensate Process Gas Abbrev.
PH
PN
PV
SA
SC
SG
SH/HPS/HP
SL/LP/LPS
SW
TC
UL

Service
Phosphate Solution
Process Nephtha
Vent gas
Process Water
service air
Steam condensate
Synthesis Gas
High Pressure Steam
LP Steam
Medium Pressure Steam
Service water
Turbine Condensate
Urea solutions
handling

WW Waste Water

SWAGE NIPPLE SWAGE (CONC)

1/2 - 11/2

PΕ

ASTM A420 WPL6-SMLS,MSS SP 95,

NC49J4500

Project .: TFL CLIENT : M/S..TFL PIPING MATERIAL SPECIFICATION PROJECT AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 LOCATION : TALCHER.ODISHA **PDIL** Rev.:1 Class: B14 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AG,AL,FG Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF LT CS 1.5 MM(MIN.) ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 2 - 21/2 SCH 40 BE SMLS.ASTM A333 GR.6.ASME B36.10. PPP611300 PIPE 3 - 4 SCH 40 BE SMLS.ASTM A333 GR.6.ASME B36.10. PPP611300 PIPE SMLS,ASTM A333 GR.6,ASME B36.10, 5 -6 SCH 40 ΒE PPP611300 SMLS,ASTM A333 GR.6,ASME B36.10, PIPE SCH 20 BE PPP611300 PIPE 12 -12 SCH 20 BE SMLS,ASTM A333 GR.6,ASME B36.10, PPP611300 PIPE 14 -16 SCH 10 BE SMLS,ASTM A333 GR.6,ASME B36.10, PPP611300 PE SMLS.ASTM A333 GR.6.ASME B36.10. PIPE 1/2 - 3/4SCH 80 PPP621300 PE SMLS,ASTM A333 GR.6,ASME B36.10, PIPE 1 - 11/4 SCH 80 PPP621300 PIPE 11/2 - 11/2 SCH 80 SMLS,ASTM A333 GR.6,ASME B36.10, PPP621300 PIPE 18 - 20 SCH 10 ΒE SMLS,ASTM A333 GR.6,ASME B36.10, PPP611300 PIPE 22 - 24 SCHSTD ΒE SMLS,ASTM A333 GR.6,ASME B36.10, PPP611300 FLANGE LONG W.N.FLANGE 1 - 1 300# WN-RF 125 AARH ASTM A350 LF2 CL.1, ASME B16.5, 24mmBORE, 200mmLONG LN3570802 ASTM A350 LF2 CL.1,ASME B16.5,WELD NECK W.N.FLANGE 1/2 - 24 150# WN-RF 125 AARH WN3570801 5 W.N.FLANGE 1/2 WN-RF 125 AARH ASTM A350 LF2 CL.1,ASME B16.5,WELD NECK 300# WN3570802 6 SPACER AND BLIND 14 - 24 150# RF 125 AARH ASTM A350 LF2 CL.1,ASME B16.48, RS352PO01 SPECL BLIND 1/2 - 12 150# RF 125 AARH ASTM A350 LF2 CL.1,ASME B16.48, SP352P001 BLIND FLANGE BLIND FLANGE 1/2 - 24 150# RF 125 AARH ASTM A350 LF2 CL.1, ASME B16.5, BF3520801 GASKET TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.20, 1/2 - 24 SPRL-WND RF GASKET 150# GSQN30301 STUD & NUTS STUD & 2NUTS HVY ASTM A320 GR.L7/ASTM A194 GR.7,, SNDA00000 HEX (BW) FITTING BRANCH WELD WITH LT CARBON STEEL, ASME B31.3, 2 - 24 BW WBE211200 RP CAF ASTM A420 WPL6-SMLS.ASME B16.9. 24 BW CP4910900 ELBOW 24 BW ASTM A420 WPL6-SMLS,ASME B16.9, EL4910900 REDUCER CONC ASTM A420 WPL6-SMLS, ASME B16.9, RC4910900 REDUCER ECC. 24 BW ASTM A420 WPL6-SMLS,ASME B16.9, RE4910900 TEE 24 BW ASTM A420 WPL6-SMLS, ASME B16.9, TE4910900 WELDOLET ASTM A350 LF2 CL.1.MSS SP 97. 2 - 24 BW WL3513300 FITTING (SW) 1/2 - 11/2 3000# SOCW ASTM A350 LF2 CL.1,ASME B16.11, CAF CP3530207 W ASTM A350 LF2 CL.1,ASME B16.11, COUPLING 1/2 - 11/2 3000# SOCW CN3530207 ELBOW 1/2 - 11/2 3000# SOCW ASTM A350 LF2 CL.1,ASME B16.11, EL3530207 HALF COUPLING 1/2 - 11/2 3000# SOCW ASTM A350 LF2 CL.1, ASME B16.11, HF3530207 W SOCKOLET 1/2 - 24 3000# SOCW ASTM A350 LF2 CL.1.MSS SP 97. SL3533307 TEE ASTM A350 LF2 CL.1,ASME B16.11, 1/2 - 11/2 3000# SOCW TE3530207 FITTING (THD) ASTM A350 LF2 CL.1,ASME B16.11, 1/2 - 11/2 3000# THD CP3540207 Т HALF COUPLING 1/2 - 11/2 3000# THD ASTM A350 LF2 CL.1,ASME B16.11, HF3540207 Т PLUG 1/2 - 11/2 THD ASTM A350 LF2 CL.1, ASME B16.11, ROUND HEAD PG3540200 THREDOLET 1/2 - 24 ASTM A350 LF2 CL.1,MSS SP 97. 3000# THD TL3543307 NIPPLE 1/2 - 11/2 SMLS,ASTM A333 GR.6,ASME B36.10, NIPPLE SCH160 PLN-PLN NPP651312 NIPPLE 1/2 - 11/2 SCH160 PLN-THD SMLS,ASTM A333 GR.6,ASME B36.10,NPT NPP661312 2 NIPPLE SCH160 SMLS,ASTM A333 GR.6,ASME B36.10,NPT 1/2 - 11/2 NPP641312 3

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Cla	iss: B14		PRO	JECTS ANI	D DEVELOPMENT	Γ INDIA LIMITE	D		
SERVICE		TEMPERATURE I		.IMITS (Deg.C)					
AG,AL,FG		Ref.SI	Ref.SI						
RATING ASME 150# RF	CORROSION ALLOWA 1.5 MM(MIN.)	NCE	MATERIAL LT CS				<u> </u>		
ITEM	NOTES SIZE (NP	S) S	CH/ RAT	END	DESCRIPTION			COMM CODE	SPCL RE
SWAGE (ECC)	1/2 - 11	/2		PE	ASTM A420 WPL6-S	SMLS,MSS SP 95,		NE49J4500	
VALVES									
GATE VALVE	1/2 - 11	/2 80	0#	SOCW	LTCS BODY ASTM	A350 GR LF2,GAV101,		GAV101	W
GATE VALVE	1/2 - 11	/2 15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,GAV110,		GAV110	F
GATE VALVE	2 - 24	15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,GAV110,		GAV110	
GLOBE VALVE	1/2 - 11	/2 80	0#	SOCW	LTCS BODY ASTM	A350 GR LF2,GLV101,		GLV101	W
GLOBE VALVE	2 - 8	15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,GLV110,		GLV110	
GLOBE VALVE	1/2 - 11	/2 15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,GLV110,		GLV110	F
CHECK VALVE	1/2 - 11	/2 80	0#	SOCW	LTCS BODY ASTM	A350 GR LF2,CHV101,		CHV101	
CHECK VALVE	2 - 24	15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,CHV110,		CHV110	
BALL VALVE	1/2 - 11	/2 80	0#	SOCW	LTCS BODY ASTM	A350 GR LF2,BAV101,		BAV101	W
BALL VALVE	1/2 - 11	/2 15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,BAV110,		BAV110	F
BALL VALVE	2 - 24	15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,BAV110,		BAV110	
BUTTERFLY VALVE	2 - 24	15	50#	FLG	LTCS BODY ASTM	A352 GR LCB,BUV101,		BUV101	

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:1 Class: B20 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) CW(UG) Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF 1.5 MM(MIN.) CS ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV 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 ΒE LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, PPQW11300 PIPE 10.00 MM BE LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, PPQW11300 PIPE 8 -10 SCH 10 ΒE 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 18 SCH 10 BE LSAW.API 5L GR.B.C&W.ASME B36.10. 16 -PP1A11300 PIPE 20 SCH 10 BE LSAW,API 5L GR.B,C&W,ASME B36.10, - 24 PP1A11300 PIPE SCH 80 SMLS,API 5L GR.B,C&W,ASME B36.10, PPX121300 PIPE 1 - 11/4 SCH 80 PΕ 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 32 BE LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, 30 08.00 MM PPQW11300 PIPE 34 08.00 MM ΒE LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, PPQW11300 PIPE 38 -38 08.00 MM ΒE LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, PPQW11300 PIPE 52 -54 12.00 MM ΒE 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 LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, 60 62 12.00 MM BE PPQW11300 PIPE 64 66 12.00 MM ΒE LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, PPQW11300 PIPE 70 14.00 MM ΒE LSAW,IS 3589 GR.FE410 C&W,ASME B36.10, PPQW11300 PIPE 72 -72 14.00 MM ΒE 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 IS2062 GR.B,AWWA C207-D,RING TYPE,SLIP ON FLANGE 26 - 72 SO-FF 150# FLA452701 SPACER AND BLIND 14 -24 RF 125 AARH CS ASTM A105,ASME B16.48, 150# RS022PO01 SPECL BLIND 1/2 - 12 CS ASTM A105,ASME B16.48, 150# RF 125 AARH 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 TP304 SS WDG:GPH FLR:TP304 SS INR RNG:CS OTR RNG:ASME B16.20. 1/2 - 24 SPRL-WND RF GASKET 150# GSQN30301 GASKET 26 - 72 3.0 MM THK FF GSKT FLAT RNG,GARLOCK 3000(SYN FBR W/NBR BDR),ASME 150# GSTO8QS01

			B16.21/AWWA C207-D,RING TYPE	
STUD & NUTS STUD & 2NUTS HVY HEX	-		ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000
FITTING (BW)				
BRANCH WELD	2 - 48	BW	CARBON STEEL,ASME B31.3,	RWOJ11200
BRANCH WELD WITH	2 - 48	BW	CARBON STEEL,ASME B31.3,	WBOJ11200
RP				
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

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:1 Class: B20 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) CW(UG) Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF 1.5 MM(MIN.) CS SPCL REV ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE TEE 2 - 6 ASTM A234 WPB-SMLS, ASME B16.9, BW TE7310900 TEE 8 - 24 BW ASTM A234 WPB-WLDD.ASME B16.9. TEOY10900 TEE 26 - 48 BW IS2062 GR.B,ASME B16.9, TEA410900 WELDOLET BW CS ASTM A105,MSS SP 97, WL0213300 FITTING (SW) 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 ELBOW 1/2 - 11/2 3000# SOCW CS ASTM A105, ASME B16.11, EL0230207 SOCKOLET 1/2 - 48 3000# SOCW CS ASTM A105,MSS SP 97, SL0233307 1/2 - 11/2 3000# SOCW CS ASTM A105,ASME B16.11, TE0230207 FITTING (THD) CAP 1/2 - 11/2 3000# THD CS ASTM A105,ASME B16.11, CP0240207 Т 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 NIPPLE 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 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95, NC73J4500 SWAGE (ECC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95. NE73J4500 VALVES 1/2 - 11/2 800# CS BODY ASTM A105, GAV201, SOCW GATE VALVE **GAV201** GATE VALVE 2 - 48 FLG CS BODY ASTM A216 GR WCB,GAV210, 150# GAV210 GLOBE VALVE 1/2 - 11/2 800# SOCW CS BODY ASTM A105,GLV201, GLV201

CS BODY ASTM A216 GR WCB,GLV210,

CS BODY ASTM A216 GR WCB,BUV203,LUG TYPE

GLV210

BUV203

GLOBE VALVE

BUTTERFLY VALVE

2 - 10

2 - 24

150#

150#

FLG

RF

Project .: TFL CLIENT : M/S..TFL PIPING MATERIAL SPECIFICATION PROJECT AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 LOCATION : TALCHER.ODISHA **PDIL** Rev.:2 Class: B22G PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) DW,AIR Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# THD CS(GALVANISED) 1.5 MM(MIN.) ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 1/2 - 3/4 SCH XS THD SMLS.ASTM A106 GR.B.HOT DIP GALV. ASME B36.10. PPAC31300 PIPE 1 - 11/4 SCH XS THD SMLS.ASTM A106 GR.B.HOT DIP GALV. ASME B36.10. PPAC31300 PIPE 11/2 - 2 THD SMLS,ASTM A106 GR.B,HOT DIP GALV.,ASME B36.10, SCH XS PPAC31300 PIPE 21/2 -SCHSTD THD SMLS,ASTM A106 GR.B,HOT DIP GALV.,ASME B36.10, PPAC31300 PIPE 4 - 4 SCHSTD THD SMLS,ASTM A106 GR.B,HOT DIP GALV.,ASME B36.10, PPAC31300 PIPE 6 - 8 SCHSTD BE SMLS, ASTM A106 GR.B, HOT DIP GALV., ASME B36.10, PPAC11300 FLANGE 1/2 - 4 ASTM A105 HOT DIP GALV. ASME B16.5. FLANGE 150# THD-RF 125 AARH FLFDK0801 W.N.FLANGE ASTM A105 HOT DIP GALV., ASME B16.5, 6 - 8 150# WN-RF 125 AARH WNFD70801 SPECL BLIND 1/2 -THD-RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.48 150# SPFDKP001 BLIND FLANGE BLIND FLANGE 1/2 - 8 150# RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.5, BFFD20801 GASKET **GASKET** 6 - 8 150# SPRL-WND RF TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.20 GSQN30301 GASKET 1/2 -4 150# 3.0 MM THK RF BUTYL RUBBER ASME B16.21. GS6720401 STUD & NUTS STUD & 2NUTS HVY ASTM A193GR.B7/A194GR.2H,HOT DIP GALV.,, SNZC00000 HEX FITTING (BW) ASTM A234 WPB-SMLS.HOT DIP GALV. ASME B16.9 CAF 8 BW CPPD10900 ELBOW 8 BW ASTM A234 WPB-SMLS,HOT DIP GALV.,ASME B16.9, ELPD10900 REDUCER CONC. BW ASTM A234 WPB-SMLS,HOT DIP GALV.,ASME B16.9, RCPD10900 REDUCER ECC. BW ASTM A234 WPB-SMLS,HOT DIP GALV.,ASME B16.9, REPD10900 TEE BW ASTM A234 WPB-SMLS.HOT DIP GALV. ASME B16.9 TEPD10900 ASTM A105 HOT DIP GALV, MSS SP 97. WELDOLET 6 -8 BW WLFD13300 FITTING (THD) 3000# ASTM A105 HOT DIP GALV., ASME B16.11, CAP 1/2 - 4 THD CPFD40207 COUPLING 3000# THD ASTM A105 HOT DIP GALV., ASME B16.11, CNFD40207 ELBOW 1/2 - 4 3000# THD ASTM A105 HOT DIP GALV., ASME B16.11, ELFD40207 HALF COUPLING 1/2 - 11/2 3000# THD ASTM A105 HOT DIP GALV., ASME B16.11, HFFD40207 PLUG 1/2 - 11/2 ASTM A105 HOT DIP GALV., ASME B16.11, ROUND HEAD THD PGFD40200 REDUCER CONC. ASTM A105 HOT DIP GALV., ASME B16.11, 2 - 4 THD RCFD40200 REDUCER ECC. THD ASTM A105 HOT DIP GALV., ASME B16.11, REFD40200 TEE 3000# ASTM A105 HOT DIP GALV., ASME B16.11, 1/2 -4 THD TEFD40207 THREDOLET 1/2 - 11/2 3000# THD ASTM A105 HOT DIP GALV., MSS SP 97, TLFD43307 NIPPLE SMLS, ASTM A106 GR.B, HOT DIP GALV., ASME B36.10, NPT **NIPPLE** 1/2 - 12 THD NPAC41344 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 THD ASTM A105 HOT DIP GALV. MSS SP 95. NCFD44500 1/2 - 11/2 THD ASTM A105 HOT DIP GALV., MSS SP 95, SWAGE (ECC) NEFD44500 VALVES GATE VALVE 2 - 8 150# FLG CS BODY ASTM A216 GR WCB,GAV210, GAV210

GATE VALVE 1/2 - 11/2 800# THRD CS BODY ASTM A105, GAV207, **GAV207** CHECK VALVE 1/2 - 11/2 800# THRD CS BODY ASTM A105.CHV207. CHV207 CHECK VALVE 2 - 8 FLG CS BODY ASTM A216 GR WCB.CHV210. 150# CHV210 BUTTERFLY VALVE 2 -RF CS BODY ASTM A216 GR WCB,BUV203,LUG TYPE

BUV203

PLV202

PLUG VALVE 150# FLG CS BODY ASTM A216 GR WCB,PLV202, Note: 1. Hot Dip Galvanizing shall be done in accordance with ASTM A53 for Pipes & ASTM A153 for flanged &fittings.

8

150#

2.Surface where Galvanizing has been burnt off during welding etc. shall be wire brushed ,zinc coated or cold galvanized.

# PIPING MATERIAL SPECIFICATION PDIL

CLIENT : M/S..TFL

Project .:TFL

श्री की आई एल PDIL	NG MATERIAL S	SPECIFICA	ATION		: M/STFL : AMMONIA/UREA COAL BASED FERTILIZER PROJECT. : TALCHER,ODISHA	DOC. No.TFL-PDS- Rev.:1	-600
Clas	ss: B22IS		PROJE	CTS AND D	EVELOPMENT INDIA LIMITED		
SERVICE		TEMPERAT	TURE LIMITS (De	g.C)			
CONSTRUCTION WA	TER	Ref.SI	Ref.SI				
RATING ASME	CORROSION ALLOWAN	NCE N	<u> </u> MATERIAL		<del></del>		
150# RF	1.5 MM(MIN.)		CS				
ITEM	NOTES SIZE (NPS	S) SC	CH/ RAT EN	D	DESCRIPTION	COMM CODE	SPCL REV
PIPE							
PIPE	2 - 21/2		50 MM BE		SMLS,IS1239 BLACK,IS 1239 PART I,HVY	PPD512600	
PIPE	3 - 3		0 MM BE		SMLS,IS1239 BLACK,IS 1239 PART I,HVY	PPD512600	
PIPE	4 - 5 6 - 6		40 MM BE 40 MM BE		SMLS,IS1239 BLACK,IS 1239 PART I,HVY SMLS,IS1239 BLACK,IS 1239 PART I,HVY	PPD512600	
PIPE	1/2 - 3/4		0 MM PE		SMLS,IS1239 BLACK,IS 1239 PART I,HVY	PPD512600 PPD522600	
PIPE	1 - 11/4		00 MM PE		SMLS,IS1239 BLACK,IS 1239 PART I,HVY	PPD522600	
PIPE	11/2 - 11		00 MM PE		SMLS,IS1239 BLACK,IS 1239 PART I,HVY	PPD522600	
PIPE	8 - 10	6.30	0 MM BE		ERW,IS 3589 GR.FE410,IS 3589,	PP521PK00	
PIPE	12 - 14	4 6.30	0 MM BE		ERW,IS 3589 GR.FE410,IS 3589,	PP521PK00	
PIPE	16 - 18	6.30	0 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	20 - 20	6.30	0 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	22 - 24	1 08.0	00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	26 - 28	3 08.0	00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	30 - 30	08.0	00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	32 - 34	10.0	00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	36 - 38		00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	40 - 42		00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	44 - 46		00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
PIPE	48 - 48	3 12.0	00 MM BE		LSAW,IS 3589 GR.FE410,IS 3589,	PPT11PK00	
FLANGE FLANGE	1/2 - 11/	2 150	0# SW	-RF 125 AARH	CS ASTM A105,ASME B16.5,	FL02L0801	
FLANGE	2 - 24			RF 125 AARH	CS ASTM A105,ASME B16.5,SLIP ON	FL0260801	1
FLANGE	26 - 48	3 150	0# SO-	-FF	IS2062 GR.B,AWWA C207-D,RING TYPE,SLIP ON	FLA452701	С
LONG W.N.FLANGE	11/2 - 11	/2 300	0# WN	-RF 125 AARH	CS ASTM A105,ASME B16.5,38mmBORE,200mmLONG	LN0270802	
W.N.FLANGE	26 - 48	3 150	0# WN	-RF 125 AARH	CS ASTM A105,ASME B16.47 SR.B,WELD NECK	WN0270701	В
W.N.FLANGE	2 - 24	150	0# WN	-RF 125 AARH	CS ASTM A105,ASME B16.5,WELD NECK	WN0270801	2
SPACER AND BLIND	14 - 24	1 150	0# RF	125 AARH	CS ASTM A105,ASME B16.48,	RS022PO01	
SPECL BLIND	1/2 - 12	2 150	0# RF	125 AARH	CS ASTM A105,ASME B16.48,	SP022P001	
BLIND FLAN							
BLIND FLANGE	26 - 48			125 AARH	CS ASTM A105,ASME B16.47 SR.B,	BF0220701	
BLIND FLANGE	1/2 - 24	1 150	0# RF	125 AARH	CS ASTM A105,ASME B16.5,	BF0220801	
GASKET GASKET	1/2 - 24	1 150	0# SPF	RL-WND RF	TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.	20, GSQN30301	
GASKET	26 - 48			RL-WND RF	TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME	GSQN3QJ01	9
					B16.20/B16.47 SR.B,		
GASKET	26 - 48	3 150	0# 3.0	MM THK FF	GSKT FLAT RNG,GARLOCK 3000(SYN FBR W/NBR BDR),ASME	GSTO8QS01	F
					B16.21/AWWA C207-D,RING TYPE		
STUD & NUT	S				AOTH AACO OD DZIAOTH AACA OD CIL		
STUD & 2NUTS HVY HEX	-				ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
	BW)						
BRANCH WELD	2 - 48		BW		CARBON STEEL,ASME B31.3,	RWOJ11200	
BRANCH WELD WITH	2 - 48		BW		CARBON STEEL,ASME B31.3,	WBOJ11200	
RP							
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	
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	

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:1 Class: B22IS PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) CONSTRUCTION WATER Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF 1.5 MM(MIN.) CS ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV TEE 2 - 6 ASTM A234 WPB-SMLS, ASME B16.9, BW TE7310900 TEE 8 - 48 BW ASTM A234 WPB-WLDD.ASME B16.9. TEOY10900 WELDOLET 2 - 48 BW CS ASTM A105,MSS SP 97, WL0213300 FITTING (SW) 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 ELBOW 1/2 - 11/2 3000# SOCW CS ASTM A105, ASME B16.11, EL0230207 SOCKOLET 1/2 - 48 SOCW CS ASTM A105 MSS SP 97. 3000# SL0233307 TEE 1/2 - 11/2 3000# SOCW CS ASTM A105,ASME B16.11, TE0230207 FITTING (THD) 1/2 - 11/2 3000# THD CS ASTM A105,ASME B16.11, CP0240207 Т 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 NIPPLE NIPPLE 1/2 - 11/2 SCH 80 PLN-PLN SMLS.IS1239 BLACK IS 1239 PART I. NPD552611 1 NIPPLE 1/2 - 11/2 PLN-THD SMLS,IS1239 BLACK,IS 1239 PART I,NPT SCH 80 NPD562611 2 NIPPLE 1/2 - 11/2 SCH 80 THD SMLS,IS1239 BLACK,IS 1239 PART I,NPT NPD542611 3 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95, NC73J4500 SWAGE (CONC) 1/2 - 11/2 PLN-THD ASTM A234 WPB-SMLS,MSS SP 95, NC7364500 SWAGE (ECC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95. NE73J4500 Р 1/2 - 11/2 ASTM A234 WPB-SMLS,MSS SP 95, SWAGE (ECC) PLN-THD NE7364500 т VALVES GATE VALVE 1/2 - 11/2 800# SOCW CS BODY ASTM A105, GAV201, GAV201 W GATE VALVE 1/2 - 11/2 150# FLG CS BODY ASTM A216 GR WCB,GAV210, GAV210 GATE VALVE 2 - 24 150# 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 FLG CS BODY ASTM A216 GR WCB.GLV210. 150# GLV210 CHECK VALVE 1/2 - 11/2 SOCW CS BODY ASTM A105,CHV201, 800# CHV201 CHECK VALVE 2 - 24 CS BODY ASTM A216 GR WCB,CHV210, 150# FLG CHV210 BALL VALVE 1/2 -1 800# SOCW CS BODY ASTM A105,BAV201, BAV201 BALL VALVE 11/2 - 11/2 800# SOCW CS BODY ASTM A105, BAV201, BAV201 W BALL VALVE CS BODY ASTM A216 GR WCB.BAV210. 11/2 - 11/2 FLG

CS BODY ASTM A216 GR WCB,BAV210,

CS BODY ASTM A216 GR WCB,PLV202,

CS BODY ASTM A105,PLV201,

CS BODY ASTM A216 GR WCB,BUV203,LUG TYPE

**BAV210** 

**BAV210** 

BUV203

PLV201

PLV202

150#

150#

150#

600#

150#

FLG

RF

THRD

FLG

2 -16

1/2 -

11/2 - 24

24

BALL VALVE

PLUG VALVE

PLUG VALVE

BUTTERFLY VALVE

क्षेत्र आर्य एत PDIL CLIENT : M/S..TFL

PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT. LOCATION : TALCHER,ODISHA

Project .:TFL T. DOC. No.TFL-PDS-600

Rev.:1

PLV202

LOCATION . TALCHER, ODISTA

Class: B22ISG PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) FW Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# THD CS(GALVANIZED) 1.5 MM(MIN.) ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 1/2 - 3/4 3.20 MM THD SMLS.IS1239 GALV..IS 1239 PART LHVY PPDH32600 PIPE 1 - 11/4 04.00 MM THD SMLS.IS1239 GALV..IS 1239 PART LHVY PPDH32600 PIPE 11/2 - 11/2 THD SMLS,IS1239 GALV.,IS 1239 PART I,HVY 04.00 MM PPDH32600 PIPE 2 - 21/2 04.50 MM THD SMLS,IS1239 GALV.,IS 1239 PART I,HVY PPDH32600 PIPE 3 - 3 4.80 MM THD SMLS,IS1239 GALV.,IS 1239 PART I,HVY PPDH32600 PIPE 4 - 5 05.40 MM THD SMLS,IS1239 GALV.,IS 1239 PART I,HVY PPDH32600 PIPE 05.40 MM SMLS,IS1239 GALV.,IS 1239 PART I,HVY 6 - 6 THD PPDH32600 FLANGE THD-RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.5, FLANGE 1/2 - 6 150# FLFDK0801 SPECL BLIND RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.48, SPFD2PO01 150# BLIND FLANGE BLIND FLANGE 1/2 - 6 150# RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.5, BFFD20801 GASKET **GASKET** 1/2 - 4 150# 3.0 MM THK RF BUTYL RUBBER, ASME B16.21, GS6720401 STUD & NUTS STUD & 2NUTS HVY ASTM A193GR.B7/A194GR.2H.HOT DIP GALV... SNZC00000 HEX FITTING (THD) ASTM A105 HOT DIP GALV. ASME B16.11. 1/2 - 6 3000# THD CPFD40207 COUPLING ASTM A105 HOT DIP GALV. ASME B16.11. 1/2 - 6 3000# THD CNFD40207 ELBOW 1/2 - 6 3000# THD ASTM A105 HOT DIP GALV., ASME B16.11, ELFD40207 ASTM A105 HOT DIP GALV., ASME B16.11, HALF COUPLING 3000# THD HFFD40207 PLUG 1/2 - 11/2 THD ASTM A105 HOT DIP GALV., ASME B16.11, ROUND HEAD PGFD40200 REDUCER CONC 2 -6 THD ASTM A105 HOT DIP GALV., ASME B16.11, RCFD40200 REDUCER ECC. ASTM A105 HOT DIP GALV. ASME B16.11. 2 - 6 THD REFD40200 TEE 3000# ASTM A105 HOT DIP GALV., ASME B16.11, 1/2 - 6 THD TEFD40207 THREDOLET 1/2 - 11/2 3000# THD ASTM A105 HOT DIP GALV., MSS SP 97, TLFD43307 NIPPLE NIPPLE 1/2 - 11/2 THD SMLS,ASTM A106 GR.B,HOT DIP GALV.,ASME B36.10,NPT NPAC41344 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 THD ASTM A105 HOT DIP GALV., MSS SP 95, NCFD44500 1/2 - 11/2 ASTM A105 HOT DIP GALV., MSS SP 95, SWAGE (ECC) THD NEFD44500 VALVES 2 - 6 GATE VALVE 150# FLG CS BODY ASTM A216 GR WCB, GAV210 GAV210 GATE VALVE 1/2 - 11/2 800# THRD CS BODY ASTM A105, GAV207, GAV207 CHECK VALVE 1/2 - 11/2 THRD CS BODY ASTM A105,CHV207, 800# CHV207 CHECK VALVE 6 FLG CS BODY ASTM A216 GR WCB, CHV210. 150# CHV210 BUTTERFLY VALVE CS BODY ASTM A216 GR WCB,BUV203,LUG TYPE 3 - 6 150# RF BUV203

Note: 1. Hot Dip Galvanizing shall be done in accordance with ASTM A53 for Pipes & ASTM A153 for flanged &fittings.

CS BODY ASTM A216 GR WCB.PLV202.

FLG

PLUG VALVE

2 - 6

150#

2. Surface where Galvanizing has been burnt off during welding etc. shall be wire brushed ,zinc coated or cold galvanized.

TEE

8 - 48

BW

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 TEMPERATURE LIMITS (Deg.C) BD,CWS,CWR,DO,ES,FG,FN,FO,FW,IAW,NI,PA,P Ref.SI Ref.SI **GETC** MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF 1.5 MM(MIN.) CS ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE 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 ΒE ERW,API 5L GR.B,ASME B36.10, PPA211300 PIPE 3/4 SCH 80 PΕ SMLS,API 5L GR.B,ASME B36.10, PPA121300 PIPE 1 - 11/4 SCH 80 PΕ 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 BE ERW.API 5L GR.B.ASME B36.10. SCH 10 PPA211300 PIPE SCH 10 LSAW,API 5L GR.B,ASME B36.10, 16 18 BE PP9611300 PIPE 20 20 SCH 10 BE LSAW,API 5L GR.B,ASME B36.10, PP9611300 PIPE 22 -24 SCHSTD ΒE LSAW, API 5L GR.B, ASME B36.10, PP9611300 PIPE 26 -28 SCHSTD ΒE LSAW, API 5L GR.B, ASME B36.10. PP9611300 PIPE 30 -32 SCHSTD BE LSAW.API 5L GR.B.ASME B36.10. PP9611300 LSAW,API 5L GR.B,ASME B36.10, PIPE 34 34 SCHSTD BE PP9611300 PIPE 36 SCH XS BE LSAW, API 5L GR.B, ASME B36.10, PP9611300 PIPE 40 -42 SCH XS ΒE LSAW, API 5L GR.B, ASME B36.10 PP9611300 PIPE 44 -46 SCH XS ΒE LSAW, API 5L GR.B, ASME B36.10, PP9611300 PIPE 48 - 48 SCH XS BE LSAW, API 5L GR.B, ASME B36.10. PP9611300 FLANGE FLANGE 1/2 - 24 SO-RF 125 AARH CS ASTM A105.ASME B16.5.SLIP ON 150# FL0260801 LONG W.N.FLANGE 11/2 - 11/2 WN-RF 125 AARH CS ASTM A105,ASME B16.5,24mm Bore,200mm Long 300# LN0270802 W.N.FLANGE 26 - 48 WN-RF 125 AARH CS ASTM A105,ASME B16.47 SR.B,WELD NECK 150# 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. SP022P001 BLIND FLANGE BLIND FLANGE RF 125 AARH CS ASTM A105.ASME B16.47 SR.B 26 - 48 150# BF0220701 BLIND FLANGE 1/2 -RF 125 AARH CS ASTM A105,ASME B16.5, 24 BF0220801 150# GASKET 1/2 - 24 150# SPRL-WND RF TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.20, GASKET GSQN30301 GASKET 26 - 48 150# SPRL-WND RF TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME GSQN3QJ01 B16.20/B16.47 SR.B, STUD & NUTS STUD & 2NUTS HVY ASTM A193 GR.B7/ASTM A194 GR.2H... SNDE00000 HEX DRIP RING DRIP RING 3 - 3 150# RF 125 AARH CS ASTM A105,PDIL-PDS-600, DR022QK01 FITTING (BW) CARBON STEEL ASME B31.3. BRANCH WELD 2 - 48 BW RWOJ11200 CARBON STEEL, ASME B31.3 BRANCH WELD WITH 2 - 48 BW WBOJ11200 RP CAF 2 - 48 BW ASTM A234 WPB-SMLS ASME B16.9. CP7310900 ASTM A234 WPB-SMLS, ASME B16.9, ELBOW 2 -6 BW EL7310900 ELBOW BW ASTM A234 WPB-WLDD, ASME B16.9, ELOY10900 L ELBOW 48 BW ASTM A234 WPB-WLDD,PDIL-PDS-600,R=3D ELOY1QK00 3 **ELBOW** 48 BW ASTM A234 WPB-WLDD,PDIL-PDS-600,R=5D ELOY1QK00 ELBOW ASTM A234 WPB-WLDD.PDIL-PDS-600.R=7D 8 -48 BW ELOY1QK00 REDUCER CONC. ASTM A234 WPB-SMLS, ASME B16.9, 2 -BW 6 RC7310900 REDUCER CONC BW ASTM A234 WPB-WLDD, ASME B16.9, RCOY10900 REDUCER ECC. BW ASTM A234 WPB-SMLS, ASME B16.9, 6 RE7310900 REDUCER ECC. 48 BW ASTM A234 WPB-WLDD, ASME B16.9, REOY10900 TEE 2 -6 BW ASTM A234 WPB-SMLS ASME B16.9. TE7310900

ASTM A234 WPB-WLDD, ASME B16.9,

TEOY10900

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:1 Class: B24 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) BD,CWS,CWR,DO,ES,FG,FN,FO,FW,IAW,NI,PA,P Ref.SI Ref.SI G ETC MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF 1.5 MM(MIN.) CS ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV WELDOLET 2 - 48 BW CS ASTM A105,MSS SP 97, WL0213300 FITTING (SW) 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 SOCW CS ASTM A105, ASME B16.11, 3000# TE0230207 FITTING (THD) 1/2 - 11/2 3000# THD CS ASTM A105,ASME B16.11, CAF CP0240207 Т COUPLING 1/2 - 11/2 3000# THD CS ASTM A105,ASME B16.11, CN0240207 Т 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 NIPPLE NIPPLE 1/2 - 11/2 SCH160 PLN-PLN SMLS.API 5L GR.B.ASME B36.10. NPA151312 1 NIPPLE 1/2 - 11/2 PLN-THD SMLS,API 5L GR.B,ASME B36.10,NPT SCH160 NPA161312 2 NIPPLE 1/2 - 11/2 SCH160 THD SMLS,API 5L GR.B,ASME B36.10,NPT NPA141312 3 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95, NC73J4500 SWAGE (CONC) 1/2 - 11/2 PLN-THD ASTM A234 WPB-SMLS,MSS SP 95. NC7364500 SWAGE (ECC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95. NE73J4500 Р ASTM A234 WPB-SMLS,MSS SP 95, SWAGE (ECC) 1/2 - 11/2 PLN-THD NE7364500 т STRAINER T-TYPE STRAINER 2 - 24 150# FLGD CS ASTM A216 GR WCB,TTS210, TTS210

CS ASTM A105,YTS201,

CS ASTM A216 GR WCB,YTS210,

CS BODY ASTM A105.GAV201.

CS BODY ASTM A105,GLV201,

CS BODY ASTM A105,CHV201,

CS BODY ASTM A105 BAV201.

CS BODY ASTM A105, PLV201.

CS BODY ASTM A216 GR WCB.GAV210.

CS BODY ASTM A216 GR WCB,GLV210,

CS BODY ASTM A216 GR WCB, CHV210

CS BODY ASTM A216 GR WCB,BAV210,

CS BODY ASTM A216 GR WCB, BUV204,

CS BODY ASTM A216 GR WCB.PLV202.

CS BODY ASTM A216 GR WCB,BUV203,LUG TYPE

YTS201

YTS210

GAV201

**GAV210** 

GLV201

GLV210

CHV201

CHV210

BAV201

**BAV210** 

BUV203

BUV204

PLV201

PLV202

Y-TYPE STRAINER

Y-TYPE STRAINER

VALVES
GATE VALVE

GATE VALVE

GLOBE VALVE

GLOBE VALVE

CHECK VALVE

CHECK VALVE

BALL VALVE

BALL VALVE

PLUG VALVE

PLUG VALVE

BUTTERFLY VALVE

BUTTERFLY VALVE

1/2 - 11/2

2 - 24

1/2 - 11/2

2 - 48

1/2 - 11/2

2 - 12

1/2 - 11/2

2 - 24

1/2 - 11/2

24

2 - 24

26 - 48

1/2 - 1

11/2 - 24

600#

150#

800#

150#

800#

150#

800#

150#

800#

150#

150#

150#

600#

150#

SOCW

FLGD

SOCW

FLG

SOCW

FLG

FLG

SOCW

FLG

RF

FLG

THRD

FLG

SOCW

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:0 Class: B24D PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) WASTE EFFLUENT, HCL Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# FF HDPE NONE ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 1 - 11/4 CALC PE HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035,SDR7 PP5922A00 PΕ PIPE 11/2 - 2 CALC HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035,SDR7 PP5922A00 PIPE 3 - 4 CALC PΕ HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035,SDR7 PP5922A00 PIPE CALC PΕ HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035,SDR7 PP5922A00 PIPE 8 - 10 CALC PΕ HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035,SDR7 PP5922A00 HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035,SDR7 PIPE 12 - 12 CALC PE PP5922A00 FLANGE FLANGE 1 - 12 LJ-FF DI ASTM A536 GR.65-45-12,MF.STD/ASME B16.5, 150# FL5193501 BLIND FLANGE BLIND FLANGE 1 - 12 FF CS ASTM A105,ASME B16.5, 150# BF0210801 GASKET GASKET 1 - 12 150# 3.0 MM THK FF EPDM,ASME B16.21, GS7880401 STUD & NUTS

A307 GR.B/A563 GR.B,,

HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035/MF.STD,SDR7

HDPE ASTM D3350 CELL 345464C(PE 3608),D-3035/MF.STD,SDR7

HDPE ASTM D3350 CELL 345464C(PE 3608), D-3035/MF.STD, SDR7

HDPE ASTM D3350 CELL 345464C(PE 3608), D-3035/MF.STD, SDR7

CS BODY ASTM A216 GR.WCB RUBBER LINED, BUV203F, LUG TYPE

CS BODY ASTM A216 GR.WCB RUBBER LINED, CHV210D,

SS BODY ASTM A351 GR CF8M,BAV510,

HDPE ASTM D3350 CELL 345464C(PE 3608),MF.STD/ASME B16.5,SDR7

SN3B00000

EL59J2B00

RC59J2B00

RE59J2B00

SE59J3500

TE59J2B00

CHV210D

BAV510

BUV203F

:

STUD & 2NUTS HVY

REDUCER CONC.

REDUCER ECC.

VALVES CHECK VALVE

BALL VALVE

BUTTERFLY VALVE

STUB END

TEE

1 - 12

1 - 12

1 - 12

1 - 12

12

1 - 12

1 - 12

12

PΕ

PΕ

PE

PE

PΕ

FLG

FLG

FF

150#

150#

150#

HEX FITTING ELBOW

#### PIPING MATERIAL SPECIFICATION पी डी आई एल PDIL Class: B24FL SERVICE

: M/S..TFL

PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA

Project .:TFL DOC. No.TFL-PDS-600

Rev.:0 PROJECTS AND DEVELOPMENT INDIA LIMITED TEMPERATURE LIMITS (Deg.C) EFFLUENT, ACIDIC H2O ETC. Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# FF NONE CS FRP LND.

ITEM !	NOTES	SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PIPE							
PIPE		1 - 11/4	SCH XS	FLGD	CS,SMLS,API 5L GR.B,FRP LND.,ASME B36.10,THK OF LING AS PER	MFR. PP5661300	
PIPE		11/2 - 11/2	SCH XS	FLGD	CS,SMLS,API 5L GR.B,FRP LND.,ASME B36.10,THK OF LING AS PER	MFR. PP5661300	
PIPE		2 - 21/2	SCHSTD	FLGD	CS,SMLS,API 5L GR.B,FRP LND.,ASME B36.10,THK OF LING AS PER	MFR. PP5661300	
PIPE		3 - 4	SCHSTD	FLGD	CS,SMLS,API 5L GR.B,FRP LND.,ASME B36.10,THK OF LING AS PER	MFR. PP5661300	
PIPE		5 - 6	SCHSTD	FLGD	CS,SMLS,API 5L GR.B,FRP LND.,ASME B36.10,THK OF LING AS PER	MFR. PP5661300	
PIPE		8 - 10	SCH 20	FLGD	CS,ERW,API 5L GR.B,FRP LND,ASME B36.10,THK OF LING AS PER I	MFR. PP5761300	
PIPE		12 - 12	SCH 20	FLGD	CS,ERW,API 5L GR.B,FRP LND,ASME B36.10,THK OF LING AS PER I	MFR. PP5761300	
FLANGE							
FLANGE		1 - 2	150#	SO-FF	CS,ASTM A105,FRP LND.,ASME B16.5,THK OF LING AS PER MFR.	FL5850801	
W.N.FLANGE		1 - 12	150#	WN-FF	${\sf CS,ASTMA105,FRPLND.,ASMEB16.5,THKOFLINGASPERMFR.}$	WN58M0801	
SPECL BLIND		1 - 12	150#	FF	CS PLT,ASTM A516 GR.60,FRP LND.,ASME B16.48,THK OF LING AS MFR.	PER SP641P001	
BLIND FLANG BLIND FLANGE	E	1 - 12	150#	FF	CS,ASTM A105,FRP LND.,ASME B16.5,THK OF LING AS PER MFR.	BF5810801	
GASKET GASKET		1 - 12	150#	FLAT	GASKET,SOFT RUBBER,ASME B16.21,3MM THK.	GSW190401	
STUD & NUTS STUD & 2NUTS HVY		-			ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX							
FITTING ELBOW		1 - 6		FLGD	CS,ASTM A234 WPB-SMLS,FRP LND,ASME B16.9,THK OF LING AS F	PER EL62Z0900	
ELBOW		8 - 12		FLGD	CS,ASTM A234 WPB-WLDD,FRP LND.,ASME B16.9,THK OF LING AS MFR.	PER EL63Z0900	
REDUCER CONC.		1 - 6		FLGD	CS,ASTM A234 WPB-SMLS,FRP LND,ASME B16.9,THK OF LING AS F MFR.	PER RC62Z0900	
REDUCER CONC.		8 - 12		FLGD	CS,ASTM A234 WPB-WLDD,FRP LND.,ASME B16.9,THK OF LING AS MFR.	PER RC63Z0900	
REDUCER ECC.		1 - 6		FLGD	CS,ASTM A234 WPB-SMLS,FRP LND,ASME B16.9,THK OF LING AS F MFR.	PER RE62Z0900	
REDUCER ECC.		8 - 12		FLGD	CS,ASTM A234 WPB-WLDD,FRP LND.,ASME B16.9,THK OF LING AS MFR.	PER RE63Z0900	
TEE		1 - 6		FLGD	CS,ASTM A234 WPB-SMLS,FRP LND,ASME B16.9,THK OF LING AS F MFR.	PER TE62Z0900	
TEE		8 - 12		FLGD	CS,ASTM A234 WPB-WLDD,FRP LND.,ASME B16.9,THK OF LING AS MFR.	PER TE63Z0900	
VALVES							
GATE VALVE		2 - 12	150#	FLG	SS BODY ASTM A351 GR CF8,GAV510,	GAV510	
GLOBE VALVE		2 - 12	150#	FLG	SS BODY ASTM A351 GR CF8,GLV510,	GLV510	
CHECK VALVE		2 - 12	150#	FLG	CS BODY ASTM A216 GR.WCB RUBBER LINED,CHV210D,	CHV210D	
BALL VALVE		2 - 12	150#	FLG	SS BODY ASTM A351 GR CF8M,BAV510,	BAV510	
BUTTERFLY VALVE		2 - 12	150#	FF	CS BODY ASTM A216 GR.WCB RUBBER LINED,BUV203,LUG TYPE	BUV203	

NOTE: 1. S.O. Flanges shall be used with pipe spools. 2. All fittings shall have ends connected to flanges.

CLIENT : M/S..TFL

Project .: TFL

GAV207

CHV207

CHV210

PROJECT AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 LOCATION : TALCHER.ODISHA **PDIL** Rev.:0 Class: B24G PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) FW Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# CS(GALVANIZED) 1.5 MM(MIN.) ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 1/2 - 3/4 SCH 80 THD SMLS.API 5L GR.B.HOT DIP GALV. ASME B36.10. PPW231300 PIPE 1 - 11/4 SCH 80 THD SMLS.API 5L GR.B.HOT DIP GALV. ASME B36.10. PPW231300 PIPE 11/2 - 2 THD SMLS,API 5L GR.B,HOT DIP GALV.,ASME B36.10, SCH 80 PPW231300 PIPE 21/2 - 3 SCH 40 THD SMLS,API 5L GR.B,HOT DIP GALV.,ASME B36.10, PPW231300 PIPE 4 - 4 SCH 40 THD SMLS,API 5L GR.B,HOT DIP GALV.,ASME B36.10, PPW231300 PIPE 6 - 6 SCH 40 ΒE SMLS, API 5L GR.B, HOT DIP GALV., ASME B36.10, PPW211300 FLANGE 1/2 - 4 ASTM A105 HOT DIP GALV. ASME B16.5. FLANGE 150# THD-RF 125 AARH FLFDK0801 W.N.FLANGE 6 - 6 WN-RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.5, 150# WNFD70801 SPECL BLIND RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.48, 150# SPFD2PO01 BLIND FLANGE BLIND FLANGE 1/2 - 6 150# RF 125 AARH ASTM A105 HOT DIP GALV., ASME B16.5, BFFD20801 GASKET **GASKET** 6 - 6 150# SPRL-WND RF TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.20, GSQN30301 GASKET 1/2 - 4 150# 3.0 MM THK RF BUTYL RUBBER.ASME B16.21. GS6720401 STUD & NUTS STUD & 2NUTS HVY ASTM A193GR.B7/A194GR.2H,HOT DIP GALV.,, SNZC00000 HEX FITTING (BW) ASTM A234 WPB-SMLS.HOT DIP GALV. ASME B16.9 CAF 6 BW CPPD10900 ELBOW 6 BW ASTM A234 WPB-SMLS,HOT DIP GALV.,ASME B16.9, ELPD10900 REDUCER CONC. BW ASTM A234 WPB-SMLS,HOT DIP GALV.,ASME B16.9, RCPD10900 REDUCER ECC. BW ASTM A234 WPB-SMLS,HOT DIP GALV.,ASME B16.9, REPD10900 TEE 6 BW ASTM A234 WPB-SMLS,HOT DIP GALV.,ASME B16.9 TEPD10900 FITTING (THD) CAF 1/2 - 4 3000# THD ASTM A105 HOT DIP GALV. ASME B16.11. CPFD40207 COUPLING ASTM A105 HOT DIP GALV., ASME B16.11, 1/2 - 11/2 3000# THD CNFD40207 ELBOW 3000# THD ASTM A105 HOT DIP GALV., ASME B16.11, ELFD40207 PLUG 1/2 - 11/2 THD ASTM A105 HOT DIP GALV., ASME B16.11, ROUND HEAD PGFD40200 REDUCER CONC 1/2 -3000# THD ASTM A105 HOT DIP GALV., ASME B16.11, RCFD40207 REDUCER ECC. ASTM A105 HOT DIP GALV., ASME B16.11, 1/2 - 4 3000# THD REFD40207 TEE 1/2 - 4 3000# THD ASTM A105 HOT DIP GALV., ASME B16.11, TEFD40207 THREDOLET 1/2 - 11/2 THD ASTM A105 HOT DIP GALV., MSS SP 97, 3000# TLFD43307 NIPPLE SCH160 SMLS,API 5L GR.B,HOT DIP GALV.,ASME B36.10,NPT NIPPLE 1/2 - 6 THD NPW241312 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 THD ASTM A234 WPB-SMLS,HOT DIP GALV.,MSS SP 95, NCPD44500 1/2 - 11/2 ASTM A234 WPB-SMLS,HOT DIP GALV.,MSS SP 95, SWAGE (ECC) THD NEPD44500 VALVES GATE VALVE 2 - 6 150# FLG CS BODY ASTM A216 GR WCB.GAV210. GAV210

Note: 1. Hot Dip Galvanizing shall be done in accordance with ASTM A53 for Pipes & ASTM A153 for flanged &fittings.

CS BODY ASTM A105, GAV207,

CS BODY ASTM A105,CHV207,

CS BODY ASTM A216 GR WCB,CHV210,

THRD

THRD

FLG

800#

800#

150#

GATE VALVE

CHECK VALVE

CHECK VALVE

1/2 - 11/2

1/2 - 11/2

2 - 6

2. Surface where Galvanizing has been burnt off during welding etc. shall be wire brushed ,zinc coated or cold galvanized.

#### Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:0 Class: B24P PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) ETP Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# FF CPVC NONE ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE PIPE PIPE 2 - 3 SCH 80 PE CPVC.ASTM F441.MF.STD/ASTM F441.PLASTIC PIPE PP552QC00 PΕ PIPE 4 - 6 SCH 80 CPVC.ASTM F441.MF.STD/ASTM F441.PLASTIC PIPE PP552QC00 PIPE 10 SCH 80 PΕ CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE PP552QC00 PIPE SCH 80 PE CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE PP552QC00 PIPE 1/2 - 3/4 SCH 80 PΕ CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE PP552QC00 CPVC.ASTM F441.MF.STD/ASTM F441.PLASTIC PIPE PIPE 1 - 11/2 SCH 80 PE PP552QC00 FLANGE FLANGE 1/2 - 12 FF CPVC.ASTM F441.MF.STD/ASTM F441.SCH80 150# FL551QC01 BLIND FLANGE BLIND FLANGE 1/2 - 12 FF CPVC,ASTM F441,MF.STD/ASTM F441, 150# BF551QC01 GASKET GASKET 150# 3.0 MM THK FF EPDM,MF.STD./ASME B16.21,FULL FACE GS788PA01 STUD & NUTS STUD & 2NUTS HVY ASTM A193 GR.B7/ASTM A194 GR.2H,, SNDE00000 HEX FITTING (BW) BRANCH WELD WITH 1/2 - 12 PΕ CPVC,ASTM F441,MF.STD/ASTM F441, WB55JQC00 1/2 - 11/2 3000# CPVC,ASTM F441,MF.STD/ASTM F441, THD CP554QC07 1/2 - 12 PΕ CPVC,ASTM F441,MF.STD/ASTM F441, EL55JQC00

FITTING (THD) FITTING ELBOW

REDUCER CONC. 1/2 - 12 PΕ CPVC,ASTM F441,MF.STD/ASTM F441, REDUCER ECC. 1/2 - 12 PE CPVC,ASTM F441,MF.STD/ASTM F441, TEE PΕ CPVC,ASTM F441,MF.STD/ASTM F441, 1/2 - 12 CPVC,ASTM F441,MF.STD/ASTM F441, UNION (GJ) 1/2 - 12 PΕ

NIPPLE 1/2 - 11/2 SCH160 PLN-PLN CPVC,ASTM F441,MF.STD/ASTM F441, NIPPLE 1/2 - 11/2 SCH160 PLN-THD CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE NPT NIPPLE 1/2 - 11/2 SCH160 THD CPVC,ASTM F441,MF.STD/ASTM F441,PLASTIC PIPE NPT VALVES

FF

CHECK VALVE 1/2 -12 150# FF CPVC BODY, CHV500C, BALL VALVE 1/2 -FF 150# BALL VALVE 3 - 6 150#

150#

1/2 - 12

CPVC BODY WITH CPVC BALL, BAV500C, BAV500C CPVC BODY WITH CPVC BALL, BAV501C, BAV501C

CPVC BODY W/ PP PLUG & EPDM SEATS.GAV500C.

SPCL REV

RC55JQC00

RE55JQC00

TE55JQC00

UN55JQC00

NP555QC12

NP556QC12

NP554QC12

GAV500C

CHV500C

2

3

NIPPLE

GATE VALVE

शिPIN पो डी आई एल PDIL	G MATEI	RIAL S	SPECIFIC	ATION	PF	ROJECT: AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DO	oject .:TFL OC. No.TFL-PDS ev.:0	-600
Class	s: B24R	L		PRO	DJECTS	AND DEVELOPMENT INDIA LIMITED		
SERVICE			TEMPER	ATURE LIMI	TS (Deg.C)			,
EFFLUENT,WASTE H2O,0	CHLORINATED	) H2O	Ref.SI	Ref.SI				
ATING ASME	CORROSION ALLOWANG		NCE .	MATERIAL				
50# FF	1.5 MM(MIN.)			CSRL				
TEM	NOTES	SIZE (NPS	S) :	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL RE
PIPE								
IPE		1/2 - 3/4	l s	CH 80	FLGD	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX761300	
IPE		1 - 11/4	l S	CH 80	FLGD	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX761300	
IPE		11/2 - 11/	/2 S	CH 80	FLGD	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX761300	
IPE		2 - 21/2	? S	CH 40	FLGD	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX761300	
IPE		3 - 4	S	CHSTD	FLGD	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX761300	
IPE		5 - 6	S	CHSTD	FLGD	CS,SMLS,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PPX761300	
IPE		8 - 10	S	CHSTD	FLGD	CS,ERW,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PP2A61300	
IPE		12 - 12	? S	CHSTD	FLGD	CS,ERW,API 5L GR.B,NATURAL RBR LND,ASME B36.10,3MM THK LING	PP2A61300	
LANGE								
LANGE		1/2 - 12	?	150#	SO-FF	CS,ASTM A105,NATURAL RBR LND,ASME B16.5,3MM THK LING	FLX650801	
PECL BLIND		1 - 12	1	150#	FF	CS PLT,ASTM A516 GR.60,NATURAL RBR LND,ASME B16.48,3MM THK LING	G SPX81P001	
BLIND FLANG	E	1 - 12		150#	FF	CS,ASTM A105,NATURAL RBR LND,ASME B16.5,3MM THK LING	BFX610801	
ASKET								

GASKET, SOFT RUBBER, ASME B16.21, 3MM THK.

CS BODY ASTM A216 GR.WCB RUBBER LINED, DPV500,

CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING ELX9Z0900

CS,ASTM A234 WPB-WLDD,NATURAL RBR LND,ASME B16.9,3MM THK LING EL3AZ0900

CS,ASTM A234 WPB-WLDD,NATURAL RBR LND,ASME B16.9,3MM THK LING RE3AZ0900

CS,ASTM A234 WPB-WLDD,NATURAL RBR LND,ASME B16.9,3MM THK LING TE3AZ0900

 ${\sf CS,ASTM}~{\sf A234}~{\sf WPB-SMLS,NATURAL}~{\sf RBR}~{\sf LND,ASME}~{\sf B16.9,3MM}~{\sf THK}~{\sf LING}$ 

 ${\sf CS,ASTM}~{\sf A234}~{\sf WPB-WLDD,NATURAL}~{\sf RBR}~{\sf LND,ASME}~{\sf B16.9,3MM}~{\sf THK}~{\sf LING}$ 

CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING

CS,ASTM A234 WPB-SMLS,NATURAL RBR LND,ASME B16.9,3MM THK LING

ASTM A193 GR.B7/ASTM A194 GR.2H,,

SS BODY ASTM A351 GR CF8,GAV510,

SS BODY ASTM A351 GR CF8,GLV510,

SS BODY ASTM A351 GR CF8M,BAV510,

CS BODY ASTM A216 GR.WCB RUBBER LINED, CHV210D,

CS BODY ASTM A216 GR.WCB RUBBER LINED, BUV203RL, LUG TYPE

GSW190401

SNDE00000

DPV500

RCX9Z0900

RC3AZ0900

REX9Z0900

TEX9Z0900

GAV510

GLV510

CHV210D

BAV510

BUV203RL

NOTE: 1. S.O. Flanges shall be used w	
2. All fittings shall have ends connect	ed to flanges.

1 - 12

1 - 12

1/2 - 6

8 - 12

1/2 - 6

8 - 12

1/2 - 6

8 - 12

1/2 - 12

1/2 - 12

2 - 12

2 - 12

12

150#

150#

150#

150#

150#

150#

150#

FLAT

FLG

FLGD

FLGD

FLGD

FLGD

FLGD

FLGD

FLGD

FLGD

FLG

FLG

FLG

FLG

FF

GASKET

HEX

FITTING

DIAPH. VALVE

REDUCER CONC.

REDUCER CONC.

REDUCER ECC.

REDUCER ECC.

VALVES GATE VALVE

GLOBE VALVE

CHECK VALVE

BALL VALVE

BUTTERFLY VALVE

TEE

TEE

ELBOW

ELBOW

STUD & NUTS
STUD & 2NUTS HVY

CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.

Project .:TFL DOC. No.TFL-PDS-600

पी डी आई एल PDIL	NG MATERIAL SE	PECIFICATION	PROJEC	T : AMMONIA/UREA COAL BASED FERTILIZER PROJECT. ON : TALCHER,ODISHA	DOC. No.TFL-PDS- Rev.:0	-600
	ss: B24S	PF	ROJECTS AND	DEVELOPMENT INDIA LIMITED		
SERVICE SL,SC (IBR)		TEMPERATURE LII				
		Ref.SI Ref.S	SI			
RATING ASME	CORROSION ALLOWANC		AL			
150# RF	1.5 MM(MIN.)	CS				
ITEM	NOTES OF (NDS)	COLUBAT	END	DECORPTION	001111 0005	ODOL DE
ITEM	NOTES SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL RE
PIPE PIPE	2 - 6	SCH 40	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	8 - 10	SCH 20	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	12 - 12	SCH 20	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	1/2 - 3/4	SCH 80	PE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03B1300	
PIPE	1 - 11/4	SCH 80	PE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03B1300	
PIPE	11/2 - 11/2	SCH 80	PE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03B1300	
PIPE	14 - 16	SCH 10	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	18 - 20	SCH 10	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	24 - 24	SCHSTD	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	26 - 28 30 - 32	SCHSTD	BE IBR	EFW,ASTM A671 GR.CC60 CL.22,ASME B36.10,	PPRXA1300	
PIPE	30 - 32	SCHSTD SCHSTD	BE IBR BE IBR	EFW,ASTM A671 GR.CC60 CL.22,ASME B36.10, EFW,ASTM A671 GR.CC60 CL.22,ASME B36.10,	PPRXA1300	
PIPE	36 - 38	SCH XS	BE IBR	EFW,ASTM A671 GR.CC60 CL.22,ASME B36.10,	PPRXA1300 PPRXA1300	
PIPE	40 - 42	SCH XS	BE IBR	EFW,ASTM A671 GR.CC60 CL.22,ASME B36.10,	PPRXA1300	
PIPE	44 - 46	SCH XS	BE IBR	EFW,ASTM A671 GR.CC60 CL.22,ASME B36.10,	PPRXA1300	
PIPE	48 - 48	14.27 MM	BE IBR	EFW,ASTM A671 GR.CC60 CL.22,ASME B36.10,	PPRXA1300	
FLANGE						
FLANGE	1/2 - 24	150#	SO-RF 125 AARH	CS ASTM A105,ASME B16.5,SLIP ON	FL02F0801	
			IBR			
W.N.FLANGE	26 - 48	150#	WN-RF 125 AARH	CS ASTM A105,ASME B16.47 SR.B,WELD NECK	WN02G0701	
			IBR			
SPACER AND BLIND	14 - 24	150#	RF 125 AARH IBR	CS ASTM A105,ASME B16.48,	RS02BPO01	
SPECL BLIND	1/2 - 12	150#	RF 125 AARH IBR	CS ASTM A105,ASME B16.48,	SP02BPO01	
BLIND FLAN BLIND FLANGE	<b>GE</b> 26 - 48	150#	RF 125 AARH IBR	CS ASTM A105,ASME B16.47 SR.B,	BF02B0701	
BLIND FLANGE	1/2 - 24	150#	RF 125 AARH IBR		BF02B0701	
GASKET					2. 023000.	
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	GSQN3QJ01	
				B16.20/B16.47 SR.B,		
STUD & NUT STUD & 2NUTS HVY	· S			ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	SINDEOUGGO	
FITTING (E	BW)					
BRANCH WELD	2 - 48		BW IBR	CARBON STEEL,ASME B31.3,	RWOJA1200	
BRANCH WELD WITH	2 - 48		BW IBR	CARBON STEEL,ASME B31.3,	WBOJA1200	
RP	2 49		DW IDD	ACTM ACCA IMPD CMI C ACME D4C O	007040000	
CAP ELBOW	2 - 48 2 - 24		BW IBR BW IBR	ASTM A234 WPB-SMLS,ASME B16.9, ASTM A234 WPB-SMLS,ASME B16.9,	CP73A0900	
ELBOW	26 - 48		BW IBR	ASTM A234 WPB-WLDD, ASME B16.9,	EL73A0900 ELOYA0900	
REDUCER CONC.	2 - 24		BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	RC73A0900	
REDUCER CONC.	26 - 48		BW IBR	ASTM A234 WPB-WLDD,ASME B16.9,	RCOYA0900	
REDUCER ECC.	2 - 24		BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	RE73A0900	
REDUCER ECC.	26 - 48		BW IBR	ASTM A234 WPB-WLDD,ASME B16.9,	REOYA0900	
TEE	2 - 24		BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	TE73A0900	
TEE	26 - 48		BW IBR	ASTM A234 WPB-WLDD,ASME B16.9,	TEOYA0900	
WELDOLET	2 - 48		BW IBR	CS ASTM A105,MSS SP 97,	WL02A3300	
•	SW)	3000#	COOM IDD	CO ACTM AARE ACME DAG 44	0000000	
CAP COUPLING	1/2 - 11/2 1/2 - 11/2	3000# 3000#	SOCW IBR SOCW IBR	CS ASTM A105,ASME B16.11, CS ASTM A105,ASME B16.11,	CP02C0207 CN02C0207	W
JOOI EINO	1/2 - 11/2	3000#	OCON IDIX	SO NOTHIN TOOPHOINE DIGITIS	GINUZGUZU/	

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:0 Class: B24S PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) SL,SC (IBR) Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF 1.5 MM(MIN.) CS ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV ELBOW 1/2 - 11/2 3000# SOCW IBR CS ASTM A105, ASME B16.11, EL02C0207 HALF COUPLING 1/2 - 11/2 3000# SOCW IBR CS ASTM A105, ASME B16.11, HF02C0207 SOCKOLET 1/2 - 48 3000# SOCW IBR CS ASTM A105,MSS SP 97, SL02C3307 1/2 - 11/2 3000# SOCW IBR CS ASTM A105,ASME B16.11, TE02C0207 FITTING (THD) CAP 1/2 - 11/2 3000# THD IBR CS ASTM A105,ASME B16.11, CP02D0207 Т PLUG 1/2 - 11/2 CS ASTM A105,ASME B16.11,ROUND HEAD THD IBR PG02D0200 THREDOLET CS ASTM A105,MSS SP 97, 1/2 - 48 3000# THD IBR TL02D3307 NIPPLE NIPPLE 1/2 - 11/2 SCH160 PLN-PLN IBR SMLS,ASTM A106 GR.B,ASME B36.10, NP03E1312 1 NIPPLE 1/2 - 11/2 SCH160 PLN-THD IBR SMLS,ASTM A106 GR.B,ASME B36.10,NPT NP03F1312 2 NIPPLE 1/2 - 11/2 SCH160 THD IBR SMLS,ASTM A106 GR.B,ASME B36.10,NPT NP03D1312 3 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PE IBR ASTM A234 WPB-SMLS,MSS SP 95. NC73Q4500 Ρ SWAGE (CONC) 1/2 - 11/2 PLN-THD IBR ASTM A234 WPB-SMLS,MSS SP 95. NC73F4500 Т SWAGE (ECC) PE IBR ASTM A234 WPB-SMLS,MSS SP 95, 1/2 - 11/2 NE73Q4500 Р SWAGE (ECC) 1/2 - 11/2 PLN-THD IBR ASTM A234 WPB-SMLS,MSS SP 95, NE73F4500 Т VALVES GATE VALVE 1/2 - 11/2 800# SOCW IBR CS BODY ASTM A105, GAV201S, GAV201S GATE VALVE 2 - 48 150# FLG IBR CS BODY ASTM A216 GR WCB, GAV210S, GAV210S GLOBE VALVE 1/2 - 11/2 800# SOCW IBR CS BODY ASTM A105,GLV201S, GLV201S GLOBE VALVE CS BODY ASTM A216 GR WCB,GLV210S, 2 - 12 FLG IBR 150# GLV210S

CS BODY ASTM A105, CHV201S,

CS BODY ASTM A216 GR WCB, CHV210S,

CHV201S

CHV210S

CHECK VALVE

CHECK VALVE

1/2 - 11/2

2 - 24

SOCW IBR

FLG IBR

800#

150#

Project ::TFL DOC. No.TFL-PDS-600 Rev.:1 CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA

PDIL				LOCAT	TION : TALCHER,ODISHA	Rev.:1	, 000
Clas	ss: B24Z		PRO	JECTS AN	D DEVELOPMENT INDIA LIMITED		
SERVICE		TEMPE	RATURE LIMIT	S (Deg.C)			
FLARE		Ref.SI	Ref.SI				
	1	<u> </u>	<u>, l                                    </u>				
RATING ASME	CORROSION ALLOW	ANCE	MATERIAL				
150# RF	3.0 MM(MIN.)		CS				
ITEM	NOTES SIZE (N	PS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL RE
PIPE							
PIPE	2 -		SCH 80	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	21/2 -		SCHSTD	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	4 -		SCHSTD	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	6 -		SCHSTD	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	8 - 1		SCHSTD	BE	ERW,API 5L GR.B,ASME B36.10,	PPA211300	
PIPE	12 -	14	SCHSTD	BE	ERW,API 5L GR.B,ASME B36.10,	PPA211300	
PIPE	1/2 - 3		SCH160	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
PIPE	1 - 11	1/4	SCH160	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
PIPE	11/2 - 1	11/2	SCH160	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
PIPE	16 -		SCHSTD	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE	20 -	22	SCHSTD	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
PIPE	24 -	24	SCHSTD	BE	LSAW,API 5L GR.B,ASME B36.10,	PP9611300	
FLANGE							
FLANGE	1/2 -		150#	SO-RF 125 AAR		FL0260801	
LONG W.N.FLANGE	11/2 - 1		300#	WN-RF 125 AAF		LN0270802	
W.N.FLANGE	26 -		150#	WN-RF 125 AAF		WN0270701	
SPACER AND BLIND	14 -		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,	SP022P001	
BLIND FLAN		40	450#	DE 405 AARU	00 40714 4405 40145 046 47 00 0		
BLIND FLANGE	26 -		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	
GASKET GASKET	1/2 -	24	150#	SPRL-WND RF	TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.2	20 CSON20201	
GASKET	26 -		150#	SPRL-WND RF	TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG;ASME B10.2		
OAORET	20 -	40	130#	OF INE-WIND IN	B16.20/B16.47 SR.B,	GSQN3QJ01	
STUD & NUT	s						
STUD & 2NUTS HVY	-				ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX							
DRIP RING							
DRIP RING	3 -	3	150#	RF 125 AARH	CS ASTM A105,PDIL-PDS-600,	DR022QK01	
•	3W)						
BRANCH WELD	2 - 4			BW	CARBON STEEL,ASME B31.3,	RWOJ11200	
BRANCH WELD WITH	2 - 4	48		BW	CARBON STEEL,ASME B31.3,	WBOJ11200	
RP	0	40		D144	ACTIVACE AND CARLO ACRES DAGE		
CAP	2 - 4			BW	ASTM A234 WPB-SMLS,ASME B16.9,	CP7310900	
ELBOW	2 -			BW	ASTM A234 WPB-SMLS,ASME B16.9,	EL7310900	
ELBOW	8 - 4			BW	ASTM A234 WPB-WLDD,ASME B16.9,	ELOY10900	L
ELBOW	8 - 4			BW	ASTM A234 WPB-WLDD,PDIL-PDS-600,R=3D	ELOY1QK00	3
ELBOW	8 - 4			BW	ASTM A234 WPB-WLDD,PDIL-PDS-600,R=5D	ELOY1QK00	5
ELBOW	8 - 4			BW	ASTM A234 WPB-WLDD,PDIL-PDS-600,R=7D	ELOY1QK00	7
REDUCER CONC.	2 -			BW	ASTM A234 WPB-SMLS,ASME B16.9,	RC7310900	
REDUCER CONC.	8 - 4			BW	ASTM A234 WPB-WLDD,ASME B16.9,	RCOY10900	
REDUCER ECC.	2 -			BW	ASTM A234 WPB-SMLS,ASME B16.9,	RE7310900	
REDUCER ECC.	8 - 4			BW	ASTM A234 WPB-WLDD,ASME B16.9,	REOY10900	
TEE		6		BW	ASTM A234 WPB-SMLS,ASME B16.9,	TE7310900	
TEE	8 - 4			BW	ASTM A234 WPB-WLDD,ASME B16.9,	TEOY10900	
WELDOLET	2 - 4	48		BW	CS ASTM A105,MSS SP 97,	WL0213300	
•	SW)	110	0005"	000	00.4074.4407.10747.57		
CAP	1/2 - 1		3000#	SOCW	CS ASTM A105,ASME B16.11,	CP0230207	W
COUPLING	1/2 - 1		3000#	SOCW	CS ASTM A105,ASME B16.11,	CN0230207	W
ELBOW	1/2 - 1	1/2	3000#	SOCW	CS ASTM A105,ASME B16.11,	EL0230207	
i e							

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:1 Class: B24Z PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) FLARE Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF 3.0 MM(MIN.) CS ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV 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 FITTING (THD) 1/2 - 11/2 3000# THD CS ASTM A105,ASME B16.11, CP0240207 Т COUPLING 1/2 - 11/2 3000# THD CS ASTM A105,ASME B16.11, CN0240207 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 NIPPLE 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 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95. NC73J4500 Ρ SWAGE (CONC) 1/2 - 11/2 PLN-THD ASTM A234 WPB-SMLS,MSS SP 95. NC7364500 Т SWAGE (ECC) PΕ ASTM A234 WPB-SMLS,MSS SP 95, 1/2 - 11/2 Р NE73J4500 SWAGE (ECC) 1/2 - 11/2 PLN-THD ASTM A234 WPB-SMLS,MSS SP 95, NE7364500 Т STRAINER 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 VALVES 1/2 - 11/2 CS BODY ASTM A105, GAV201, 800# SOCW GATE VALVE **GAV201** GATE VALVE 48 FLG CS BODY ASTM A216 GR WCB,GAV210, 150# GAV210

CS BODY ASTM A105,GLV201,

CS BODY ASTM A105.CHV201.

CS BODY ASTM A105,BAV201,

CS BODY ASTM A105.PLV201.

CS BODY ASTM A216 GR WCB,GLV210,

CS BODY ASTM A216 GR WCB.CHV210.

CS BODY ASTM A216 GR WCB,BAV210,

CS BODY ASTM A216 GR WCB, BUV204,

CS BODY ASTM A216 GR WCB,PLV202,

CS BODY ASTM A216 GR WCB,BUV203,LUG TYPE

GLV201

GLV210

CHV201

CHV210

**BAV201** 

BAV210

BUV203

BUV204

PLV201

PLV202

:

GLOBE VALVE

GLOBE VALVE

CHECK VALVE

CHECK VALVE

BALL VALVE

BALL VALVE

PLUG VALVE

PLUG VALVE

BUTTERFLY VALVE

BUTTERFLY VALVE

1/2 - 11/2

1/2 - 11/2

2 - 24

1/2 - 11/2

2 - 24

26 - 48

1/2 - 1

11/2 - 24

24

2 - 12

800#

150#

800#

150#

800#

150#

150#

150#

600#

150#

SOCW

FLG

SOCW

FLG

SOCW

FLG

RF

FLG

THRD

FLG

Project .:TFL DOC. No.TFL-PDS-600 Rev.:0 CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA

PDIL	ss: B40		DD/		ON: TALCHER,ODISHA  DEVELOPMENT INDIA LIMITED	Rev.:0	
SERVICE	33. <b>D4</b> U	TEI	MPERATURE LIMI		DEVELOPMENT INDIA LIMITED		
CD,FG,HG,PA,PC		Ref.SI	Ref.SI				
RATING ASME 150# RF	CORROSION ALL NONE	.OWANCE	MATERIAL SS 304				
100//10	NONE			, L			
ITEM	NOTES SIZI	E (NPS)	SCH/ RAT	END END	DESCRIPTION	COMM CODE	SPCL RE
PIPE							
PIPE	26	- 28	SCH 10	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.10,	PPZ511300	
PIPE	30	- 32	SCH 10	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.10,	PPZ511300	
PIPE	34	- 36	SCH 10	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.10,	PPZ511300	
PIPE	2	- 4	SCH10S	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.19,	PPZ511400	
PIPE	1/2	- 3/4	SCH40S	PE	SMLS,ASTM A312 TP304L,ASME B36.19,	PP8521400	
PIPE	1	- 11/4	SCH40S	PE	SMLS,ASTM A312 TP304L,ASME B36.19,	PP8521400	
PIPE	11/2	2 - 11/2	SCH40S	PE	SMLS,ASTM A312 TP304L,ASME B36.19,	PP8521400	
PIPE	6	- 8	SCH10S	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.19,	PPZ511400	
PIPE	10	- 12	SCH10S	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.19,	PPZ511400	
PIPE	14	- 16	SCH10S	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.19,	PPZ511400	
PIPE	18	- 20	SCH10S	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.19,	PPZ511400	
PIPE	22	- 24	SCH10S	BE	EFW,STR.WELD,ASTM A312 TP304L,ASME B36.19,	PPZ511400	
FLANGE							
LONG W.N.FLANGE		2 - 11/2	300#	WN-RF 125 AARH		LN8170802	
W.N.FLANGE		- 36	150#	WN-RF 125 AARH		WN8170701	
W.N.FLANGE		- 24	150#	WN-RF 125 AARH		WN8170801	5
W.N.FLANGE SPACER AND BLIND		- 24 - 24	300# 150#	WN-RF 125 AARH RF 125 AARH	ASTM A182 F304L,ASME B16.5,WELD NECK  ASTM A182 F304L,ASME B16.48,	WN8170802	6
SPECL BLIND		- 12	150#	RF 125 AARH	ASTM A162 F304L,ASME B16.46, ASTM A182 F304L,ASME B16.48,	RS812P001	
		- 12	150#	RF 123 AARH	A31W A102 F304L,A3WE D10.40,	SP812PO01	
BLIND FLAN BLIND FLANGE		- 36	150#	RF 125 AARH	ASTM A182 F304L,ASME B16.47 SR.B,	BF8120701	
BLIND FLANGE	1/2	- 24	150#	RF 125 AARH	ASTM A182 F304L,ASME B16.5,	BF8120801	1
BLIND FLANGE	1/2	- 24	300#	RF 125 AARH	ASTM A182 F304L,ASME B16.5,	BF8120802	2
GASKET							
GASKET	1/2	- 24	150#	SPRL-WND RF	TP304 SS WDG; GPH FLR; TP304 SS INR RNG/ OTR RNG,ASME B16.20,	GSQL30301	1
GASKET	1/2	- 24	300#	SPRL-WND RF	TP304 SS WDG; GPH FLR; TP304 SS INR RNG/ OTR RNG,ASME B16.20, $$	GSQL30302	2
GASKET	26	- 36	150#	SPRL-WND RF	TP304 SS WDG; GPH FLR; TP304 SS INR RNG/ OTR RNG,ASME	GSQL3QJ01	
					B16.20/B16.47 SR.B,		
STUD & NUT STUD & 2NUTS HVY	S				ASTM A193 GR.B8 CL.2/ASTM A194 GR.8,,	0114000000	
HEX		-			ASTWATES GIVE CELZASTWATES GIVE,	SNA600000	
DRIP RING							
DRIP RING	3	- 3	150#	RF 125 AARH	ASTM A182 F304L,PDIL-PDS-600,	DR812QK01	
FITTING (F	BW)						
BRANCH WELD	2	- 36		BW	STAINLESS STEEL,ASME B31.3,	RWOK11200	
BRANCH WELD WITH	2	- 36		BW	STAINLESS STEEL,ASME B31.3,	WBOK11200	
RP							
CAP	2	- 36		BW	ASTM A403 WP304L-SMLS,ASME B16.9,	CP8310900	
ELBOW	2			BW	ASTM A403 WP304L-WLDD,ASME B16.9,	EL8410900	L
ELBOW	2		19.05 MM	BW	ASTM A403 WP304L-WLDD,PDIL-PDS-600,R=3D	EL841QK60	3
ELBOW	2		19.05 MM	BW	ASTM A403 WP304L-WLDD,PDIL-PDS-600,R=5D	EL841QK60	5
REDUCER CONC.		- 36		BW	ASTM A403 WP304L-WLDD,ASME B16.9,	RC8410900	
REDUCER ECC.	2			BW	ASTM A403 WP304L-WLDD,ASME B16.9,	RE8410900	
TEE WELDOLET	2			BW	ASTM A403 WP304L-WLDD,ASME B16.9,	TE8410900	
WELDOLET		- 36		BW	ASTM A182 F304L,MSS SP 97,	WL8113300	
FITTING (S Cap	<b>SW)</b> 1/2	- 11/2	3000#	SOCW	ASTM A182 F304L,ASME B16.11,	CP8130207	W
COUPLING		- 11/2	3000#	SOCW	ASTM A182 F304L,ASME B16.11,	CN8130207	••
ELBOW		- 11/2	3000#	SOCW	ASTM A182 F304L,ASME B16.11,	EL8130207	
HALF COUPLING		- 11/2	3000#	SOCW	ASTM A182 F304L,ASME B16.11,	HF8130207	
SOCKOLET		- 36	3000#	SOCW	ASTM A182 F304L,MSS SP 97,	SL8133307	
ı							

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:0 Class: B40 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) CD,FG,HG,PA,PC Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF SS 304L NONE ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV TEE 1/2 - 11/2 3000# SOCW ASTM A182 F304L, ASME B16.11, TE8130207 FITTING (THD) 1/2 - 11/2 3000# THD ASTM A182 F304L ASME B16.11. CAP CP8140207 Т PLUG 1/2 - 11/2 THD ASTM A182 F304L,ASME B16.11,ROUND HEAD PG8140200 THREDOLET 3000# THD ASTM A182 F304L,MSS SP 97, TL8143307 NIPPLE NIPPLE 1/2 - 11/2 SCH80S PLN-PLN SMLS,ASTM A312 TP304L,ASME B36.19, NP8551413 1 NIPPLE 1/2 - 11/2 SCH80S PLN-THD SMLS,ASTM A312 TP304L,ASME B36.19,NPT NP8561413 2 NIPPLE 1/2 - 11/2 SCH80S THD SMLS,ASTM A312 TP304L,ASME B36.19,NPT NP8541413 3 SWAGE NIPPLE 1/2 - 11/2 PΕ ASTM A403 WP304L-SMLS,MSS SP 95, SWAGE (CONC) NC83J4500 Р SWAGE (CONC) 1/2 - 11/2 PLN-THD ASTM A403 WP304L-SMLS,MSS SP 95, NC8364500 Т SWAGE (ECC) 1/2 - 11/2 PΕ ASTM A403 WP304L-SMLS,MSS SP 95, NE83J4500 SWAGE (ECC) 1/2 - 11/2 PLN-THD ASTM A403 WP304L-SMLS,MSS SP 95, NE8364500 VALVES GATE VALVE 1/2 - 1 800# SOCW SS BODY ASTM A182 GR F304, GAV501, GAV501

SS BODY ASTM A182 GR F304,GAV501,

SS BODY ASTM A351 GR CF8, GAV510,

SS BODY ASTM A351 GR CF8,GAV510,

SS BODY ASTM A182 GR F304,GLV501,

SS BODY ASTM A351 GR CF8,GLV510,

SS BODY ASTM A182 GR F304.CHV501.

SS BODY ASTM A351 GR CF8,CHV510,

SS BODY ASTM A351 GR CF8M,BAV510,

SS BODY ASTM A351 GR CF8M.BAV510.

SS BODY AISI 316,BAV501,

SS BODY AISI 316,BAV501,

GAV501

GAV510

GAV510

GLV501

GLV510

CHV501

CHV510

BAV501

BAV501

BAV510

BAV510

W

F

F

:

GATE VALVE

GATE VALVE

GATE VALVE

GLOBE VALVE

GLOBE VALVE

CHECK VALVE

CHECK VALVE

BALL VALVE

BALL VALVE

BALL VALVE

BALL VALVE

11/2 - 11/2

11/2 - 11/2

2 - 24

1/2 - 11/2

2 - 12

1/2 - 11/2

2 - 24

1/2 - 1

11/2 - 11/2

11/2 - 11/2

2 - 12

800#

150#

150#

800#

150#

800#

150#

800#

800#

150#

150#

SOCW

FLG

FLG

FLG

SOCW

FLG

THRD

THRD

FLG

FLG

SOCW

CLIENT : M/S..TFL PROJECT

AMMONIA/UREA COAL BASED FERTILIZER PROJECT. LOCATION : TALCHER.ODISHA

Project .: TFL DOC. No.TFL-PDS-600

Rev.:1

**PDIL** Class: B50 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AF,AW,CD,DM,HZ,IA,MDA,PC,PH.VS.CH Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF SS 304 NONE ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 26 - 28 06.35 MM BE EFW.ASTM A358 GR.TP304 CL.1.ASME B36.10 PPW911300 PIPE 30 - 32 SCH 10 BE EFW.ASTM A358 GR.TP304 CL.1.ASME B36.10 PPW911300 PIPE EFW,ASTM A358 GR.TP304 CL.1,ASME B36.10, 34 36 SCH 10 ΒE PPW911300 PIPE SCHSTD BE EFW,ASTM A358 GR.TP304 CL.1,ASME B36.10, PPW911300 PIPE 42 -44 SCHSTD ΒE EFW,ASTM A358 GR.TP304 CL.1,ASME B36.10, PPW911300 PIPE 46 -48 SCHSTD BE EFW, ASTM A358 GR.TP304 CL.1, ASME B36.10 PPW911300 PE SMLS.ASTM A312 TP304.ASME B36.19. PIPE 1/2 - 3/4SCH40S PPPE21400 SMLS,ASTM A312 TP304,ASME B36.19, PIPE 1 - 11/4 SCH40S PΕ PPPE21400 PIPE 11/2 - 11/2 SCH40S SMLS,ASTM A312 TP304,ASME B36.19, PPPE21400 PIPE 2 - 4 SCH10S ΒE EFW,STR.WELD,ASTM A312 TP304,ASME B36.19, PPZ111400 PIPE 8 SCH10S ΒE EFW,STR.WELD,ASTM A312 TP304,ASME B36.19 PPZ111400 PIPE 10 -12 SCH10S BE EFW.STR.WELD.ASTM A312 TP304.ASME B36.19. PPZ111400 EFW,STR.WELD,ASTM A312 TP304,ASME B36.19, PIPE 14 -16 SCH10S BE PPZ111400 PIPE 18 20 SCH10S BE EFW,STR.WELD,ASTM A312 TP304,ASME B36.19, PPZ111400 PIPE 24 SCH10S EFW,STR.WELD,ASTM A312 TP304,ASME B36.19, 22 -ΒE PPZ111400 FLANGE W.N.FLANGE 26 - 48 150# WN-RF 125 AARH ASTM A182 F304, ASME B16.47 SR.B, WELD NECK WN0670701 W.N.FLANGE 1/2 - 24 150# WN-RF 125 AARH ASTM A182 F304, ASME B16.5, WELD NECK WN0670801 SPACER AND BLIND RF 125 AARH ASTM A182 F304 ASME B16.48 14 - 24 150# RS062PO01 SPECL BLIND 1/2 -12 RF 125 AARH ASTM A182 F304, ASME B16.48, 150# SP062PO01 BLIND FLANGE 26 - 48 150# RF 125 AARH ASTM A182 F304, ASME B16.47 SR.B, BLIND FLANGE BF0620701 BLIND FLANGE 1/2 -24 150# RF 125 AARH ASTM A182 F304, ASME B16.5, BF0620801 GASKET GASKET 1/2 - 24 150# SPRL-WND RF TP304 SS WDG: GPH FLR: TP304 SS INR RNG/ OTR RNG ASME B16.20. GSQL30301 SPRL-WND RF TP304 SS WDG: GPH FLR: TP304 SS INR RNG/ OTR RNG.ASME GASKET 26 - 48 150# GSQL3QJ01 B16.20/B16.47 SR.B. STUD & NUTS ASTM A193 GR.B8 CL.2/ASTM A194 GR.8,, STUD & 2NUTS HVY SNA600000 HEX DRIP RING DRIP RING 3 - 3 150# RF 125 AARH ASTM A182 F304,PDIL-PDS-600, DR062QK01 FITTING (BW) BRANCH WELD BW STAINLESS STEEL, ASME B31.3, RWOK11200 BRANCH WELD WITH STAINLESS STEEL, ASME B31.3 48 BW WBOK11200 RP ASTM A403 WP304-SMLS,ASME B16.9, 48 BW CP7410900 ELBOW 48 BW ASTM A403 WP304-WLDD, ASME B16.9, ELZ410900 REDUCER CONC. BW ASTM A403 WP304-WLDD, ASME B16.9, RCZ410900 REDUCER ECC. 48 BW ASTM A403 WP304-WLDD.ASME B16.9. REZ410900 TEE ASTM A403 WP304-WLDD, ASME B16.9, 2 -48 BW TEZ410900 ASTM A182 F304,MSS SP 97, WELDOLET BW WL0613300 FITTING (SW) 1/2 - 11/2 3000# SOCW ASTM A182 F304,ASME B16.11, CP0630207 W COUPLING 1/2 - 11/2 3000# SOCW ASTM A182 F304, ASME B16.11. CN0630207 ELBOW 1/2 - 11/2 3000# SOCW ASTM A182 F304, ASME B16.11. EL0630207 HALF COUPLING 1/2 - 11/2 3000# SOCW ASTM A182 F304, ASME B16.11. HF0630207 SOCKOLET 1/2 - 48 3000# SOCW ASTM A182 F304,MSS SP 97, SL0633307 ASTM A182 F304,ASME B16.11, TEE 1/2 - 11/2 3000# SOCW TE0630207 FITTING (THD) 1/2 - 11/2 3000# THD ASTM A182 F304, ASME B16.11, CP0640207

CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA

Project .:TFL DOC. No.TFL-PDS-600

Rev.:1

Class: B50 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AF,AW,CD,DM,HZ,IA,MDA,PC,PH,VS,CHRef.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF NONE SS 304

ITEM	NOTES	SIZE (NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PLUG		1/2 - 11/2		THD	ASTM A182 F304,ASME B16.11,ROUND HEAD	PG0640200	
THREDOLET		1/2 - 48	3000#	THD	ASTM A182 F304,MSS SP 97,	TL0643307	
NIPPLE							
NIPPLE		1/2 - 11/2	SCH80S	PLN-PLN	SMLS,ASTM A312 TP304,ASME B36.19,	NPPE51413	1
NIPPLE		1/2 - 11/2	SCH80S	PLN-THD	SMLS,ASTM A312 TP304,ASME B36.19,NPT	NPPE61413	2
NIPPLE		1/2 - 11/2	SCH80S	THD	SMLS,ASTM A312 TP304,ASME B36.19,NPT	NPPE41413	3
SWAGE NIPI	PLE						
SWAGE (CONC)		1/2 - 11/2		PE	ASTM A403 WP304-SMLS,MSS SP 95,	NC74J4500	Р
SWAGE (CONC)		1/2 - 11/2		PLN-THD	ASTM A403 WP304-SMLS,MSS SP 95,	NC7464500	Т
SWAGE (ECC)		1/2 - 11/2		PE	ASTM A403 WP304-SMLS,MSS SP 95,	NE74J4500	Р
SWAGE (ECC)		1/2 - 11/2		PLN-THD	ASTM A403 WP304-SMLS,MSS SP 95,	NE7464500	Т
STRAINER							
T-TYPE STRAINER		2 - 24	150#	FLGD	SS ASTM A351 GR CF8,TTS510,	TTS510	
Y-TYPE STRAINER		2 - 24	150#	FLGD	SS ASTM A351 GR CF8,YTS510,	YTS510	
Y-TYPE STRAINER		1/2 - 11/2	600#	SOCW	ASTM A182 F304,YTS501,	YTS501	
VALVES							
GATE VALVE		1/2 - 11/2	800#	SOCW	SS BODY ASTM A182 GR F304,GAV501,	GAV501	
GATE VALVE		2 - 24	150#	FLG	SS BODY ASTM A351 GR CF8,GAV510,	GAV510	
GLOBE VALVE		1/2 - 11/2	800#	SOCW	SS BODY ASTM A182 GR F304,GLV501,	GLV501	
GLOBE VALVE		2 - 12	150#	FLG	SS BODY ASTM A351 GR CF8,GLV510,	GLV510	
CHECK VALVE		1/2 - 11/2	800#	SOCW	SS BODY ASTM A182 GR F304,CHV501,	CHV501	
CHECK VALVE		2 - 24	150#	FLG	SS BODY ASTM A351 GR CF8,CHV510,	CHV510	
CHECK VALVE		26 - 36	150#	FLG	SS BODY ASTM A351 GR CF8,CHV520,	CHV520	
BALL VALVE		1/2 - 11/2	800#	THRD	SS BODY AISI 316,BAV501,	BAV501	
BALL VALVE		2 - 6	150#	FLG	SS BODY ASTM A351 GR CF8M,BAV510,	BAV510	
BALL VALVE		8 - 24	150#	FLG	SS BODY ASTM A351 GR CF8M,BAV520,	BAV520	
BUTTERFLY VALVE		6 - 48	150#	RF	SS BODY ASTM A351 GR CF8,BUV510,WAFER TYPE	BUV510	
PLUG VALVE		1/2 - 1	600#	THRD	SS BODY AISI 316,PLV501,	PLV501	
PLUG VALVE		11/2 - 6	150#	FLG	SS BODY ASTM A351 GR CF8M,PLV510,	PLV510	

CLIENT: M/S..TFL Project ::TFL
PROJECT: :AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION: :TALCHER,ODISHA
Project ::TFL
DOC. No.TFL-PDS-600

पी डी आई एल PDIL						ON TALCUED ODICUA	OC. No.TFL-PDS v.:2	5-600
	lass: B52			PRO	JECTS AN	DEVELOPMENT INDIA LIMITED	· V Z	
SERVICE			TEMPERAT					
UL,WET ACID FLAR	E GAS		Ref.SI	Ref.SI				
RATING ASME		ON ALLOWAN	ICE N	IATERIAL				
150# RF	NONE			SS 316L				
ITEM	NOTES	SIZE (NPS	S) SC	H/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PIPE								
PIPE		1/2 - 3/4	SCH	140S	PE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9121400	
PIPE		1 - 11/2	SCH	140S	PE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9121400	
PIPE		2 - 3	SCH	I10S	BE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9111400	
PIPE		4 - 6	SCH	110S	BE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9111400	
PIPE		8 - 10	SCH	110S	BE	SS,EFW,ASTM A358 TP316L CL.1,ASME B36.19,	PP9211400	
PIPE		12 - 14	SCH	110S	BE	SS,EFW,ASTM A358 TP316L CL.1,ASME B36.19,	PP9211400	
PIPE		16 - 18	SCH	110S	BE	SS,EFW,ASTM A358 TP316L CL.1,ASME B36.19,	PP9211400	
FLANGE								
FLANGE		1/2 - 11/2	2 150	#	SW-RF 125 AAR	SS,ASTM A182 F316L,ASME B16.5,SOCKET WELD	FL88L0801	5
FLANGE		1/2 - 11/2	2 300	#	SW-RF 125 AAR	SS,ASTM A182 F316L,ASME B16.5,SOCKET WELD	FL88L0802	6
W.N.FLANGE		2 - 4	150	#	WN-RF 125 AAR	SS,ASTM A182 F316L,ASME B16.5,WELD NECK	WN8870801	5
W.N.FLANGE		6 - 18	150	#	WN-RF 125 AAR	SS,ASTM A182 F316L,ASME B16.5,WELD NECK	WN8870801	
W.N.FLANGE		2 - 4	300	#	WN-RF 125 AAR	SS,ASTM A182 F316L,ASME B16.5,WELD NECK	WN8870802	6
SPACER AND BLIND	)	18 - 18	150	#	RF 125 AARH	ASTM A240 TP316L,ASME B16.48,	RS932PO01	
SPECL BLIND		1/2 - 16	150	#	RF 125 AARH	ASTM A240 TP316L,ASME B16.48,	SP932P001	
BLIND FLA	NGE							
BLIND FLANGE		1/2 - 18	150	#	RF 125 AARH	SS,ASTM A182 F316L,ASME B16.5,	BF8820801	
GASKET								
GASKET		1/2 - 4	150	#	SPRL-WND RF	GASKET,TP316L SS WDG;GPH FLR;TP316L SS INR RNG/ OTR RNG,ASME B16.20,	GS0830301	5
GASKET		6 - 18	150	#	SPRL-WND RF	GASKET,TP316L SS WDG;GPH FLR;TP316L SS INR RNG/ OTR RNG,ASME	GS0830301	
ONORE1		0 10	100	"	OF THE TITLE TH	B16.20,	G30030301	
GASKET		1/2 - 4	300	#	SPRL-WND RF	GASKET,TP316L SS WDG;GPH FLR;TP316L SS INR RNG/ OTR RNG,ASME	GS0830302	6
						B16.20,		
STUD & NU	JTS							
STUD & 2NUTS HVY		-				ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX								
FITTING	(BW)							
CAP		2 - 18			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	CP8910900	
ELBOW		2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	EL8910900	
ELBOW		8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	EL9010900	
REDUCER CONC.		2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	RC8910900	
REDUCER CONC.		8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	RC9010900	
REDUCER ECC.		2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	RE8910900	
REDUCER ECC.		8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	RE9010900	
TEE		2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	TE8910900	
TEE		8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	TE9010900	
WELDOLET		2 - 18			BW	SS,ASTM A182 F316L,MSS SP 97,	WL8813300	
FITTING	(SW)							
CAP		1/2 - 11/2			SOCW	SS,ASTM A182 F316L,ASME B16.11,	CP8830207	
COUPLING		1/2 - 11/2			SOCW	SS,ASTM A182 F316L,ASME B16.11,	CN8830207	W
ELBOW		1/2 - 11/2			SOCW	SS,ASTM A182 F316L,ASME B16.11,	EL8830207	
HALF COUPLING		1/2 - 11/2		)#	SOCW	SS,ASTM A182 F316L,ASME B16.11,	HF8830207	W
SOCKOLET		1/2 - 18	300	)#	SOCW	SS,ASTM A182 F316L,MSS SP 97,	SL8833307	
TEE		1/2 - 11/2	2 3000	)#	SOCW	SS,ASTM A182 F316L,ASME B16.11,	TE8830207	
	(THD)							
COUPLING		1/2 - 11/2			THD	SS,ASTM A182 F316L,ASME B16.11,	CN8840207	T
ELBOLET		1/2 - 18			THD	SS,ASTM A182 F316L,MSS SP 97,	ET8843307	
HALF COUPLING		1/2 - 11/2		)#	THD	SS,ASTM A182 F316L,ASME B16.11,	HF8840207	Т
PLUG		1/2 - 11/2			THD	SS,ASTM A182 F316L,ASME B16.11,ROUND HEAD	PG8840200	
THREDOLET		1/2 - 18	300	)#	THD	SS,ASTM A182 F316L,MSS SP 97,	TL8843307	

CLIENT : M/S..TFL Project .: TFL PIPING MATERIAL SPECIFICATION PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA DOC. No.TFL-PDS-600 **PDIL** Rev.:2 Class: B52 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) UL,WET ACID FLARE GAS Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 150# RF SS 316L NONE SIZE (NPS) COMM CODE SPCL REV ITEM NOTES SCH/ RAT END DESCRIPTION NIPPLE SCH80S NIPPLE 1/2 - 11/2 PLN-PLN SS,SMLS,ASTM A312 TP316L,ASME B36.19, NP9151413 NIPPLE 1/2 - 11/2 SCH80S PLN-THD SS,SMLS,ASTM A312 TP316L,ASME B36.19, NP9161413 2 NIPPLE 1/2 - 11/2 SCH80S THD SS,SMLS,ASTM A312 TP316L,ASME B36.19, NP9141413 3 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PE SS,ASTM A182 F316L,MSS SP 95, NC88J4500 SWAGE (ECC) 1/2 - 11/2 PΕ SS,ASTM A182 F316L,MSS SP 95, NE88J4500 VALVES 1/2 - 11/2 SOCW GATE VALVE 800# SS BODY AISI 316L,GAV401, GAV401 GATE VALVE 2 - 6 FLG SS BODY ASTM A351 GR CF3M, GAV410, 150# GAV410 GLOBE VALVE 1/2 - 11/2 800# SOCW SS BODY AISI 316L,GLV401, GLV401 GLOBE VALVE 150# FLG SS BODY ASTM A351 GR CF3M,GLV410, GLV410 CHECK VALVE 1/2 - 11/2 800# SOCW SS BODY AISI 316L,CHV401, CHV401 CHECK VALVE 2 - 12 150# FLG SS BODY ASTM A351 GR CF3M,CHV410, CHV410

SS BODY ASTM A351 GR CF3M,BUV410,WAFER TYPE

BUV410

:

BUTTERFLY VALVE

6 - 18

150#

RF

CLIENT PIPING MATERIAL SPECIFICATION PROJECT **PDIL** 

Project .: TFL : M/S..TFL AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 LOCATION : TALCHER.ODISHA Rev.:1 Class: D14 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AG,AL,FG Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 300# RF LT CS 1.5 MM(MIN.) ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 2 - 6 SCH 40 BE SMLS.ASTM A333 GR.6.ASME B36.10. PPP611300 PIPE 8 - 10 SCH 30 BE SMLS.ASTM A333 GR.6.ASME B36.10. PPP611300 PIPE 12 SMLS,ASTM A333 GR.6,ASME B36.10, 14 SCH 40 ΒE PPP611300 PIPE 3/4 SCH 80 PΕ SMLS,ASTM A333 GR.6,ASME B36.10, PPP621300 PIPE 1 - 11/4 SCH 80 PΕ SMLS,ASTM A333 GR.6,ASME B36.10, PPP621300 PIPE 11/2 - 11/2 SCH 80 PE SMLS,ASTM A333 GR.6,ASME B36.10, PPP621300 PIPE 16 - 18 BE SMLS.ASTM A333 GR.6.ASME B36.10. SCH 40 PPP611300 SMLS,ASTM A333 GR.6,ASME B36.10, PIPE 20 - 22 SCH 40 BE PPP611300 SCH 40 BE SMLS,ASTM A333 GR.6,ASME B36.10, PPP611300 FLANGE LONG W.N.FLANGE 11/2 - 11/2 300# WN-RF 125 AARH ASTM A350 LF2 CL.1,ASME B16.5,38mmBORE,200mmLONG LN3570802 W.N.FLANGE 1/2 - 24 300# WN-RF 125 AARH ASTM A350 LF2 CL.1, ASME B16.5, WELD NECK WN3570802 SPACER AND BLIND 14 - 24 300# RF 125 AARH ASTM A350 LF2 CL.1, ASME B16.48, RS352PO02 SPECL BLIND ASTM A350 LF2 CL.1,ASME B16.48, 1/2 - 12 RF 125 AARH 300# SP352PO02 BLIND FLANGE BLIND FLANGE 1/2 - 24 300# RF 125 AARH ASTM A350 LF2 CL.1,ASME B16.5, BF3520802 GASKET 1/2 - 24 300# SPRL-WND RF TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.20 GSQN30302 STUD & NUTS STUD & 2NUTS HVY ASTM A320 GR.L7/ASTM A194 GR.7,, SNDA00000 FITTING (BW) BRANCH WELD WITH 2 - 24 BW LT CARBON STEEL, ASME B31.3, WBE211200 RP CAP 24 BW ASTM A420 WPL6-SMLS, ASME B16.9, CP4910900 ELBOW 24 BW ASTM A420 WPL6-SMLS,ASME B16.9, EL4910900 REDUCER CONC. 24 BW ASTM A420 WPL6-SMLS, ASME B16.9, RC4910900 REDUCER ECC. ASTM A420 WPL6-SMLS.ASME B16.9. 24 BW RE4910900 TEE 24 BW ASTM A420 WPL6-SMLS,ASME B16.9, 2 -TE4910900 WELDOLET 24 BW ASTM A350 LF2 CL.1,MSS SP 97, WL3513300 FITTING (SW) CAP 1/2 - 11/2 3000# SOCW ASTM A350 LF2 CL.1, ASME B16.11, CP3530207 W COUPLING 1/2 - 11/2 3000# SOCW ASTM A350 LF2 CL.1.ASME B16.11. CN3530207 ELBOW ASTM A350 LF2 CL.1.ASME B16.11. 1/2 - 11/2 3000# SOCW EL3530207 HALF COUPLING 1/2 - 11/2 3000# ASTM A350 LF2 CL.1,ASME B16.11, SOCW HF3530207 ASTM A350 LF2 CL.1,MSS SP 97, SOCKOLET 1/2 - 24 3000# SOCW SL3533307 TEE 1/2 - 11/2 3000# SOCW ASTM A350 LF2 CL.1,ASME B16.11, TE3530207 FITTING (THD) CAP 1/2 - 11/2 3000# THD ASTM A350 LF2 CL.1.ASME B16.11. CP3540207 PLUG 1/2 - 11/2 THD ASTM A350 LF2 CL.1.ASME B16.11.ROUND HEAD PG3540200 THREDOLET 3000# THD ASTM A350 LF2 CL.1,MSS SP 97, 1/2 - 24 TL3543307 NIPPLE SMLS,ASTM A333 GR.6,ASME B36.10, NIPPLE 1/2 - 11/2 SCH160 PLN-PLN NPP651312 1 NIPPLE 1/2 - 11/2 SCH160 PLN-THD SMLS,ASTM A333 GR.6,ASME B36.10,NPT NPP661312 2 NIPPLE 1/2 - 11/2 SCH160 THD SMLS,ASTM A333 GR.6,ASME B36.10,NPT NPP641312 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PE ASTM A420 WPL6-SMLS MSS SP 95. NC49J4500 Р ASTM A420 WPL6-SMLS,MSS SP 95, SWAGE (CONC) 1/2 - 11/2 PLN-THD NC4964500 Т SWAGE (ECC) 1/2 - 11/2 PΕ ASTM A420 WPL6-SMLS,MSS SP 95, NE49J4500 Р SWAGE (ECC) 1/2 - 11/2 PLN-THD ASTM A420 WPL6-SMLS,MSS SP 95, NE4964500 Т **VALVES** 

की आई एल PDIL	ING MATERIAL S	SPECIFIC <i>I</i>	ATION		JECT	: M/STFL : AMMONIA/UREA : TALCHER,ODISH		RTILIZER PROJECT.	Project .:TFL DOC. No.TFL-PD: Rev.:1	S-600
Cla	iss: D14		PRO	JECTS A	ND D	EVELOPMENT	INDIA LIMITE	:D		
SERVICE AG,AL,FG		TEMPERA	TURE LIMITS	S (Deg.C)						
AG,AL,I G		Ref.SI	Ref.SI							
RATING ASME	CORROSION ALLOWAY	ICE .	 MATERIAL		1			1		
300# RF	1.5 MM(MIN.)		LT CS							
ITEM	NOTES SIZE (NPS	S) S	CH/ RAT	END	-	DESCRIPTION			COMM CODE	SPCL RE
GATE VALVE	1/2 - 1	80	)#	SOCW		LTCS BODY ASTM A	350 GR LF2,GAV101,		GAV101	
GATE VALVE	11/2 - 11	/2 80	)#	SOCW		LTCS BODY ASTM A	350 GR LF2,GAV101,		GAV101	W
GATE VALVE	11/2 - 11	/2 30	0#	FLG		LTCS BODY ASTM A	352 GR LCB,GAV111,		GAV111	F
GATE VALVE	2 - 24	30	0#	FLG		LTCS BODY ASTM A	352 GR LCB,GAV111,		GAV111	
GLOBE VALVE	1/2 - 11/	2 80	)#	SOCW		LTCS BODY ASTM A	350 GR LF2,GLV101,		GLV101	
GLOBE VALVE	2 - 8	30	0#	FLG		LTCS BODY ASTM A	352 GR LCB,GLV111,		GLV111	
CHECK VALVE	1/2 - 11/	2 80	)#	SOCW		LTCS BODY ASTM A	350 GR LF2,CHV101,		CHV101	
CHECK VALVE	2 - 24	30	0#	FLG		LTCS BODY ASTM A	352 GR LCB,CHV111,		CHV111	
BALL VALVE	1/2 - 1	80	)#	SOCW		LTCS BODY ASTM A	350 GR LF2,BAV101,		BAV101	
BALL VALVE	11/2 - 11	/2 80	)#	SOCW		LTCS BODY ASTM A	350 GR LF2,BAV101,		BAV101	W
BALL VALVE	11/2 - 11	/2 30	0#	FLG		LTCS BODY ASTM A	352 GR LCB,BAV111,		BAV111	F
BALL VALVE	2 - 14	30	0#	FLG		LTCS BODY ASTM A	352 GR LCB,BAV111,		BAV111	

शामाज MATERIAL SPECIFICATION

CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.

Project .:TFL DOC. No.TFL-PDS-600

पी डी आई एल PDIL	NG MATERIAL S	SPECIFICATI	PR		: AMMONIA/UREA COAL BASED FEI : TALCHER,ODISHA	RTILIZER PROJECT.	DOC. No.TFL-PDS-6 Rev.:0	500
Clas	ss: D24		PROJECTS	AND D	EVELOPMENT INDIA LIMITE	:D		
SERVICE AG,AL,AW,FG,FN,HG,IA ETC.	h,IAW,NG,NI,PA,PN,VS		E LIMITS (Deg.C) Ref SI					
RATING ASME	CORROSION ALLOWA	NCE MAT	ERIAL	$\overline{}$				
300# RF	1.5 MM(MIN)		CS					
ITEM	NOTES SIZE (NP	PS) SCH/F	RAT END		DESCRIPTION		COMM CODE	SPCL REV
PIPE								
PIPE	2 - 6	SCH 40	) BE		SMLS,API 5L GR.B,ASME B36.10,		PPA111300	
PIPE	8 - 8	SCH 20	) BE		SMLS,API 5L GR.B,ASME B36.10,		PPA111300	
PIPE	1/2 - 3/				SMLS,API 5L GR.B,ASME B36.10,		PPA121300	
PIPE	1 - 11/				SMLS,API 5L GR.B,ASME B36.10,		PPA121300	
PIPE PIPE	11/2 - 11 10 - 1				SMLS,API 5L GR.B,ASME B36.10, SMLS,API 5L GR.B,ASME B36.10,		PPA121300	
PIPE	10 - 1.				SMLS,API 5L GR.B,ASME B36.10,		PPA111300 PPA111300	
PIPE	16 - 1				SMLS,API 5L GR.B,ASME B36.10,		PPA111300	
PIPE	20 - 2				SMLS,API 5L GR.B,ASME B36.10,		PPA111300	
PIPE	22 - 2	22 17.48 M	MM BE		SMLS,API 5L GR.B,ASME B36.10,		PPA111300	
PIPE	24 - 2	24 SCH 40	) BE		SMLS,API 5L GR.B,ASME B36.10,		PPA111300	
PIPE	26 - 2	28 17.40 M	MM BE		SMLS,API 5L GR.B,ASME B36.10,		PPA111300	
FLANGE LONG W.N.FLANGE	11/2 - 11	1/2 300#	WN-RF 125	5 AARH	CS ASTM A105,ASME B16.5,38mmBORE,20	00mmLONG	LN0270802	
W.N.FLANGE	26 - 2	28 300#	WN-RF 125	5 AARH	CS ASTM A105,ASME B16.47 SR.B,WELD N	NECK	WN0270702	
W.N.FLANGE	1/2 - 2	24 300#	WN-RF 125	5 AARH	CS ASTM A105,ASME B16.5,WELD NECK		WN0270802	
SPACER AND BLIND	14 - 2	24 300#	RF 125 AA	.RH	CS ASTM A105,ASME B16.48,		RS022PO02	
SPECL BLIND	1/2 - 1	2 300#	RF 125 AA	.RH	CS ASTM A105,ASME B16.48,		SP022PO02	
BLIND FLAN		2004	DE 405 44	DU	00 4074 4405 4045 040 47 00 0			
BLIND FLANGE BLIND FLANGE	26 - 2		RF 125 AAI		CS ASTM A105,ASME B16.47 SR.B,		BF0220702	
GASKET	1/2 - 2		RF 125 AA		CS ASTM A105,ASME B16.5,		BF0220802	
GASKET	1/2 - 2		SPRL-WNE		TP304 SS WDG;GPH FLR;TP304 SS INR RI			
GASKET	26 - 2	28 300#	SPRL-WNE	) RF	TP304 SS WDG;GPH FLR;TP304 SS INR RN B16.20/B16.47 SR.B,	NG;CS OTR RNG,ASME	GSQN3QJ02	
STUD & NUT STUD & 2NUTS HVY HEX	<b>S</b>				ASTM A193 GR.B7/ASTM A194 GR.2H,,		SNDE00000	
DRIP RING DRIP RING	3 - 3	300#	RF 125 AA	.RH	CS ASTM A105,PDIL-PDS-600,		DR022QK02	
FITTING (I	BW)							
BRANCH WELD	2 - 28	3	BW		CARBON STEEL,ASME B31.3,		RWOJ11200	
BRANCH WELD WITH RP	2 - 28	3	BW		CARBON STEEL,ASME B31.3,		WBOJ11200	
CAP	2 - 28	3	BW		ASTM A234 WPB-SMLS,ASME B16.9,		CP7310900	
ELBOW	2 - 28	3	BW		ASTM A234 WPB-SMLS,ASME B16.9,		EL7310900	
REDUCER CONC.	2 - 28	3	BW		ASTM A234 WPB-SMLS,ASME B16.9,		RC7310900	
REDUCER ECC.	2 - 28		BW		ASTM A234 WPB-SMLS,ASME B16.9,		RE7310900	
TEE	2 - 28		BW		ASTM A234 WPB-SMLS,ASME B16.9,		TE7310900	
WELDOLET	2 - 28	3	BW		CS ASTM A105,MSS SP 97,		WL0213300	
FITTING (S	<b>SW)</b> 1/2 - 11.	/2 3000#	SOCW		CS ASTM A105,ASME B16.11,		CP0230207	W
COUPLING	1/2 - 11		SOCW		CS ASTM A105,ASME B16.11,		CN0230207	•
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 - 2	28 3000#	SOCW		CS ASTM A105,MSS SP 97,		SL0233307	
TEE	1/2 - 11	/2 3000#	SOCW		CS ASTM A105,ASME B16.11,		TE0230207	
	HD)							
CAP	1/2 - 11		THD		CS ASTM A105,ASME B16.11,	0	CP0240207	Т
PLUG THREDOLET	1/2 - 11. 1/2 - 2		THD THD		CS ASTM A105,ASME B16.11,ROUND HEAD CS ASTM A105,MSS SP 97,	ע	PG0240200	
THREBOLLT	1/2 - 2	0 3000#	Ш		CO AO I W A 100, W OO OF 57,		TL0243307	

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:0 Class: D24 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AG,AL,AW,FG,FN,HG,IAH,IAW,NG,NI,PA,PN,VS Ref SI Ref SI ETC. MATERIAL RATING ASME CORROSION ALLOWANCE 300# RF 1.5 MM(MIN) CS SPCL REV ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE NIPPLE NIPPLE 1/2 - 11/2 PLN-PLN SCH160 SMLS, API 5L GR.B, ASME B36.10, NPA151312 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 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PΕ ASTM A234 WPB-SMLS,MSS SP 95, NC73J4500 SWAGE (CONC) 1/2 - 11/2 PLN-THD ASTM A234 WPB-SMLS,MSS SP 95, NC7364500 1/2 - 11/2 SWAGE (ECC) PΕ ASTM A234 WPB-SMLS,MSS SP 95. NE73J4500 SWAGE (ECC) 1/2 - 11/2 PLN-THD ASTM A234 WPB-SMLS,MSS SP 95, NE7364500 Т VALVES 2 - 24 300# FLG CS BODY ASTM A216 GR WCB,GAV211, GATE VALVE **GAV211** GATE VALVE 1/2 - 11/2 800# SOCW CS BODY ASTM A105,GAV201, GAV201 GLOBE VALVE 1/2 - 11/2 800# SOCW CS BODY ASTM A105,GLV201, GLV201 GLOBE VALVE 2 - 12 300# FLG CS BODY ASTM A216 GR WCB,GLV211, GLV211

CS BODY ASTM A105, CHV201,

CS BODY ASTM A105,BAV202,

CS BODY ASTM A105.PLV201.

CS BODY ASTM A216 GR WCB,CHV211,

CS BODY ASTM A216 GR WCB,BAV211,

CS BODY ASTM A216 GR WCB, BAV221,

CS BODY ASTM A216 GR WCB,PLV205,

CS BODY ASTM A216 GR WCB,BUV202,WAFER TYPE

CHV201

CHV211

BAV202

BAV211

BAV221

BUV202

PLV201

PLV205

CHECK VALVE

CHECK VALVE

BALL VALVE

BALL VALVE

BALL VALVE

PLUG VALVE

PLUG VALVE

BUTTERFLY VALVE

1/2 - 11/2

2 - 24

1/2 - 11/2

6

24

3 - 24

11/2 - 6

1/2

800#

300#

800#

300#

300#

300#

600#

300#

SOCW

FLG

SOCW

FLG

FLG

RF

THRD

FLG

CLIENT : M/S..TFL PROJECT : AMMONIA

: AMMONIA/UREA COAL BASED FERTILIZER PROJECT.

LOCATION : TALCHER, ODISHA

Project .:TFL

DOC. No.TFL-PDS-600 Rev.:0

Class: D50 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AW,PH,PC,AF,DM,MD,IA Ref SI Ref SI MATERIAL RATING ASME CORROSION ALLOWANCE 300# RF SS 304 NONE ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 14 - 14 SCHSTD BE EFW.STR.WELD.ASTM A312 TP304.ASME B36.10 PPZ111300 PIPE 16 -18 SCH XS BE EFW.ASTM A358 GR.TP304 CL.1.ASME B36.10 PPW911300 PIPE 20 EFW,ASTM A358 GR.TP304 CL.1,ASME B36.10, 20 SCH XS ΒE PPW911300 PIPE 24 SCH 40 BE EFW,ASTM A358 GR.TP304 CL.1,ASME B36.10, PPW911300 PIPE 26 - 28 17.48 MM ΒE EFW,ASTM A358 GR.TP304 CL.1,ASME B36.10, PPW911300 PIPE 1/2 - 3/4 SCH40S PE SMLS, ASTM A312 TP304, ASME B36.19 PPPE21400 PE SMLS.ASTM A312 TP304.ASME B36.19. PIPE 1 - 11/4 SCH40S PPPE21400 SMLS,ASTM A312 TP304,ASME B36.19, PIPE 11/2 - 11/2 SCH40S PΕ PPPE21400 PIPE SCH10S BE EFW,STR.WELD,ASTM A312 TP304,ASME B36.19, PPZ111400 PIPE 8 SCH40S ΒE EFW,STR.WELD,ASTM A312 TP304,ASME B36.19, 6 -PPZ111400 PIPE 10 - 12 SCH40S ΒE EFW,STR.WELD,ASTM A312 TP304,ASME B36.19, PPZ111400 FLANGE W.N.FLANGE 26 - 28 300# WN-RF 125 AARH ASTM A182 F304.ASME B16.47 SR.B.WELD NECK WN0670702 ASTM A182 F304,ASME B16.5,WELD NECK W.N.FLANGE 1/2 - 24 300# WN-RF 125 AARH WN0670802 SPACER AND BLIND 14 28 RF 125 AARH ASTM A182 F304, ASME B16.48, 300# RS062PO02 SPECL BLIND 1/2 - 12 300# RF 125 AARH ASTM A182 F304, ASME B16.48, SP062P002 BLIND FLANGE BLIND FLANGE 26 - 28 300# RF 125 AARH ASTM A182 F304, ASME B16.47 SR.B BF0620702 **BLIND FLANGE** 1/2 - 28 300# RF 125 AARH ASTM A182 F304, ASME B16.5, BF0620802 GASKET TP304 SS WDG; GPH FLR; TP304 SS INR RNG/ OTR RNG, ASME B16.20, 1/2 - 24 SPRL-WND RF GASKET 300# GSQL30302 GASKET SPRL-WND RF TP304 SS WDG; GPH FLR; TP304 SS INR RNG/ OTR RNG,ASME 26 - 28 300# GSQL3QJ02 B16.20/B16.47 SR.B, STUD & NUTS STUD & 2NUTS HVY ASTM A193 GR.B8T CL.2/ASTM A194 GR.8TA, SNQG00000 HEX DRIP RING ASTM A182 F304,PDIL-PDS-600, DRIP RING 300# RF 125 AARH DR062QK02 FITTING (BW) BRANCH WELD 2 - 28 BW STAINLESS STEEL, ASME B31.3 RWOK11200 BRANCH WELD WITH 28 BW STAINLESS STEEL, ASME B31.3. WBOK11200 CAF 2 - 24 BW ASTM A403 WP304-SMLS,ASME B16.9, CP7410900 ELBOW 28 BW ASTM A403 WP304-WLDD.ASME B16.9. ELZ410900 ELBOW 28 19.05 MM BW ASTM A403 WP304-WLDD.PDIL-PDS-600.R=3D ELZ41QK60 3 REDUCER CONC. ASTM A403 WP304-WLDD, ASME B16.9, 2 -28 BW RCZ410900 REDUCER ECC. ASTM A403 WP304-WLDD, ASME B16.9, BW REZ410900 TEE 2 -28 BW ASTM A403 WP304-WLDD, ASME B16.9, TEZ410900 WELDOLET 2 - 28 BW ASTM A182 F304 MSS SP 97. WL0613300 FITTING (SW) CAF 1/2 - 11/2 3000# SOCW ASTM A182 F304.ASME B16.11. CP0630207 W 1/2 - 11/2 3000# SOCW ASTM A182 F304,ASME B16.11, COUPLING CN0630207 ELBOW 1/2 - 11/2 3000# SOCW ASTM A182 F304,ASME B16.11, EL0630207 HALF COUPLING 1/2 - 11/2 3000# SOCW ASTM A182 F304, ASME B16.11, HF0630207 SOCKOLET 1/2 - 28 3000# SOCW ASTM A182 F304,MSS SP 97. SL0633307 TEE 1/2 - 11/2 ASTM A182 F304, ASME B16.11. 3000# SOCW TE0630207 FITTING (THD) 1/2 - 11/2 3000# THD ASTM A182 F304, ASME B16.11, CAF CP0640207 Т PLUG 1/2 - 11/2 THD ASTM A182 F304,ASME B16.11,ROUND HEAD PG0640200 THREDOLET 1/2 - 28 3000# ASTM A182 F304,MSS SP 97, THD TL0643307 NIPPLE

Project .: TFL PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL PROJECT : AMMONIA/UREA C LOCATION : TALCHER,ODISHA AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DOC. No.TFL-PDS-600 **PDIL** Rev.:0 Class: D50 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AW,PH,PC,AF,DM,MD,IA Ref SI Ref SI MATERIAL RATING ASME CORROSION ALLOWANCE 300# RF NONE SS 304 SPCL REV ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE NIPPLE SCH80S 1/2 - 11/2 PLN-PLN SMLS, ASTM A312 TP304, ASME B36.19, NPPE51413 NIPPLE 1/2 - 11/2 SCH80S PLN-THD SMLS.ASTM A312 TP304.ASME B36.19.NPT NPPE61413 2 NIPPLE 1/2 - 11/2 SCH80S THD SMLS,ASTM A312 TP304,ASME B36.19,NPT NPPE41413 3 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PΕ ASTM A403 WP304-SMLS,MSS SP 95, NC74J4500 SWAGE (CONC) 1/2 - 11/2 PLN-THD ASTM A403 WP304-SMLS,MSS SP 95, NC7464500 Т SWAGE (ECC) 1/2 - 11/2 PΕ ASTM A403 WP304-SMLS,MSS SP 95, NE74J4500 SWAGE (ECC) ASTM A403 WP304-SMLS,MSS SP 95, 1/2 - 11/2 PLN-THD NE7464500 Τ VALVES 1/2 - 1 800# SOCW SS BODY ASTM A182 GR F304,GAV501, GATE VALVE GAV501 GATE VALVE 11/2 - 11/2 800# SOCW SS BODY ASTM A182 GR F304,GAV501, GAV501 W

SS BODY ASTM A351 GR CF8M,GAV511,

SS BODY ASTM A351 GR CF8M,GAV511,

SS BODY ASTM A182 GR F304,GLV501,

SS BODY ASTM A351 GR CF8M,GLV511,

SS BODY ASTM A182 GR F304,CHV501,

SS BODY ASTM A351 GR CF8M,CHV511,

SS BODY ASTM A351 GR CF8M,BAV521,

SS BODY ASTM A351 GR CF8M,PLV511,

SS BODY AISI 316,BAV501,

SS BODY AISI 316.PLV501.

GAV511

GAV511

GLV501

GLV511

CHV501

CHV511

BAV501

BAV521

PLV501

PLV511

:

GATE VALVE

GATE VALVE

GLOBE VALVE

GLOBE VALVE

CHECK VALVE

CHECK VALVE

BALL VALVE

BALL VALVE

PLUG VALVE

PLUG VALVE

11/2 - 11/2

2 - 24

1/2 - 11/2

2 - 12

1/2 - 11/2

2 - 24

1/2 - 11/2

8 - 24

1/2 - 1

11/2 - 6

300#

300#

800#

300#

800#

300#

800#

300#

600#

300#

FLG

FLG

FLG

SOCW

SOCW

FLG

THRD

FLG

THRD

FLG

Project .:TFL DOC. No.TFL-PDS-600 Rev :2

CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA

PDIL					LOCAT	TON TALCUED ODICUA	v.:2	3-000
Clas	ss: D52			PRC	JECTS AN	D DEVELOPMENT INDIA LIMITED		
SERVICE			TEMPERA*	TURE LIMIT	S (Deg.C)			
UL			Ref.SI	Ref.SI				
RATING ASME	CORROSION AL	LOWANG	DE I	MATERIAL				
300# RF	NONE			SS 316	L			
ITEM	NOTES SI	ZE (NPS)	SO	CH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PIPE								
PIPE	1/	/2 - 3/4	SC	H40S	PE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9121400	
PIPE		1 - 11/2	SC	H40S	PE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9121400	
PIPE	:	2 - 3	SC	H10S	BE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9111400	
PIPE	•	4 - 6	SC	H10S	BE	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	PP9111400	
PIPE	;	8 - 10	SC	H10S	BE	SS,EFW,ASTM A358 TP316L CL.1,ASME B36.19,	PP9211400	
PIPE	1	2 - 14	SC	H10S	BE	SS,EFW,ASTM A358 TP316L CL.1,ASME B36.19,	PP9211400	
PIPE	1	6 - 18	SC	H10S	BE	SS,EFW,ASTM A358 TP316L CL.1,ASME B36.19,	PP9211400	
FLANGE								
FLANGE	1/	/2 - 11/2	30	0#	SW-RF 125 AAF	RH SS,ASTM A182 F316L,ASME B16.5,SOCKET WELD	FL88L0802	
W.N.FLANGE	:	2 - 18	30	0#	WN-RF 125 AAF	RH SS,ASTM A182 F316L,ASME B16.5,WELD NECK	WN8870802	
SPACER AND BLIND	1	8 - 18	30	0#	RF 125 AARH	ASTM A240 TP316L,ASME B16.48,	RS932PO02	
SPECL BLIND	1/	/2 - 16	30	0#	RF 125 AARH	ASTM A240 TP316L,ASME B16.48,	SP932PO02	
BLIND FLAN								
BLIND FLANGE	1/	/2 - 18	30	0#	RF 125 AARH	SS,ASTM A182 F316L,ASME B16.5,	BF8820802	
GASKET	4.	10 10	30	0#	SPRL-WND RF	CACKET TRACE OF WIDO ORDER INTRACE OF INDIDUCE OTD DAYS ACME	00000000	
GASKET	1/	/2 - 18	30	U#	SFRL-WIND RF	GASKET,TP316L SS WDG;GPH FLR;TP316L SS INR RNG/ OTR RNG,ASME B16.20,	GS0830302	
STUD & NUT	9					5.0.2.5,		
STUD & 2NUTS HVY	3	-				ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX								
FITTING (I	BW)							
CAP	:	2 - 18			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	CP8910900	
ELBOW	:	2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	EL8910900	
ELBOW	;	8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	EL9010900	
REDUCER CONC.	:	2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	RC8910900	
REDUCER CONC.	:	8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	RC9010900	
REDUCER ECC.	:	2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	RE8910900	
REDUCER ECC.	:	8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	RE9010900	
TEE	:	2 - 6			BW	SS,ASTM A403 WP316L-SMLS,ASME B16.9,	TE8910900	
TEE		8 - 18			BW	SS,ASTM A403 WP316L-WLDD,ASME B16.9,	TE9010900	
WELDOLET	;	2 - 18			BW	SS,ASTM A182 F316L,MSS SP 97,	WL8813300	
FITTING (	SW)							
CAP	1/	/2 - 11/2	300	00#	SOCW	SS,ASTM A182 F316L,ASME B16.11,	CP8830207	
COUPLING	1/	/2 - 11/2	300	00#	SOCW	SS,ASTM A182 F316L,ASME B16.11,	CN8830207	W
ELBOW	1/	/2 - 11/2	300	00#	SOCW	SS,ASTM A182 F316L,ASME B16.11,	EL8830207	
HALF COUPLING	1/	/2 - 11/2	300	00#	SOCW	SS,ASTM A182 F316L,ASME B16.11,	HF8830207	W
SOCKOLET	1/	/2 - 18	300	00#	SOCW	SS,ASTM A182 F316L,MSS SP 97,	SL8833307	
TEE	1/	/2 - 21/2	300	00#	SOCW	SS,ASTM A182 F316L,ASME B16.11,	TE8830207	
	HD)							
COUPLING	1/	/2 - 11/2	300	00#	THD	SS,ASTM A182 F316L,ASME B16.11,	CN8840207	T
ELBOLET	1/	/2 - 18	300	00#	THD	SS,ASTM A182 F316L,MSS SP 97,	ET8843307	
HALF COUPLING	1/	/2 - 11/2	300	00#	THD	SS,ASTM A182 F316L,ASME B16.11,	HF8840207	T
PLUG		/2 - 11/2			THD	SS,ASTM A182 F316L,ASME B16.11,ROUND HEAD	PG8840200	
THREDOLET	1/	/2 - 18	300	00#	THD	SS,ASTM A182 F316L,MSS SP 97,	TL8843307	
NIPPLE		n		11000	DINDIN	CO CMI C ACTM ASSO TROSCI. ACMIT DOS SO	NEC	
NIPPLE		/2 - 11/2		H80S	PLN-PLN	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	NP9151413	1
NIPPLE		/2 - 11/2		H80S	PLN-THD	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	NP9161413	2
NIPPLE		/2 - 11/2	SC	H80S	THD	SS,SMLS,ASTM A312 TP316L,ASME B36.19,	NP9141413	3
SWAGE NIPF SWAGE (CONC)		/2 - 11/2			PE	SS.ASTM A182 F316L.MSS SP 95,	NIC80 INEUU	
SWAGE (CONC) SWAGE (ECC)		/2 - 11/2			PE PE	SS,ASTM A182 F316L,MSS SP 95,	NC88J4500 NE88J4500	
	17	- 11/2				SOMETHING CONCENTION OF SOME	NE00J430U	

पी डी आई एल PDIL	NG MATERIAL	SPECIF	ICATION	PRO	NT : M/STFL JECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT ATION : TALCHER,ODISHA	Project .:TFL DOC. No.TFL-PDS Rev.:2	S-600
Clas	ss: D52		PR	OJECTS A	ND DEVELOPMENT INDIA LIMITED		
SERVICE JL		TEMF	PERATURE LIM	IITS (Deg.C)			
JL		Ref.SI	Ref.S	il			
ATING ASME 300# RF	CORROSION ALLOW NONE	ANCE	MATERIA SS 3				
TEM	NOTES SIZE (N	PS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL RE
/ALVES							
SATE VALVE	1/2 - 1		800#	SOCW	SS BODY AISI 316L,GAV401,	GAV401	
SATE VALVE	2 -		300#	FLG	SS BODY ASTM A351 GR CF3M,GAV411,	GAV411	
SLOBE VALVE	1/2 - 1		800#	SOCW	SS BODY AISI 316L,GLV401,	GLV401	
SLOBE VALVE	2 -		300#	FLG	SS BODY ASTM A351 GR CF3M,GLV411,	GLV411	
CHECK VALVE	1/2 - 1		800#	SOCW	SS BODY AISI 316L,CHV401,	CHV401	
CHECK VALVE	2 -		300#	FLG	SS BODY ASTM A351 GR CF3M,CHV411,	CHV411	
SUTTERFLY VALVE	6 -	18	300#	RF	SS BODY ASTM A351 GR CF3M,BUV411,WAFER TYPE	BUV411	

M PIPING ΜΔΤΕΡΙΔΙ SPECIFICATION CLIENT : M/S..TFL

Project .:TFL

्री डी आई एल PDIL	IG MATERIAL	SPECIFIC	ATION		: M/STFL T : AMMONIA/UREA COAL BASED FERTILIZER PROJECT. DN : TALCHER,ODISHA	Project .:TFL DOC. No.TFL-PDS-6 Rev.:0	600
Clas	s: F24		PRO	JECTS AND	DEVELOPMENT INDIA LIMITED		
SERVICE AW,HG,PA,PC,PN,SG		TEMPERA	ATURE LIMITS	S (Deg.C)			
		Ref SI	Ref SI				
RATING ASME 600# RF	CORROSION ALLOWA 1.5 MM(MIN.)	ANCE	MATERIAL CS				
ITEM	NOTES SIZE (NF	PS) S	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PIPE		,					
PIPE	2 - 3	3 S	CH 40	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	4 -	5 S	CH 80	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	6 -	8 S	CH 80	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	10 -	12 S	CH 80	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	14 -	16 S	CH 80	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	18 - 3		CH 80	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	22 - 1		CH 80	BE	SMLS,API 5L GR.B,ASME B36.10,	PPA111300	
PIPE	1/2 - 3		CH 80	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
PIPE	1 - 11 11/2 - 1		CH 80 CH 80	PE PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
	11/2 - 1	11/2 5	CH 00	PE	SMLS,API 5L GR.B,ASME B36.10,	PPA121300	
FLANGE LONG W.N.FLANGE	11/2 - 1	11/2 6	600#	WN-RF 125 AARH	CS ASTM A105,ASME B16.5,38mmBORE,200mmLONG	LN0270803	
W.N.FLANGE	1/2 - 2	24 6	600#	WN-RF 125 AARH	CS ASTM A105,ASME B16.5,WELD NECK	WN0270803	
SPACER AND BLIND	10 - 3	24 6	00#	RF 125 AARH	CS ASTM A105,ASME B16.48,	RS022PO03	
SPECL BLIND	1/2 -	8 6	600#	RF 125 AARH	CS ASTM A105,ASME B16.48,	SP022PO03	
BLIND FLANG BLIND FLANGE	6 <b>E</b> 1/2 - 3	24 6	600#	RF 125 AARH	CS ASTM A105,ASME B16.5,	BF0220803	
GASKET GASKET	1/2 - :	24 6	600#	SPRL-WND RF	TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.	20, GSQN30303	
STUD & NUTS STUD & 2NUTS HVY	; -				ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX							
1	<b>W)</b>	14		BW	CADDON CTEEL ACME D24.2	DWO 144000	
BRANCH WELD WITH	2 - 2			BW	CARBON STEEL,ASME B31.3,  CARBON STEEL.ASME B31.3,	RWOJ11200 WBOJ11200	
RP				511	O'RISSING LEEL, OHE BOTIO,	WBO011200	
CAP	2 - 2	24		BW	ASTM A234 WPB-SMLS,ASME B16.9,	CP7310900	
ELBOW	2 - 2	24		BW	ASTM A234 WPB-SMLS,ASME B16.9,	EL7310900	
REDUCER CONC.	2 - 2	24		BW	ASTM A234 WPB-SMLS,ASME B16.9,	RC7310900	
REDUCER ECC.	2 - 2	24		BW	ASTM A234 WPB-SMLS,ASME B16.9,	RE7310900	
TEE	2 - 2	24		BW	ASTM A234 WPB-SMLS,ASME B16.9,	TE7310900	
WELDOLET	2 - 2	24		BW	CS ASTM A105,MSS SP 97,	WL0213300	
FITTING (S	<b>W)</b> 1/2 - 1	1/0 3/	000#	SOCW	CS ASTM A105,ASME B16.11,	CP0230207	W
COUPLING	1/2 - 1		000#	SOCW	CS ASTM A105,ASME B16.11,	CP0230207	VV
ELBOW	1/2 - 1		000#	SOCW	CS ASTM A105,ASME B16.11,	EL0230207	
HALF COUPLING	1/2 - 1		000#	SOCW	CS ASTM A105,ASME B16.11,	HF0230207	
SOCKOLET	1/2 - 3	24 30	000#	SOCW	CS ASTM A105,MSS SP 97,	SL0233307	
TEE	1/2 - 1	1/2 30	000#	SOCW	CS ASTM A105,ASME B16.11,	TE0230207	
FITTING (TH	HD)						
CAP	1/2 - 1	1/2 30	000#	THD	CS ASTM A105,ASME B16.11,	CP0240207	T
PLUG	1/2 - 1			THD	CS ASTM A105,ASME B16.11,ROUND HEAD	PG0240200	
THREDOLET	1/2 - 3	24 30	000#	THD	CS ASTM A105,MSS SP 97,	TL0243307	
NI PPLE NIPPLE	1/2 - 1	1/2 5	CH160	PLN-PLN	SMLS,API 5L GR.B,ASME B36.10,	NPA151312	1
NIPPLE	1/2 - 1		CH160	PLN-THD	SMLS,API 5L GR.B,ASME B36.10,NPT	NPA161312	2
NIPPLE	1/2 - 1		CH160	THD	SMLS,API 5L GR.B,ASME B36.10,NPT	NPA141312	3
SWAGE NIPP						· · -	•
SWAGE (CONC)	1/2 - 1	1/2		PE	ASTM A234 WPB-SMLS,MSS SP 95,	NC73J4500	Р
SWAGE (CONC)	1/2 - 1	1/2		PLN-THD	ASTM A234 WPB-SMLS,MSS SP 95,	NC7364500	T
SWAGE (ECC)	1/2 - 1	1/2		PE	ASTM A234 WPB-SMLS,MSS SP 95,	NE73J4500	Р

CLIENT : M/S..TFL Project .: TFL PIPING MATERIAL SPECIFICATION PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA DOC. No.TFL-PDS-600 PDIL Rev.:0 Class: F24 PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) AW,HG,PA,PC,PN,SG Ref SI Ref SI MATERIAL RATING ASME CORROSION ALLOWANCE 600# RF CS 1.5 MM(MIN.) SIZE (NPS) SPCL REV ITEM NOTES SCH/ RAT END DESCRIPTION COMM CODE SWAGE (ECC) 1/2 - 11/2 PLN-THD ASTM A234 WPB-SMLS,MSS SP 95, NE7364500 VALVES FLG GATE VALVE 11/2 - 11/2 600# CS BODY ASTM A216 GR WCB, GAV212, **GAV212** F GATE VALVE 2 - 24 600# FLG CS BODY ASTM A216 GR WCB,GAV212, GAV212 GATE VALVE 1/2 -800# SOCW CS BODY ASTM A105,GAV201, GAV201 GATE VALVE 11/2 - 11/2 800# SOCW CS BODY ASTM A105,GAV201, GAV201 W GLOBE VALVE 1/2 - 11/2 SOCW CS BODY ASTM A105,GLV201, 800# GLV201 GLOBE VALVE 2 - 8 FLG CS BODY ASTM A216 GR WCB,GLV212, 600# GLV212 CHECK VALVE 1/2 - 11/2 800# SOCW CS BODY ASTM A105,CHV201, CHV201 CHECK VALVE 16 600# FLG CS BODY ASTM A216 GR WCB,CHV212, CHV212 BALL VALVE 4 - 24 600# FLG CS BODY ASTM A216 GR WCB,BAV222, BAV222 NEEDLE VALVE SS BODY ASTM A182 GR F316,NEV501, 1/2 - 1/2 800# SOCW NEV501

Project ::TFL DOC. No.TFL-PDS-600 Rev.:0

CLIENT : M/S..TFL
PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA

PDIL				LOCATIO	ON : TALCHER,ODISHA	Rev.:0	. 000
Clas	ss: F24S		PRO	JECTS AND	DEVELOPMENT INDIA LIMITED		
SERVICE		TEMPE	RATURE LIMI	rs (Deg.C)			
BB,BF,SM,SC (IBR)		Ref SI	Ref SI				
	_						
RATING ASME	CORROSION ALLOV	VANCE	MATERIAL				
600# RF	1.5 MM(MIN.)		CS				
ITEM	NOTES SIZE (	NPS)	SCH/ RAT	END	DESCRIPTION	COMM CODE	SPCL REV
PIPE							
PIPE	2 -	6	SCH 40	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	8 -	10	SCH 60	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	12 -	14	SCH 60	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	16 -	18	SCH 60	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	20 -	22	SCH 60	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	24 -	24	SCH 60	BE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03A1300	
PIPE	1/2 -	3/4	SCH 80	PE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03B1300	
PIPE	1 -	11/4	SCH 80	PE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03B1300	
PIPE	11/2 -		SCH 80	PE IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	PP03B1300	
	2	2	00.100	. 2 .5.1	CILLEY COM THE COURT OF THE COU	11 035 1300	
FLANGE LONG W.N.FLANGE	11/2 -	11/2	600#	WN-RF 125 AARH	CS ASTM A105,ASME B16.5,38mmBORE,200mmLONG	LN02G0803	
			-				
WNELANOE	110	24	6004	IBR	OC ACTM AAGE ACME DAGE WELD NEGY	140.000	_
W.N.FLANGE	1/2 -	24	600#	WN-RF 125 AARH	CS ASTM A105,ASME B16.5,WELD NECK	WN02G0803	D
				IBR			
W.N.FLANGE	1/2 -	24	600#	WN-RJ IBR	CS ASTM A105,ASME B16.5,WELD NECK	WN02W0803	R
SPACER AND BLIND	10 -	24	600#	RF 125 AARH IBR	CS ASTM A105,ASME B16.48,	RS02BPO03	
SPECL BLIND	1/2 -	8	600#	RF 125 AARH IBR	CS ASTM A105,ASME B16.48,	SP02BPO03	
BLIND FLAN	GE						
BLIND FLANGE	1/2 -	24	600#	RF 125 AARH IBR	CS ASTM A105,ASME B16.5,	BF02B0803	
GASKET							
GASKET	1/2 -	24	600#	SPRL-WND RF	TP304 SS WDG;GPH FLR;TP304 SS INR RNG;CS OTR RNG,ASME B16.2	0, GSQN30303	
STUD & NUT	S						
STUD & 2NUTS HVY	-				ASTM A193 GR.B7/ASTM A194 GR.2H,,	SNDE00000	
HEX							
	BW)			DW/ IDD	0400000077771 40047 004.0		
BRANCH WELD	2 -			BW IBR	CARBON STEEL, ASME B31.3,	RWOJA1200	
BRANCH WELD WITH	2 -	24		BW IBR	CARBON STEEL,ASME B31.3,	WBOJA1200	
RP	0	04		DWIDD	AOTH ACCALMIDE ONLO ACHE DACO		
CAP	2 -			BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	CP73A0900	
ELBOW	2 -			BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	EL73A0900	
REDUCER CONC.	2 -			BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	RC73A0900	
REDUCER ECC.	2 -	24		BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	RE73A0900	
TEE	2 -	24		BW IBR	ASTM A234 WPB-SMLS,ASME B16.9,	TE73A0900	
WELDOLET	2 -	24		BW IBR	CS ASTM A105,MSS SP 97,	WL02A3300	
•	SW)						
CAP	1/2 -	11/2	3000#	SOCW IBR	CS ASTM A105,ASME B16.11,	CP02C0207	W
COUPLING	1/2 -	11/2	3000#	SOCW IBR	CS ASTM A105,ASME B16.11,	CN02C0207	
ELBOW	1/2 -	11/2	3000#	SOCW IBR	CS ASTM A105,ASME B16.11,	EL02C0207	
HALF COUPLING	1/2 -	11/2	3000#	SOCW IBR	CS ASTM A105,ASME B16.11,	HF02C0207	
SOCKOLET	1/2 -	24	3000#	SOCW IBR	CS ASTM A105,MSS SP 97,	SL02C3307	
TEE	1/2 -	11/2	3000#	SOCW IBR	CS ASTM A105,ASME B16.11,	TE02C0207	
FITTING (T	HD)						
CAP	1/2 -	11/2	3000#	THD IBR	CS ASTM A105,ASME B16.11,	CP02D0207	T
PLUG	1/2 -	11/2		THD IBR	CS ASTM A105,ASME B16.11,ROUND HEAD	PG02D0200	
THREDOLET	1/2 -	24	3000#	THD IBR	CS ASTM A105,MSS SP 97,	TL02D3307	
NIPPLE							
NIPPLE	1/2 -	11/2	SCH160	PLN-PLN IBR	SMLS,ASTM A106 GR.B,ASME B36.10,	NP03E1312	1
NIPPLE	1/2 -	11/2	SCH160	PLN-THD IBR	SMLS,ASTM A106 GR.B,ASME B36.10,NPT	NP03F1312	2
NIPPLE	1/2 -	11/2	SCH160	THD IBR	SMLS,ASTM A106 GR.B,ASME B36.10,NPT	NP03D1312	3
SWAGE NIPE	PLE						
SWAGE (CONC)	1/2 -	11/2		PE IBR	ASTM A234 WPB-SMLS,MSS SP 95,	NC73Q4500	Р

PIPING MATERIAL SPECIFICATION CLIENT : M/S..TFL Project .: TFL PROJECT : AMMONIA/UREA COAL BASED FERTILIZER PROJECT.
LOCATION : TALCHER,ODISHA DOC. No.TFL-PDS-600 **PDIL** Rev.:0 Class: F24S PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) BB,BF,SM,SC (IBR) Ref SI Ref SI MATERIAL RATING ASME CORROSION ALLOWANCE 600# RF CS 1.5 MM(MIN.) SIZE (NPS) SPCL REV ITEM NOTES SCH/ RAT END DESCRIPTION COMM CODE ASTM A234 WPB-SMLS,MSS SP 95, SWAGE (CONC) 1/2 - 11/2 PLN-THD IBR NC73F4500 SWAGE (ECC) 1/2 - 11/2 PE IBR ASTM A234 WPB-SMLS,MSS SP 95, NE73Q4500 Р SWAGE (ECC) 1/2 - 11/2 PLN-THD IBR ASTM A234 WPB-SMLS,MSS SP 95, NE73F4500 Т VALVES GATE VALVE 1/2 - 1 800# SOCW IBR CS BODY ASTM A105,GAV202S, GAV202S GATE VALVE 11/2 - 11/2 800# SOCW IBR CS BODY ASTM A105, GAV202S, GAV202S W GATE VALVE 11/2 - 11/2 FLG IBR CS BODY ASTM A216 GR WCB,GAV212S, 600# GAV212S GATE VALVE 2 - 24 FLG IBR CS BODY ASTM A216 GR WCB, GAV212S, 600# GAV212S GLOBE VALVE 1/2 - 11/2 800# SOCW IBR CS BODY ASTM A105,GLV201S, GLV201S GLOBE VALVE 2 - 12 600# FLG IBR CS BODY ASTM A216 GR WCB,GLV212S, GLV212S CHECK VALVE 1/2 - 11/2 800# SOCW IBR CS BODY ASTM A105,CHV201S, CHV201S CHECK VALVE CS BODY ASTM A216 GR WCB,CHV212S, 2 - 16 600# FLG IBR CHV212S NEEDLE VALVE

SS BODY ASTM A182 GR F316,NEV501S,

NEV501S

1/2 - 1/2

800#

SOCW IBR

CLIENT : M/S..TFL

AMMONIA/UREA COAL BASED FERTILIZER PROJECT.

Project .: TFL

PROJECT DOC. No.TFL-PDS-600 LOCATION : TALCHER.ODISHA **PDIL** Rev.:0 Class: H24S PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) BB,BF,HS,SC (IBR) Ref SI Ref SI MATERIAL RATING ASME CORROSION ALLOWANCE 1500# RJ CS 1.5 MM(MIN.) ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 1/2 - 3/4 SCH160 PE IBR SMLS.ASTM A106 GR.B.ASME B36.10. PP03B1300 PIPE 1 - 11/4 SCH160 PE IBR SMLS.ASTM A106 GR.B.ASME B36.10. PP03B1300 PIPE 11/2 - 11/2 SMLS,ASTM A106 GR.B,ASME B36.10, SCH160 PE IBR PP03B1300 PIPE SCH160 BE IBR SMLS,ASTM A106 GR.B,ASME B36.10, PP03A1300 PIPE 4 -5 SCH120 BE IBR SMLS,ASTM A106 GR.B,ASME B36.10, PP03A1300 PIPE 6 -8 SCH120 BE IBR SMLS.ASTM A106 GR.B.ASME B36.10. PP03A1300 PIPE 12 BE IBR SMLS.ASTM A106 GR.B.ASME B36.10. 10 -SCH140 PP03A1300 SMLS,ASTM A106 GR.B,ASME B36.10, PIPE 14 -16 SCH140 BE IBR PP03A1300 PIPE 18 20 SCH140 BE IBR SMLS,ASTM A106 GR.B,ASME B36.10, PP03A1300 PIPE 22 - 24 SCH140 BE IBR SMLS,ASTM A106 GR.B,ASME B36.10, PP03A1300 FLANGE LONG W.N.FLANGE 11/2 - 11/2 1500# WN-RJ IBR CS ASTM A105, ASME B16.5, 38mmBORE, 200mmLONG LN02W0805 W.N.FLANGE 1/2 - 24 1500# WN-RJ IBR CS ASTM A105, ASME B16.5, WELD NECK WN02W0805 SPACER AND BLIND WN-RJ IBR 8 - 24 1500# CS ASTM A105, ASME B16.48, RS02WPO05 SPECL BLIND 1/2 1500# WN-RJ IBR CS ASTM A105,ASME B16.48, SP02WPO05 BLIND FLANGE 1/2 - 24 1500# WN-RJ IBR CS ASTM A105,ASME B16.5, BLIND FLANGE BF02W0805 GASKET GASKET 1/2 - 24 1500# **RJ OCT** SOFT IRON, ASME B16.20, GS7940305 STUD & NUTS STUD & 2NUTS HVY ASTM A193 GR.B7/ASTM A194 GR.2H. SNDE00000 HEX (BW) FITTING BRANCH WELD 2 - 24 BW IBR CARBON STEEL ASME B31.3. RWOJA1200 CARBON STEEL ASME B31.3. BRANCH WELD WITH 2 -24 BW IBR WBOJA1200 RP CAF 2 - 24 BW IBR ASTM A234 WPB-SMLS ASME B16.9. CP73A0900 ELBOW ASTM A234 WPB-SMLS.ASME B16.9. 24 BW IBR EL73A0900 REDUCER CONC. BW IBR ASTM A234 WPB-SMLS, ASME B16.9, 24 RC73A0900 REDUCER ECC. BW IBR ASTM A234 WPB-SMLS, ASME B16.9, RE73A0900 TEE 2 -24 BW IBR ASTM A234 WPB-SMLS,ASME B16.9, TE73A0900 WELDOLET 2 - 24 BW IBR CS ASTM A105,MSS SP 97, WL02A3300 FITTING (SW) 1/2 - 11/2 6000# SOCW IBR CS ASTM A105.ASME B16.11. CP02C0208 W COUPLING 1/2 - 11/2 6000# SOCW IBR CS ASTM A105,ASME B16.11, CN02C0208 1/2 - 11/2 ELBOW 6000# SOCW IBR CS ASTM A105,ASME B16.11, EL02C0208 HALF COUPLING 1/2 - 11/2 6000# SOCW IBR CS ASTM A105,ASME B16.11, HF02C0208 SOCKOLET 1/2 - 24 6000# SOCW IBR CS ASTM A105 MSS SP 97. SL02C3308 TEE 1/2 - 11/2 6000# SOCW IBR CS ASTM A105.ASME B16.11. TE02C0208 FITTING (THD) 1/2 - 11/2 6000# THD IBR CS ASTM A105,ASME B16.11, Т CP02D0208 CS ASTM A105,ASME B16.11,ROUND HEAD PLUG 1/2 - 11/2 THD IBR PG02D0200 THREDOLET 1/2 - 11/2 6000# THD IBR CS ASTM A105,MSS SP 97, TL02D3308 NIPPLE NIPPLE 1/2 - 11/2 SCHXXS PLN-PLN IBR SMLS, ASTM A106 GR.B, ASME B36.10. NP03E1314 NIPPLE 1/2 - 11/2 PLN-THD IBR SMLS,ASTM A106 GR.B,ASME B36.10,NPT SCHXXS NP03F1314 2 NIPPLE 1/2 - 11/2 SMLS,ASTM A106 GR.B,ASME B36.10,NPT SCHXXS THD IBR NP03D1314 3 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PE IBR ASTM A234 WPB-SMLS,MSS SP 95, NC73Q4500 Р 1/2 - 11/2 PLN-THD IBR ASTM A234 WPB-SMLS,MSS SP 95, SWAGE (CONC) NC73F4500 Т SWAGE (ECC) 1/2 - 11/2 PE IBR ASTM A234 WPB-SMLS,MSS SP 95. NE73Q4500 Р

शिPIN पो डी आई एल PDIL	SPECIFICATION CLIENT: M/STFL PROJECT: AMMONIA/UREA COAL BASED FERTILIZER PROJECT. LOCATION: TALCHER,ODISHA						Project .:TFL DOC. No.TFL-PDS-600 Rev.:0			
Clas	s: H24S				AND	DEVELOPMENT	INDIA LIMIT	ED		
SERVICE BB,BF,HS,SC (IBR)		TEMPERA	TURE LIMIT	S (Deg.C)						
188,81 ,110,00 (1811)		Ref SI	Ref SI							
RATING ASME 1500# RJ	CORROSION ALLOWAL 1.5 MM(MIN.)	NCE	MATERIAL CS							
ITEM	NOTES SIZE (NP:	I S) S	CH/ RAT	END		DESCRIPTION			COMM CODE	SPCL REV
SWAGE (ECC)	1/2 - 11/	2		PLN-THD I	BR	ASTM A234 WPB-SI	MLS,MSS SP 95,		NE73F4500	Т
VALVES										
GATE VALVE	1/2 - 1	15	500#	SOCW IBR	ł	CS BODY ASTM A10	05,GAV204S,		GAV204S	
GATE VALVE	11/2 - 2	4 15	500#	BW IBR		CS BODY ASTM A2	16 GR WCB,GAV216S		GAV216S	
GLOBE VALVE	1/2 - 1	15	500#	SOCW IBR	1	CS BODY ASTM A10	05,GLV204S,		GLV204S	
GLOBE VALVE	11/2 -	3 15	500#	BW IBR		CS BODY ASTM A2	16 GR WCB,GLV216S,		GLV216S	
CHECK VALVE	1/2 - 1	15	500#	SOCW IBR	1	CS BODY ASTM A10	05,CHV204S,		CHV204S	
CHECK VALVE	11/2 - 2	4 15	500#	BW IBR		CS BODY ASTM A2	16 GR WCB,CHV216S		CHV216S	
NEEDLE VALVE	1/2 - 1/3	2 15	500#	SOCW IBR	t	SS BODY ASTM A18	32 GR F316,NEV502S,		NEV502S	

CLIENT : M/S..TFL

AMMONIA/UREA COAL BASED FERTILIZER PROJECT.

Project .: TFL

DOC. No.TFL-PDS-600

PROJECT LOCATION : TALCHER.ODISHA **PDIL** Rev.:1 Class: J36S PROJECTS AND DEVELOPMENT INDIA LIMITED SERVICE TEMPERATURE LIMITS (Deg.C) SH,SC (IBR) Ref.SI Ref.SI MATERIAL RATING ASME CORROSION ALLOWANCE 2500#RJ 1.5 MM(MIN.) AS ITEM NOTES SIZE (NPS) SCH/ RAT END DESCRIPTION COMM CODE SPCL REV PIPE PIPE 1/2 - 3/4 SCHXXS PE IBR SMLS.ASTM A335 GR.P22.ASME B36.10. PP34B1300 PIPE 1 - 11/4 SCHXXS PE IBR SMLS.ASTM A335 GR.P22.ASME B36.10. PP34B1300 PIPE 11/2 - 11/2 SMLS,ASTM A335 GR.P22,ASME B36.10, SCHXXS PE IBR PP34B1300 PIPE SCHXXS BE IBR SMLS,ASTM A335 GR.P22,ASME B36.10, PP34A1300 PIPE 6 24.00 MM BE IBR SMLS, ASTM A335 GR. P22, ASME B36.10, 6 -PP34A1300 PIPE 8 -8 30.00 MM BE IBR SMLS.ASTM A335 GR.P22.ASME B36.10. PP34A1300 10 SMLS.ASTM A335 GR.P22.ASME B36.10. PIPE 10 -38.00 MM BE IBR PP34A1300 SMLS,ASTM A335 GR.P22,ASME B36.10, PIPE 12 12 44.00 MM BE IBR PP34A1300 PIPE 48.00 MM BE IBR SMLS,ASTM A335 GR.P22,ASME B36.10, PP34A1300 PIPE 16 16 55.00 MM BE IBR SMLS, ASTM A335 GR. P22, ASME B36.10, PP34A1300 PIPE 18 -18 62.00 MM BE IBR SMLS, ASTM A335 GR. P22, ASME B36.10, PP34A1300 PIPE 20 - 20 68.00 MM BE IBR SMLS.ASTM A335 GR.P22.ASME B36.10. PP34A1300 FLANGE WN-RJ IBR ASTM A182 F22,ASME B16.5,LONG WELD NECK LONG W.N.FLANGE 1/2 - 11/2 2500# LN05W0806 W.N.FLANGE 2500# WN-RJ IBR ASTM A182 F22,ASME B16.5,WELD NECK WN05W0806 SPACER AND BLIND 12 2500# WN-RJ IBR ASTM A182 F22, ASME B16.48, 6 -RS05WPO06 SPECL BLIND 1 -4 2500# WN-RJ IBR ASTM A182 F22, ASME B16.48, SP05WPO06 BLIND FLANGE BLIND FLANGE 1/2 - 12 2500# WN-RJ IBR ASTM A182 F22.ASME B16.5. BF05W0806 GASKET 1/2 - 12 2500# RJ OCT ASTM A182 F5.ASME B16.20. GASKET GSB340306 STUD & NUTS STUD & 2NUTS HVY ASTM A193 GR.B16/ASTM A194 GR.7,, SNB100000 HEX FITTING (BW) ALLOY STEEL, ASME B31.3, BRANCH WELD 2 - 20 BW IBR RWE3A1200 BRANCH WELD WITH 20 BW IBR ALLOY STEEL, ASME B31.3, WBE3A1200 RP CAP 2 - 20 BW IBR ASTM A234 WP22, ASME B16.9, CPD2A0900 ELBOW 20 BW IBR ASTM A234 WP22, ASME B16.9, ELD2A0900 REDUCER CONC. 20 BW IBR ASTM A234 WP22,ASME B16.9, RCD2A0900 REDUCER ECC. 2 - 20 BW IBR ASTM A234 WP22, ASME B16.9, RED2A0900 TEE ASTM A234 WP22.ASME B16.9. 2 - 20 BW IBR TED2A0900 WELDOLET BW IBR ASTM A182 F22,MSS SP 97, 2 - 20 WL05A3300 FITTING (SW) 1/2 - 11/2 ASTM A182 F22,ASME B16.11, 9000# SOCW IBR CP05C0209 W COUPLING 1/2 - 11/2 9000# SOCW IBR ASTM A182 F22,ASME B16.11, CN05C0209 **ELBOW** 1/2 - 11/2 9000# SOCW IBR ASTM A182 F22, ASME B16.11, EL05C0209 HALF COUPLING 1/2 - 11/2 9000# SOCW IBR ASTM A182 F22.ASME B16.11. HF05C0209 SOCKOLET 6000# ASTM A182 F22,MSS SP 97, 1/2 - 20 SOCW IBR SL05C3308 1/2 - 11/2 9000# SOCW IBR ASTM A182 F22,ASME B16.11, TE05C0209 FITTING (THD) 1/2 - 11/2 6000# THD IBR ASTM A182 F22,ASME B16.11, CAF CP05D0208 Т PLUG 1/2 - 11/2 THD IBR ASTM A182 F22, ASME B16.11, ROUND HEAD PG05D0200 THREDOLET 1/2 - 20 THD IBR ASTM A182 F22 MSS SP 97. 6000# TL05D3308 NIPPLE 1/2 - 11/2 SMLS,ASTM A335 GR.P22,ASME B36.10, NIPPLE SCHXXS PLN-PLN IBR NP34E1314 NIPPLE 1/2 - 11/2 SCHXXS PLN-THD IBR SMLS,ASTM A335 GR.P22,ASME B36.10,NPT NP34F1314 2 NIPPLE SCHXXS SMLS,ASTM A335 GR.P22,ASME B36.10,NPT 1/2 - 11/2 THD IBR NP34D1314 3 SWAGE NIPPLE SWAGE (CONC) 1/2 - 11/2 PE IBR ASTM A234 WP22,MSS SP 95 NCD2Q4500 Р

शिश पी डी आई एल <b>PDIL</b>	NG MATE	RIALS	SPECIFIC	CAT	ION	PR	ENT OJECT CATION	: M/STFL : AMMONIA/UREA : TALCHER,ODISH		RTILIZER PROJECT.	Project .:TFL DOC. No.TFL-PDS Rev.:1	S-600
Cla	ss: J36S				PRO	JECTS	AND D	EVELOPMENT	INDIA LIMITE	D		
SERVICE SH,SC (IBR)			TEMPE	TEMPERATURE LIMITS (Deg.C)		(Deg.C)						
30,30 (IDK)			Ref.SI		Ref.SI							
RATING ASME 2500#RJ	CORROSIOI 1.5 MM(MIN		NCE	MAT	TERIAL AS	·						
ITEM	NOTES	SIZE (NPS	S)	SCH/	RAT	END		DESCRIPTION			COMM CODE	SPCL REV
SWAGE (CONC)		1/2 - 11/	/2			PLN-THD IE	3R	ASTM A234 WP22,M	SS SP 95,		NCD2F4500	Т
SWAGE (ECC)		1/2 - 11/	/2			PE IBR		ASTM A234 WP22,M	SS SP 95,		NED2Q4500	Р
SWAGE (ECC)		1/2 - 11/	/2			PLN-THD IE	BR	ASTM A234 WP22,M	SS SP 95,		NED2F4500	T
VALVES												
GATE VALVE		1/2 - 1		2500#		SOCW IBR		CR-MO BODY ASTN	A182 GR F22,GAV305	5,	GAV305S	
GATE VALVE		11/2 - 11	/2	2500#		SOCW IBR		CR-MO BODY ASTM	A182 GR F22,GAV305	8,	GAV305S	W
GATE VALVE		11/2 - 11	/2	2500#		BW IBR		CR-MO BODY ASTM	A217 GR WC9,GAV326	S,	GAV326S	В
GATE VALVE		2 - 16	;	2500#		BW IBR		CR-MO BODY ASTM	A217 GR WC9,GAV326	S,	GAV326S	
GLOBE VALVE		1/2 - 11/	/2	2500#		SOCW IBR		CR-MO BODY ASTM	A182 GR F22,GLV3058	,	GLV305S	
GLOBE VALVE		2 - 8		2500#		BW IBR		CR-MO BODY ASTM	A217 GR WC9,GLV326	S,	GLV326S	
CHECK VALVE		1/2 - 11/	/2	2500#		SOCW IBR		CR-MO BODY ASTM	A182 GR F22,CHV3059	<b>)</b> ,	CHV305S	
CHECK VALVE		2 - 18	3	2500#		BW IBR		CR-MO BODY ASTM	A217 GR WC9,CHV326	S,	CHV326S	
NEEDLE VALVE		1/2 - 1/2	2	2500#		SOCW IBR		SS BODY ASTM A18	2 GR F316,NEV503S,		NEV503S	
:												



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TE

EQUAL TEE

WL WELDOLET

#### PROJECTS & DEVELOPMENT INDIA LTD

TFL-PDS-600	1
DOCUMENT NO	REV

BRANCH TABLE: TABLE-A1

APPLICABLE PIPING MATERIAL SPECIFICATIONS: B14, D14, B20, B22IS, B24, D24, B24S,

PRESSURE RATING <= 300#

B24Z

```
<----BRANCH
                                                                                           S I Z E-----
               3 1 1 2 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4 5 5 5 5 5
          \begin{smallmatrix} M & Q & 1 & Q & M & 2 & M & 3 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 
      МТ
    3Q E T
      1 E E T
    1Q
    1M E E E
                           Τ
      2 S S S
                         ET
    2M S S S
                         EET
      3 S S S
                         EEET
      4 S S S
                          SEEET
      6 S S S
                          SWWEET
      8 S S S
                         SWWWEET
    10 S S S
                         SWWWWEET
    12 S S S
                         SWWWWEET
    14 S S S
                         SWWWWWEET
    16 S S S
                         SWWWWWPEET
    18 S S S
                          SWWWWWPPEET
    20 S S S
                         SWWWWWPPPEET
    22 S S S
                          SWWWWWPPPPEET
    24 S S S
                          SWWWWWPPPPEET
    26 S S S
                          SPPPPPPPPPPEET
    28 S S S
                          SPPPPPPPPPPPEET
    30 S S S
                          SPPPPPPPPPPPPEET
    32 S S S
                          SPPPPPPPPPPPPEET
                           SPPPPPPPPPPPPPEET
    34 S S S
                           SPPPPPPPPPPPPPEET
    36 S S S
    38 S S S
                           SPPPPPPPPPPPPPPEET
    40 S S S
                           SPPPPPPPPPPPPPPPEET
                          SPPPPPPPPPPPPPPPPEET
    42 S S S
                          SPPPPPPPPPPPPPPPPPEET
    44 S S S
    46 S S S
                          SPPPPPPPPPPPPPPPPPPEET
                         SPPPPPPPPPPPPPPPPPPPEET
    48 S S S
    50
    52
    54
    56
    58
    A-
Ε
       TE
                 REDUCING TEE
Ρ
       WB
                 BRANCH WELD WITH RP
S
       SL
               SOCKOLET
```



# PROJECTS & DEVELOPMENT INDIA LTD

TFL-PDS-600	1
DOCUMENT NO	REV

BRANCH TABLE: TABLE-A2

APPLICABLE PIPING MATERIAL SPECIFICATIONS: B40,B50,B52,D50,D52.

PRESSURE RATING <=300#

```
3 1 1 2 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4 5 5 5 5 5
 M Q 1 Q M 2 M 3 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8
МТ
3Q E T
1 E E T
1Q
1M E E E
      Т
2 S S S
     ΕT
2M
3 S S S
      ΕE
          Т
4 S S S
     SE
         EΤ
6 S S S
     SP
         EET
8 S S S
     SP
         PEET
10 S S S
     SP
         PPEET
12 S S S
     SP
         PPPEET
14 S S S
     SP
         PPPPEET
16 S S S
         PPPPEET
     SP
18 S S S
     SP
         PPPPPEET
20 S S S
     SP
         PPPPPPEET
22 S S S
     SP
         PPPPPPPEET
24 S S S
     SP
         PPPPPPPEET
26 S S S
      SP
         PPPPPPPPEET
28 S S S
      SP
         PPPPPPPPPEET
30 S S S
      SP
         PPPPPPPPPPEET
32 S S S
     SP
         PPPPPPPPPPEET
34 S S S
         PPPPPPPPPPPEET
      SP
          PPPPPPPPPPPEET
36 S S S
      SP
38 S S S
      SP
          PPPPPPPPPPPPEET
40 S S S
      SP
          PPPPPPPPPPPPPEET
         PPPPPPPPPPPPPPPEET
42 S S S
      SP
         PPPPPPPPPPPPPPPEET
44 S S S
      SP
46 S S S
      SP
         PPPPPPPPPPPPPPPPEET
         PPPPPPPPPPPPPPPPPEET
     SP
48 S S S
50
52
54
56
58
A-
```

```
E TE REDUCING TEE
```

P WB BRANCH WELD WITH RP

S SL SOCKOLET

T TE EQUAL TEE



WL

WELDOLET

# PROJECTS & DEVELOPMENT INDIA LTD

TFL-PDS-600	1
DOCUMENT NO	REV

BRANCH TABLE: TABLE-A3

APPLICABLE PIPING MATERIAL

SPECIFICATIONS: F24, F24s, H24s, J36s

```
S I Z E---->
               <----B R A N C H
                   3 11 2 1111122222333334444455555
               \begin{smallmatrix} M & Q & 1 & Q & M & 2 & M & 3 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8 & 0 & 2 & 4 & 6 & 8
       МТ
      3Q E T
        1 E E T
     10
     1M E E E
                                     Τ
                                    ΕT
        2 S S S
      2M
        3 S S S
                                    ΕE
                                                       Τ
        4 S S S
                                    SE
                                                      ΕT
        6 S S S
                                    S W
                                                       E E T
        8 S S S
                                    S W
                                                       WEET
     10 S S S
                                    S W
                                                       WWEET
     12 S S S
                                    S W
                                                       WWWEET
     14 S S S
                                    S W
                                                       WWWWEET
     16 S S S
                                    S W
                                                       WWWWEET
     18 S S S
                                    S W
                                                       WWWWWEET
      20 S S S
                                    S W
                                                      WWWWWWEET
      22 S S S
                                    S W
                                                      WWWWWWEET
     24 S S S
                                    S W
                                                      WWWWWWWEET
     26 S S S
                                    S W
                                                      WWWWWWWEET
     28 S S S
                                   S W
                                                      WWWWWWWWEET
     30 S S S
                                                      WWWWWWWWEET
                                   S W
     32 S S S
                                                      WWWWWWWWWEET
                                  S W
     34 S S S
                                                      WWWWWWWWWWEET
                                  S W
     36 S S S
                                 SW WWWWWWWWWWWEET
     38
     40
     42
     44
     46
     48
     50
     52
     54
     56
     58
     A-
     {
m TE}
Ε
                     {
m TEE}
                     SOCKOLET
S
          SL
Т
          TE
                     TEE
```



# **PROJECTS & DEVELOPMENT INDIA LTD**

TFL-PDS-600	0
DOCUMENT NO	REV

BRANCH TABLE : TABLE-R1
APPLICABLE PIPING MATERIAL SPECIFICATIONS:B22G,B22ISG,B24G,B24RL,B24FL.
PRESSURE RATING <= 300#

```
3 1 1 2
 M Q 1 Q M 2 M 3 4 6 8 0 2
M
3Q
1
    Τ
1Q
   E T
1M
2
   E E T
2M
     ΕE
3
   \mathbf{E}
         Т
4
   E E E
         ΕT
6
   E EE EET
   E EE EEET
8
   E E P
         PEEET
10
12
   E EP PPEEET
A-
```

- E TE REDUCING TEE
- P WB BRANCH WELD WITH RP
- T TE EQUAL TEE



# **PROJECTS & DEVELOPMENT INDIA LTD**

TFL-PDS-600	0
DOCUMENT NO	REV

BRANCH TABLE : TABLE-R2
APPLICABLE PIPING MATERIAL SPECIFICATIONS: B24D, B24P.
PRESSURE RATING <= 300#

```
3 1 1 2 1 1
 M Q 1 Q M 2 M 3 4 6 8 0 2
 3Q
 1
 1Q
 1M
        Т
 2
 2M
           Т
 3
         \mathbf{E}
 4
           ΕT
         E
           EET
 6
         \mathbf{E}
 8
         E
           E E E T
 10
        E E E E T
 12
        E EEEET
```

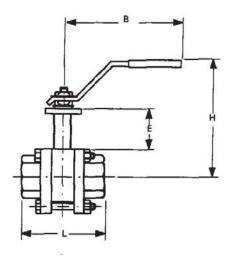
A-

E TE REDUCING TEE T TE EQUAL TEE

TFL-PDS-600	1
DOCUMENT NO	REV

# **VALVE DATA SHEETS**





ITEM NO	BAV	101
PRESSURE RATING CLASS	800	
FACE	sw	_
co	NSTRUCTION	A).≤
BODY	THREE PIECES T FULL BORE FLOATING BALL	
EXTENDED STEM	YES b)	
WRENCH OPERATED	YES	- 87
GEAR OPERATED	NO	
FIRE SAFE	YES	
NOMINAL SIZE	1/2" - 1 1/2"	
Adding the state of N	IATERIALS	
BODY	A 350 Gr. LF2	
BALL	AISI 316	
BODY SEAT RING	PTFE	
STEM PACKING	PTFE GRAPHITE	
STEM	13 Cr.	
DESIG	N CONDITIONS	
PRESSURE RATING	API 602	
FLUID	Kg/cm2g	°C

# DESIGN (ILLUSTRATIVE ONLY)

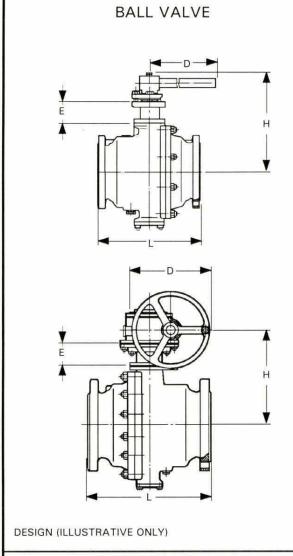
# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 602, API 607, API 608, ANSI B16.11, ANSI B16.34

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
- b) STEM EXTENSION E = 120MM (FOR MAX. 70MM COLD INSULATION)



ITEM NO	BAV	110		
PRESSURE RATING CLASS	150			
FACE	RF			
col	NSTRUCTION			
BODY	SPLIT BODY, F FLOATING BAL TRUN. MOUNT LONG PATTER	L = < 4" BALL > 4"		
EXTENDED STEM	YES b)			
WRENCH OPERATED	1 1/2" - 6"			
GEAR OPERATED	8" - 14"			
FIRE SAFE	YES			
NOMINAL SIZE	1 1/2" - 14"			
N	MATERIALS			
BODY	A 352 Gr. LCB			
BALL	AISI 316			
BODY SEAT RING	PTFE			
STEM PACKING	PTFE GRAPHITE			
STEM	13 Cr.			
DESIG	IN CONDITIONS			
PRESSURE RATING	ANSI B16.34			
FLUID	Kg/cm2g	°C		

# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2.
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

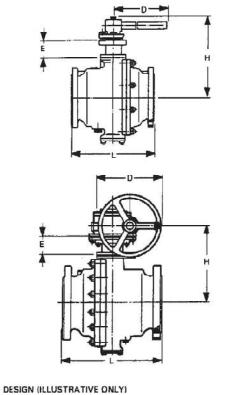
#### MANDATORY STANDARDS:

API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
- b) STEM EXTENSION E = 150mm (FOR MAX 100mm COLD INSULATION)

NOM. DIA.	INCH	1 1/2	2	3	4	6	8	10	12	14	16	18	20	24		
LENGTH L	mm															
Н	mm															
D	mm															
APPROX WT	Kg															





ITEM NO	BAV 111	
PRESSURE RATING CLASS	300	
FACE	RF	
CONST	RUCTION	
BODY	SPLIT BODY, FULL BO FLOATING BALL = < TRUM MOUNT RATE LONG PATTERN	4"
EXTENDED STEM	YES b)	1000
WRENCH OPERATED	1 1/2" - 6"	
GEAR OPERATED	8" - 14"	
FIRE SAFE	YES	
NOMINAL SIZE	1 1/2" - 14"	
MAT	ERIALS	
BODY	A 352 Gr. LCB	, Lin
BALL	AISI 316 OR C.S. CHROMEPLATED	,
BODY SEAT RING	PTFE	
STEM PACKING	PTFE GRAPHITE	
STEM	13 Cr.	
DESIGN C	ONDITIONS	
PRESSURE RATING	ANSI B16.34	_
FLUID	Kg/cm2g	C

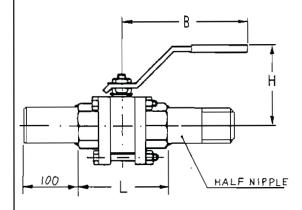
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

#### MANDATORY STANDARDS:

API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD b) STEM EXTENSION E = 150mm (FOR MAX 100mm COLD INSULATION)





800
SW b)
NSTRUCTION
THREE PIECES TYPE FULL BORE FLOATING BALL
NO
YES
NO
YES
1/2" - 1 1/2"
MATERIALS
A 105
AISI 316
PTFE
PTFE GRAPHITE
13 Cr.
N CONDITIONS
API 602
I

# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- $2\,$  if otherwise stated the valves shall be full bore

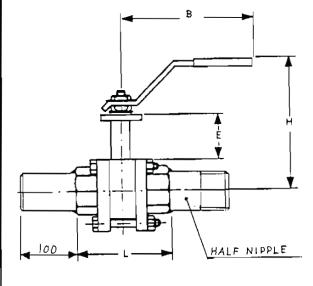
### MANDATORY STANDARDS:

DESIGN (ILLUSTRATIVE ONLY)

API 598, API 602, API 607, API 608, ANSI B16.11, ANSI B16.34

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
  b) VALVE PROVIDED WITH EXTENTED ENDS, 100mm LONG SCH 80/HALF NIPPLE





ITEM NO	BAV 202
PRESSURE RATING CLASS	800
FACE	SW c)
CONSTR	RUCTION
BODY	THREE PIECES TYPE FULL BORE FLOATING BALL
EXTENDED STEM	YES b)
WRENCH OPERATED	YES
GEAR OPERATED	NO
FIRE SAFE	YES
NOMINAL SIZE	1/2" - 1 1/2"
MATE	RIALS
BODY	A 105
BALL	AISI 316
BODY SEAT RING	PTFE
STEM PACKING	PTFE GRAPHITE
STEM	13 Cr.
DESIGN CO	ONDITIONS
PRESSURE RATING	API 602
	,

#### \_\_\_\_

DESIGN (ILLUSTRATIVE ONLY)

# 1. COPPER AND COPPER ALLOYS NOT PERMITTED

2 IF OTHERWISE STATED THE VALVES SHALL BE FULL BORE

# MANDATORY STANDARDS:

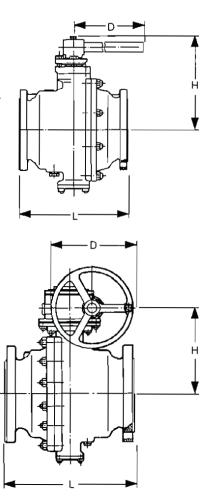
API 598, API 602, API 608, ANSI B16.11, ANSI B16.34

#### NOTES:

GENERAL

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
- b) STEM EXTENSION E = 120mm (FOR MAX. 70mm COLD INSULATION)
- c) VALVE PROVIDED WITH EXTENDED ENDS, 100mm LONG SCH 80/HALF NIPPLE





ITEM NO	BAV 210	
PRESSURE RATING CLASS	150	_
FACE		
FACE	RF	
COI	ISTRUCTION	
BODY	SPLIT BODY, FULL BOF FLOATING BALL = < 4' TRUN. MOUNT BALL > LONG PATTERN	•
EXTENDED STEM	NO	
WRENCH OPERATED	2" - 6"	
GEAR OPERATED	8" - 24"	
FIRE SAFE	YES	
NOMINAL SIZE	2" - 24"	
N	IATERIALS	
BODY	A 216 Gr. WCB	
BALL	AISI 316 OR C.S. CHROMEPLATED	
BODY SEAT RING	PTFE	
STEM PACKING	PTFE GRAPHITE	
STEM	13 Cr.	
	N CONDITIONS	_
PRESSURE RATING	ANSI B16.34	
FLUID	Kg/cm2g °C	_

# DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

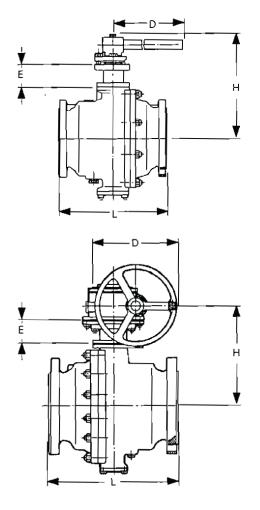
# MANDATORY STANDARDS:

API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

# NOTES:

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD





ITEM NO	BAV 211
PRESSURE RATING CLASS	300
FACE	RF
CON	STRUCTION
BODY	SPLIT BODY, FULL BORE FLOATING BALL = < 4" TRUN. MOUNT BALL > 4" LONG PATTERN
EXTENDED STEM	YES b)
WRENCH OPERATED	2" - 6"
GEAR OPERATED	8" - 12"
FIRE SAFE	YES
NOMINAL SIZE	2" - 12"
M	ATERIALS
BODY	A 216 Gr. WCB
BALL	AISI 316 OR C.S, CHROMEPLATED
BODY SEAT RING	PTFE
STEM PACKING	PTFE GRAPHITE
STEM	13 Cr.
DESIG	N CONDITIONS
PRESSURE RATING	ANSI B16.34

### DESIGN (ILLUSTRATIVE ONLY)

# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

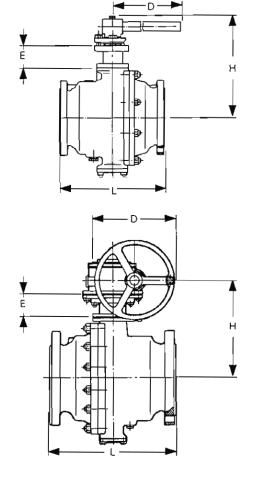
# MANDATORY STANDARDS:

API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
- b) STEM EXTENSION E = 120mm (FOR MAX 70mm COLD INSULATION)







ITEM NO	BAV 222
11200140	DAV 222
PRESSURE RATING CLASS	600
FACE	RF
CONS	TRUCTION
BODY	SPLIT BODY FULL BORE TRUNNION MOUNTED BALL LONG PATTERN
EXTENDED STEM	NO
WRENCH OPERATED	NO
GEAR OPERATED	YES
FIRE SAFE	YES
NOMINAL SIZE	8" - 24"
MA	TERIALS
BODY	A 216 Gr. WCB
BALL	A 351 Gr. CF 8M OR CS CHROMEPLATED
BODY SEAT RING	AISI 316 STELLITED
STEM PACKING	PTFE GRAPHITE
STEM	AISI 316
DESIGN	CONDITIONS
PRESSURE RATING	ANSI B16.34
FLUID	Kg/cm2g °C

# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2
- 3.IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

# MANDATORY STANDARDS:

DESIGN (ILLUSTRATIVE ONLY)

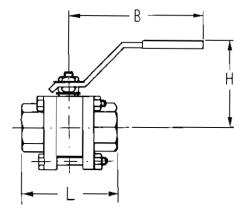
API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

#### NOTES:

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
- b) STEM EXTENSION E = 150 mm

rev.1





ITEM NO	BAV	501
PRESSURE RATING CLASS	800	
FACE	THREADED	(NPT)
CONS	STRUCTION	_
BODY	THREE PIEC FULL BORE FLOATING I	
EXTENDED STEM	NO	
WRENCH OPERATED	YES	
GEAR OPERATED	NO	_
FIRE SAFE	YES	
NOMINAL SIZE	1/2" - 1 1/2	."
MA	ATERIALS	
BODY	AISI 316	
BALL	AISI 316	
BODY SEAT RING	PTFE	
STEM PACKING	PTFE GRAPHITE	
STEM	AISI 316	
DESIGN	CONDITIONS	
PRESSURE RATING	API 602	

DESIGN (ILLUSTRATIVE ONLY)

# GENERAL

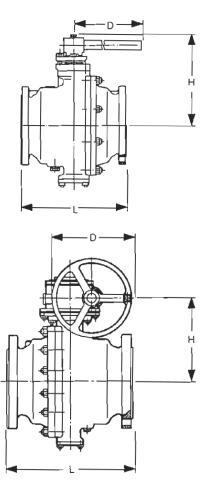
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 602, API 607, API 608, ANSI B16.11, ANSI B16.34

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
- b) BOTH ENDS FEMALE SCREWED





ITEM NO	BAV 510
PRESSURE RATING CLASS	150
FACE	RF
···	CONSTRUCTION
BODY	SPLIT BODY, FULL BORE, FLOATING BALL = < 4" TRUN. MOUNT BALL > 4" LONG PATTERN
EXTENDED STEM	NO
WRENCH OPERATED	2" - 6"
GEAR OPERATED	8" - 12"
FIRE SAFE	YES
NOMINAL SIZE	2" - 12"
	MATERIALS
BODY	A 351 Gr. CF 8M
BALL	AISI 316
BODY SEAT RING	PTFE
STEM PACKING	PTFE GRAPHITE
STEM	AISI 316
	SIGN CONDITIONS
	ANSI B16.34

DESIGN (ILLUSTRATIVE ONLY)

# 1. COPPER AND COPPER ALLOYS NOT PERMITTED

2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

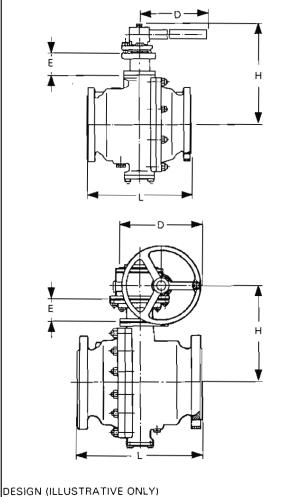
# NOTES:

GENERAL

a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD







ITEM NO	BAV 520
PRESSURE RATING CLASS	150
FACE	RF
COI	NSTRUCTION
BODY	SPLIT BODY FULL BORE TRUNNION MOUNTED BALL LONG PATTERN
EXTENDED STEM	NO
WRENCH OPERATED	NO
GEAR OPERATED	YES
FIRE SAFE	YES
NOMINAL SIZE	8" - 24"
N	MATERIALS
BODY	A 351 Gr. CF 8M
BALL	A 351 Gr. CF 8M or CS Chromeplated
BODY SEAT RING	AISI 316 STELLITED
STEM PACKING	PTFE GRAPHITE
STEM	AISI 316
DESIG	IN CONDITIONS
PRESSURE RATING	ANSI B16.34

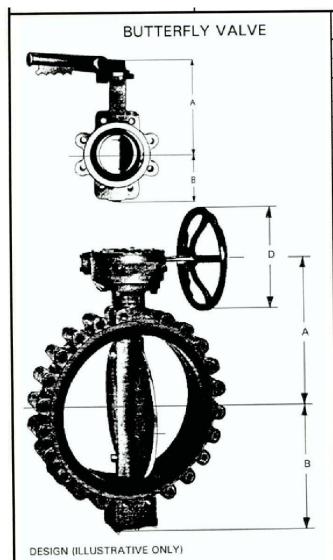
# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 607, API 608, ANSI B16.10, ANSI B16.34, ANSI B16.5

- a) SEAT RATING ACC. TO MANUFACTURER'S STANDARD
- b) STEM EXTENSION E = 150mm



ITEM NO	BUV	101
PRESSURE RATING CLASS	150	
FACE	RF	
CON	STRUCTION	
BODY	LUG TYPE WITH TI	HREADED HOLES
	METAL SEATER	
	CATEGORY "B	"
GEAR OPERATED	>= 8"	
GLAN OF ENATED		
NOMINAL SIZE	2" - 20"	
M	ATERIALS	
BODY	A 352 Gr. LCB	
BODY SEAT	A 182 F304	
DISC	AISI 304 STELLITED	
SHAFT	AISI 304	
SHAFT PACKING	GRAPHITE	
DESIG	N CONDITIONS	
PRESSURE RATING	ANSI B16.34	
FLUID	Kg/cm2g	°C
LIQUID LPG/PROPANE/BUTANE	3.5	- 45

# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED 2. FACE-TO-FACE DIMENSIONS SHALL BE PER API 609

# MANDATORY STANDARDS:

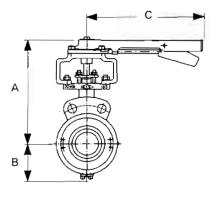
API 609, ANSI B16.34, ANSI B16.5

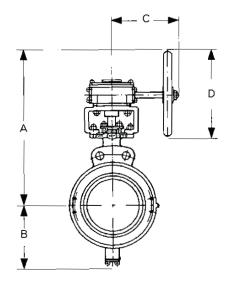
### NOTES:

a) EXTENDED SHAFT TO BE PROVIDED FOR VALVES WITH GEARBOX TO AVOID HEATING OF GEARBOX









ITEM NO	BUV 202
PRESSURE RATING CLASS	300
FACE	RF
CONSTR	RUCTION
BODY	WAFER TYPE
	METAL SEATED
	CATEGORY "B"
GEAR OPERATED	> = 8"
101111111111111111111111111111111111111	3" - 24"
NOMINAL SIZE	
MATE	RIALS
BODY	A 216 Gr. WCB
BODY SEAT	A 182 Gr. F6a
DISC	
DISC	A 216 Gr. WC8 HARD FACED
SHAFT	13 Cr.
SHAFT PACKING	
SHAFT FACKING	GRAFOIL
DESIGN CO	ONDITIONS
PRESSURE RATING	ANSI B16.34

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED 2. FACE-TO-FACE DIMENSIONS SHALL BE PER API 609

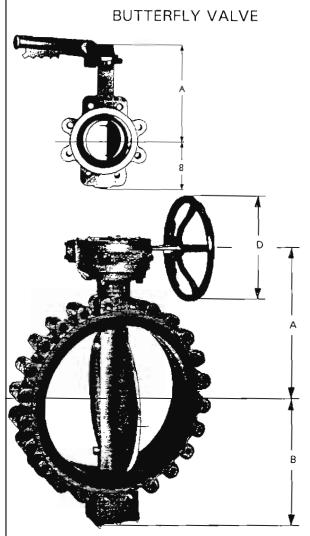
# MANDATORY STANDARDS:

API 609, ANSI B16.34, ANSI B16.5

#### NOTES:

a) EXTENDED SHAFT TO BE PROVIDED FOR VALVES WITH GEARBOX TO AVOID HEATING OF GEARBOX





ITEM NO	BUV 203
PRESSURE RATING CLASS	150
FACE	RF
CONSTR	RUCTION
BODY	CAST
	LUG TYPE WITH
	THREADED HOLES
	RUBBER LINED
GEAR OPERATED	YES > = 8"
NOMINAL SIZE	2" - 24"
MATE	RIALS
BODY	A 216 Gr. WCB
BODY LINING	ETHYLENE-PROPYLENE
DISC	A216 GR.WCB+
SHAFT	13 Cr
SHAFT PACKING	PTFE
DESIGN CO	ONDITIONS
PRESSURE RATING	API 609

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

- 1. RUBBER LINING: THE WETTED SURFACES OF VALVE SHALL BE FULLY LINED AND THE LINING SHALL EXTEND OVER THE FLANGE SEALING FACE
- 2. LEVER OPERATORS SUITABLE FOR THROTTLING PURPOSES SHALL BE PROVIDED FOR VALVES 6" AND SMALLER
- 3. FACE-TO-FACE DIMENSIONS SHALL BE PER API 609
- 4. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

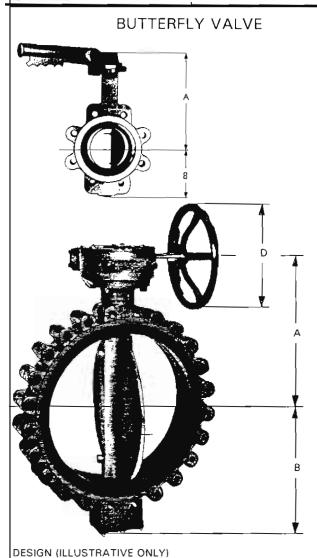
API 609, ANSI B16.5

#### NOTES:

a) THE VALVE SHALL BE DESIGNED FOR CLOSURE IN DEAD-END-PIPING

rev.1





	1	
ITEM NO	BUV 203	RL
PRESSURE RATING CLASS	150	
FACE	RF	
С	ONSTRUCTION	
80DY	CAST	
	LUG TYPE WITH	
	THREADED HOLES	
	RUBBER LINED	
CEAR OPERATED	1/50	
GEAR OPERATED	YES > = 8"	
NOMINAL SIZE	2" - 24"	
	MATERIALS	
BODY	A 216 Gr. WCB	
BODY LINING	ETHYLENE-PROPYLE	NE
DISC	A216 GR.WCB+ RUBBER LIN	IED rev.1
SHAFT	13 Cr	rev.
SHAFT PACKING	PTFE	
DES	IGN CONDITIONS	
PRESSURE RATING	API 609	

# GENERAL

- 1. RUBBER LINING: THE WETTED SURFACES OF VALVE SHALL BE FULLY LINED AND THE LINING SHALL EXTEND OVER THE FLANGE SEALING FACE
- 2. LEVER OPERATORS SUITABLE FOR THROTTLING PURPOSES SHALL BE PROVIDED FOR VALVES 6" AND SMALLER
- 3. FACE-TO-FACE DIMENSIONS SHALL BE PER API 609
- 4. COPPER AND COPPER ALLOYS NOT PERMITTED

#### MANDATORY STANDARDS:

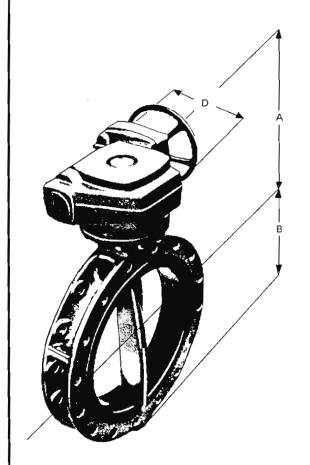
API 609, ANSI B16.5

#### NOTES:

a) THE VALVE SHALL BE DESIGNED FOR CLOSURE IN DEAD-END-PIPING

b)THIS VALVE SHALL BE RUBBERLINED FOR CORROSSIVE SERVICE.





ITEM NO	BUV 204
PRESSURE RATING CLASS	150
FACE	RF
СО	NSTRUCTION
BODY	FLANGED SHORT BODY
	FULL-DRILLED
	BOLTHOLES IN FLANGES
	RUBBER LINED
GEAR OPERATED	YES
TEAN OF CHAPES	11.3
NOMINAL SIZE	26" - 64"
ħ	MATERIALS
BODY	A 216 Gr. WCB
BODY LINING	ETHYLENE-PROPYLENE
DISC	A216 GR.WCB+ RUBBER LINED
SHAFT	13 Cr
SHAFT PACKING	PTFE
DESIG	SN CONDITIONS
PRESSURE RATING	ASME B16.47
	1.13.112.2.11

DESIGN (ILLUSTRATIVE ONLY)

### 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

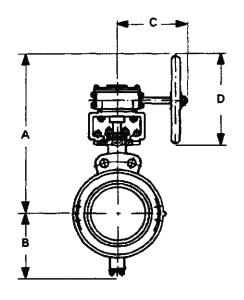
#### NOTES:

- a) THE VALVE SHALL BE DESIGNED FOR CLOSURE IN DEAD-END-PIPING
- b) FLANGES ACC. TO ASME B16.47 SERIES B

rev.1

ev.1





ITEM NO	BUV 410
PRESSURE RATING CLASS	150
FACE	RF
CONSTI	RUCTION
BODY	WAFER TYPE
	CATEGORY "B"
GEAR OPERATED	> = 8"
Opar or chartes	7-0
NOMINAL SIZE	6" - 48"
MATE	RIALS
BODY	A351 Gr.CF3M
BODY SEAT	REINFORCED PTFE a)
BODY SEAT  DISC	REINFORCED PTFE a) SS316L
DISC	
DISC	SS316L
DISC SHAFT SHAFT PACKING	SS316L A276 Gr.316L
DISC SHAFT SHAFT PACKING	SS316L A276 Gr.316L PTFE
DISC SHAFT SHAFT PACKING	SS316L A276 Gr.316L PTFE
DISC SHAFT SHAFT PACKING DESIGN CO	SS316L A276 Gr.316L PTFE  DNDITIONS
DISC SHAFT SHAFT PACKING DESIGN CO	SS316L A276 Gr.316L PTFE  DNDITIONS
DISC SHAFT SHAFT PACKING DESIGN CO	SS316L A276 Gr.316L PTFE  DNDITIONS

#### DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

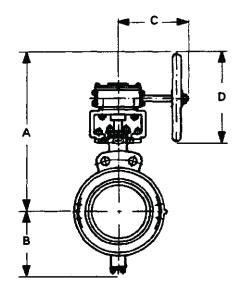
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. FASE-TO-FASE DIMENSIONS SHALL BE PER API 609

# MANDATORY STANDARDS:

API 609, ANSI B16.34, ANSI B16.47, ANSI B16.5

- a) MANUFACTURER MAY RECOMMEND ALTERNATIVE SEAT MATERIAL AND SEAT RATING SUBJECT TO PURCHASER APPROVAL
- b) FLANGES > 24" ACC. TO ASME B16.47 SERIES B





ITEM NO	BUV 411	
PRESSURE RATING CLASS	300	
FACE	RF	
CC	INSTRUCTION	
BODY	WAFER TYPE	
	CATEGORY "B"	
GEAR OPERATED	> = 8"	
NOMINAL SIZE	6" - 48"	
<del></del>	6" - 48"  MATERIALS	
BODY	<del></del>	
BODY SEAT	REINFORCED PTFE a	
	REINFONCED FIFE a	
DISC	SS316L	
SHAFT	A276 Gr.316L	
SHAFT PACKING	PTFE	
(DESI	GN CONDITIONS	
PRESSURE RATING	ANSI B16.34	

#### DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

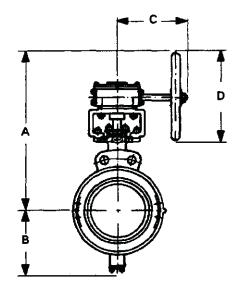
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. FASE-TO-FASE DIMENSIONS SHALL BE PER API 609

# MANDATORY STANDARDS:

API 609, ANSI B16.34, ANSI B16.47, ANSI B16.5

- a) MANUFACTURER MAY RECOMMEND ALTERNATIVE SEAT MATERIAL AND SEAT RATING SUBJECT TO PURCHASER APPROVAL
- b) FLANGES > 24" ACC. TO ASME B16.47 SERIES B





ITEM NO	BUV 510
PRESSURE RATING CLASS	150
FACE	RF
C	CONSTRUCTION
BODY	WAFER TYPE
	CATEGORY "B"
GEAR OPERATED	> = 8"
SEAR OPERATED	>=0
	<del></del>
NOMINAL SIZE	6" - 48"
	MATERIALS
BODY	A 351 Gr. CF8
BODY SEAT	REINFORCED PTFE a)
DISC	STAINLESS TYPE 304
SHAFT	A 276 Gr. 304
SHAFT PACKING	
SHAFI FACKING	PTFE
DES	GIGN CONDITIONS
PRESSURE RATING	ANSI B16.34

#### DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

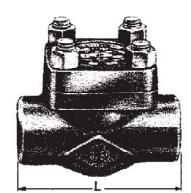
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. FASE-TO-FASE DIMENSIONS SHALL BE PER API 609

# MANDATORY STANDARDS:

API 609, ANSI B16.34, ANSI B16.47, ANSI B16.5

- a) MANUFACTURER MAY RECOMMEND ALTERNATIVE SEAT MATERIAL AND SEAT RATING SUBJECT TO PURCHASER APPROVAL
- b) FLANGES > 24" ACC. TO ASME B16.47 SERIES B





ITEM NO	CHV	101
PRESSURE RATING CLASS	800	
FACE	sw	
CONST	TRUCTION	
BODY	FORGED	Media
BONNET TO BODY CONNECTION	BOLTED	
SEAT RING	RENEWABLE	
TYPE DF DISC	BALL	
NOMINAL SIZE	1/2" - 1 1/2"	0.004
MAT	TERIALS	- 12
BODY	A 350 Gr. LF2	2
BODY SEAT RING	AISI 304	
DISC	AISI 304	
		-
DESIGN C	CONDITIONS	
PRESSURE RATING	API 602	
FLUID	Kg/cm2g	°C

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

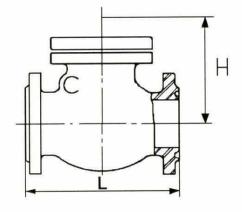
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
  2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B 16.34

# NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602



TEM NO	CHV 110
PRESSURE RATING CLASS	150
FACE	RF
CONS	TRUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
NOMINAL SIZE	2" - 24"
MA	TERIALS
BODY	A 352 Gr. LCB
BODY SEAT RING	AISI 304
DISC	AISI 304
HINGE PIN	AISI 304
DESIGN	CONDITIONS
PRESSURE RATING	ANSI B16.34
FLUID	Kg/cm2g
	5750
A Committee of the Comm	
2	

# GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

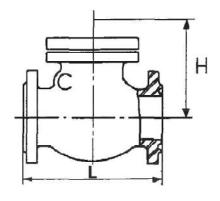
# MANDATORY STANDARDS:

DESIGN (ILLUSTRATIVE ONLY)

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOM. DIA.	INCH	2	3	4	6	8	10	12	14	16	18	20	24	1077	
LENGTH L	mm		V50452474654		0.061	15036									
Н	mm														
							1								-
															_
APPROX WT	Kg														1





ITEM NO	CHV	111				
PRESSURE RATING CLASS	300					
FACE	RF	RF				
CONS	TRUCTION					
BODY	CAST	-				
BONNET TO BODY CONNECTION	BOLTED					
SEAT RING	RENEWABLE					
TYPE OF DISC	SWING TYPE					
ACCESSORIES	NO					
BY PASS	NO					
NOMINAL SIZE	2" - 24"					
The state of the s	TERIALS	3-3				
BODY	A 352 Gr. LC	В				
BODY SEAT RING	AIS1 304					
DISC	AISI 304					
HINGE PIN	AISI 304					
	5					
DESIGN	CONDITIONS					
PRESSURE RATING	ANSI B16.34	<del></del>				
FLUID	Kg/cm2g	°C				
AMMONIA GAS	30	50/-33				
AMMONIA LIQUID	40	50/-33				
-						

# GENERAL

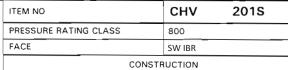
1. COPPER AND COPPER ALLOYS NOT PERMITTED

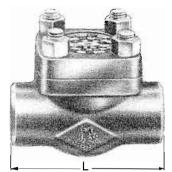
# MANDATORY STANDARDS:

DESIGN (ILLUSTRATIVE ONLY)

API 59B, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45







	000
FACE	SW IBR
CONST	RUCTION
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
CEAT DING	DENEMA DE E
SEAT RING	RENEWABLE
TYPE OF DISC	BALL
NOMINAL SIZE	1/2" - 1 1/2"
MAT	ERIALS
BODY	A 105
BODY SEAT RING	A 182 Gr. F6a
	STELLITED
DISC	13 Cr Stellited.
	!

DESIGN CONDITIONS

API 602

PRESSURE RATING

DESIGN (ILLUSTRATIVE ONLY)

### GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED 2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

#### MANDATORY STANDARDS:

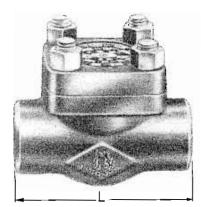
API 598, API 602, ANSI B16.11, ANSI B16.34

### NOTES:

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602 b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION  $\,$

rev.1





ITEM NO	<b>CHV</b> 201
PRESSURE RATING CLASS	800
FACE	SW
CONST	RUCTION
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	BALL
NOMINAL SIZE	1/2" - 1 1/2"
MAT	ERIALS
BODY	A 105
BODY SEAT RING	A 182 Gr. F6a STELLITED
DISC	A 182 Gr. F6a
DESIGN C	CONDITIONS
PRESSURE RATING	API 602
PRESSURE RATING	API 602

DESIGN (ILLUSTRATIVE ONLY)

### **GENERAL**

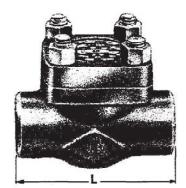
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED 2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B 16.34

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602





ITEM NO	CHV	2049				
PRESSURE RATING CLASS	1500					
FACE	sw					
CONS	TRUCTION					
BODY	FORGED					
BONNET TO BODY CONNECTION	BOLTED	BOLTED				
SEAT RING	RENEWABLE	_				
TYPE OF DISC	PISTON					
	<del> </del>					
NOMINAL SIZE	1/2" - 1"					
MA	TERFALS	7,70				
BODY	A 105					
BODY SEAT RING	A 182 Gr. F6a STELLITED	1				
DISC	A 182 Gr. F6a	1				
T. 4 28	4					
	4					
DESIGN	CONDITIONS	20 0100				
PRESSURE RATING	ANSI B16.34					

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

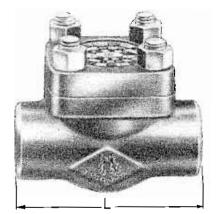
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
  2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602 b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	<b>CHV</b> 207
PRESSURE RATING CLASS	800
FACE	THD
CONST	RUCTION
BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	BALL
NOMINAL SIZE	1/2" - 1 1/2"
MATE	ERIALS
BODY	A 105
BODY SEAT RING	A 182 Gr. F6a STELLITED
DISC	A 182 Gr. F6a
DESIGN C	ONDITIONS
PRESSURE RATING	API 602
	<u> </u>

# DESIGN (ILLUSTRATIVE ONLY)

# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
  2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

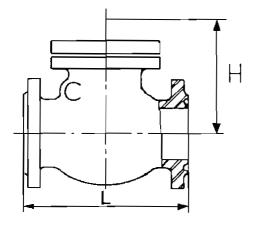
# MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B 16.34

# NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602





ITEM NO	CHV 210
PRESSURE RATING CLASS	150
FACE	RF
CONS	TRUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
	0.000
NOMINAL SIZE	2" - 24"
MA	TERIALS
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
DISC	A 216 Gr. WCB 13Cr. FACED
HINGE PIN	13 Cr.
DESIGN	CONDITIONS
PRESSURE RATING	ANSI B16.34

DESIGN (ILLUSTRATIVE ONLY)

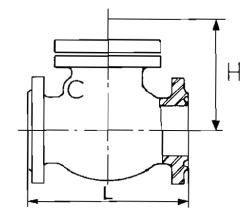
# GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV	210D
PRESSURE RATING CLASS	150	
FACE	RF	
CONST	RUCTION	
BODY	CAST	_
BONNET TO BODY CONNECTION	BOLTED	
SEAT RING	RENEWABLE	
TYPE OF DISC	SWING TYPE	
	011111111111111111111111111111111111111	
ACCESSORIES	NO	
BY-PASS	NO	
NOMINAL SIZE	2" - 24"	
	ERIALS	
IVIAI		
BODY		RUBBER LINED
		RUBBER LINED
BODY	A216 GR.WCB	СВ
BODY SEAT RING	A 105 STELLITED A 216 Gr. W	СВ
BODY BODY SEAT RING DISC	A 105 STELLITED A 216 Gr. W 13Cr. FACED	СВ
BODY BODY SEAT RING DISC	A 105 STELLITED A 216 Gr. W 13Cr. FACED	СВ
BODY BODY SEAT RING DISC HINGE PIN	A 105 STELLITED A 216 Gr. W 13Cr. FACED	СВ

# DESIGN (ILLUSTRATIVE ONLY)

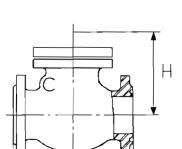
GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV	210S
PRESSURE RATING CLASS	150	
FACE	RF IBR	
CONST	RUCTION	
BODY	CAST	
BONNET TO BODY CONNECTION	BOLTED	
<u> </u>		

RENEWABLE

SWING TYPE

SEAT RING

TYPE OF DISC

ACCESSORIES NO
BY-PASS NO

NOMINAL SIZE 2" - 24"

MATERIALS

BODY A 216 Gr. WCB

BODY SEAT RING A105

STELLITED

DISC A 216 Gr. WCB
13Cr. FACED

HINGE PIN 13 Cr.

### DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

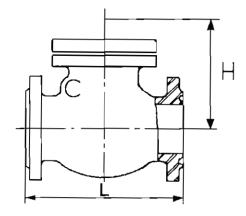
API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

#### NOTES:

a) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

rev.1





ITEM NO	CHV 211
PRESSURE RATING CLASS	300
FACE	RF
CONS	TRUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO -
BY-PASS	NO
NOMINAL SIZE	2" - 24"
	TERIALS
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
DISC	A 216 Gr. WCB 13 Cr. FACED
HINGE PIN	13 Cr.
	-
DESIGN	CONDITIONS
PRESSURE RATING	ANSI B16.34

DESIGN (ILLUSTRATIVE ONLY)

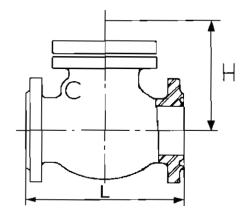
# GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV 212
PRESSURE RATING CLASS	600
FACE	RF
CONS	TRUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	RENEWABLE
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
NOMINAL SIZE	2" - 16"
MAI	TERIALS
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
DISC	A 216 Gr. WCB STELLITED
HINGE PIN	13 Cr.
DESIGN	CONDITIONS
PRESSURE RATING	ANSI B16.34
FLUID	Kg/cm2g °

# DESIGN (ILLUSTRATIVE ONLY)

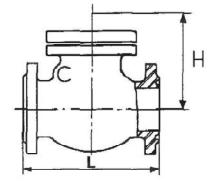
# GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV	2125			
PRESSURE RATING CLASS	600				
FACE	RF				
CON	STRUCTION				
BODY	CAST				
BONNET TO BODY CONNECTION	BOLTED				
SEAT RING	RENEWABL	E			
TYPE OF DISC	SWING TYP	'E			
ACCESSORIES	NO				
BY-PASS	NO				
NOMINAL SIZE	2" - 16"				
M/	TERIALS				
BODY	A 216 Gr. V	VCB			
BODY SEAT RING	A 182 Gr. F STELLITED	A 182 Gr. F6a STELUTED			
DISC	A 182 Gr. F	A 182 Gr. F6a STELLITED			
HINGE PIN	13 Cr.	- 100 m			
and the street of the street of	PT				
	3.73				
DESIGN	CONDITIONS	1.1-1			

#### DESIGN (ILLUSTRATIVE ONLY)

## GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

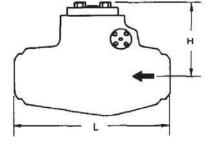
## MANDATORY STANDARDS:

API 598, API 600, ANSI 816.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

#### NOTES:

a) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	CHV	2168				
PRESSURE RATING CLASS	1500					
FACE	BW					
CONS	STRUCTION					
BODY	CAST a)					
BONNET TO BODY CONNECTION	PRESSURE	SEAL				
SEAT RING	WELDED					
TYPE OF DISC	SWING TYP	E				
ACCESSORIES	NO					
BY-PASS	NO					
NOMINAL SIZE	1 1/2" - 24'					
	TERIALS					
BODY	A 216 Gr. WCB					
BODY SEAT RING	A 105 STELLITED					
DISC	A 182 Gr. F STELLITED	6a				
HINGE PIN	13 Cr.					
DESIGN (	CONDITIONS	W.				
PRESSURE RATING	ANSI B16.34					

# DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

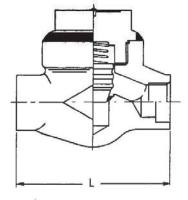
1. COPPER AND COPPER ALLOYS NOT PERMITTED

## MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

- a) END TO END DIMENSIONS SHALL BE SHORT PATTERN b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	CHV	305S					
PRESSURE RATING CLASS FACE  CON RODY RONNET TO BODY CONNECTION REAT RING PYPE OF DISC  ROMINAL SIZE  MA RODY RODY SEAT RING RISC	2500	<b>4</b>	_				
FACE	sw						
	TRUCTION						
BODY	FORGED						
BONNET TO BODY CONNECTION	WELDED						
SEAT PING	INTEGRAL						
	PISTON		-				
Tre or other tree and the second	/ ristore		-				
MONANAL CIZE	2/2" 1 2/2	m .	_				
	1/2" - 1 1/2		-				
	ATERIALS						
BODY	A 182 Gr. F22						
경투면 하시트라 마양에 발생하다 아트라와(아와) 네트라 중심했다	STELLITED						
DISC	A 182 Gr. F	6a	100				
	STELLITED		-				
			-				
DESIGN C	DNDITIONS	Fr Him					
	ANSI B16,34	4					

## DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

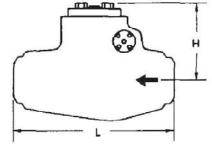
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

## MANDATDRY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B 16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	CHV	326S				
PRESSURE RATING CLASS	2500					
FACE	BW					
CONST	TRUCTION	RUCTION				
BODY	CAST a)					
BONNET TO BODY CONNECTION	PRESSURE	PRESSURE SEAL				
SEAT RING	WELDED					
TYPE OF DISC	SWING TY	PE				
ACCESSORIES	NO					
BY-PASS	NO					
NOMINAL SIZE	2" - 18"	NISA TELEVISION NEWSFILM				
MAT	ERIALS	12				
BODY	A 217 Gr. \	NC9				
BODY SEAT RING	A 182 Gr. F STELLITED	A 182 Gr. F22 STELLITED				
DISC	A 182 Gr. F	22				
HINGE PIN	13 Cr.					
	1					
DECEM	CONDITIONS	(4)				

# DESIGN (ILLUSTRATIVE ONLY)

## GENERAL

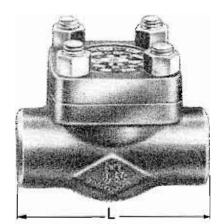
1. COPPER AND COPPER ALLOYS NOT PERMITTED

## MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

- a) END TO END DIMENSIONS SHALL BE SHORT PATTERN b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	CHV401	
PRESSURE RATING CLASS	800	
FACE	sw	
CONST	TRUCTION	1
BODY	FORGED	1
BONNET TO BODY CONNECTION	BOLTED	
SEAT RING	RENEWABLE	-
TYPE OF DISC	BALL	$\dashv$
		4
		$\dashv$
NOMINAL SIZE	1/2" - 1 1/2"	
MAT	TERIALS	
BODY	A182 Gr.F316L	rev
BODY SEAT RING	SS316L	rev
DISC	SS316L	rev
	-	╛
		4
		_
DESIGN (	CONDITIONS	
PRESSURE RATING	API 602	$\neg$

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

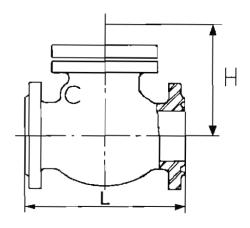
## MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B 16.34

## NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602





ITEM NO	CHV410	
PRESSURE RATING CLASS	150	
FACE	RF	
CONST	TRUCTION	
BODY	CAST	
BONNET TO BODY CONNECTION	BOLTED	
SEAT RING	INTEGRAL	
TYPE OF DISC	SWING TYPE	
ACCESSORIES	NO -	
BY-PASS	NO	
NOMINAL SIZE	2" - 24"	
	ERIALS	
BODY	A351 Gr.CF3M	r
BODY SEAT RING	SS316L	
DISC	SS316L	
HINGE PIN	SS316L	
DESIGN (	CONDITIONS	
PRESSURE RATING	ANSI B16.34	

## DESIGN (ILLUSTRATIVE ONLY)

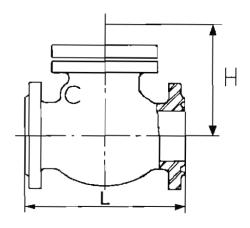
## GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV411	
PRESSURE RATING CLASS	300	
FACE	RF	
CONS	TRUCTION	
BODY	CAST	
BONNET TO BODY CONNECTION	BOLTED	
SEAT RING	INTEGRAL	-
TYPE OF DISC	SWING TYPE	
ACCESSORIES	NO	
BY-PASS	NO	
NOMINAL SIZE	2" - 24"	
MAT	TERIALS	
BODY	A351 Gr.CF3M	
BODY SEAT RING	SS316L	
DISC	SS316L	
HINGE PIN	SS316L	
DESIGN	CONDITIONS	
PRESSURE RATING	ANSI B16.34	

#### DESIGN (ILLUSTRATIVE ONLY)

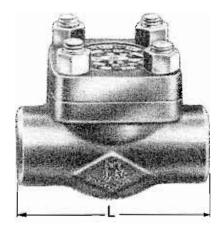
## GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV 5	01
PRESSURE RATING CLASS	800	
FACE	sw	
CONS	TRUCTION	
BODY	FORGED	
BONNET TO BODY CONNECTION	BOLTED	
	i	
SEAT RING	RENEWABLE	
TYPE OF DISC	BALL	<del>-</del>
	<del>-</del>	
	+	
NOMINAL SIZE	1/2" - 1 1/2"	
MAI	TERIALS	
BODY	A 182 Gr. F304	
BODY SEAT RING	AISI 304	
DISC	AISI 304	
		_
DESIGN (	CONDITIONS	
PRESSURE RATING	API 602	

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. IF NOT OTHERWISE STATED THE VALVE SHALL BE FULL BORE

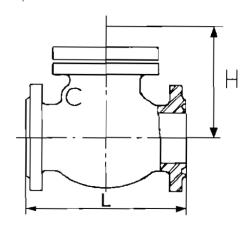
## MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B 16.34

## NOTES:

a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602





ITEM NO	CHV 510
PRESSURE RATING CLASS	150
FACE	RF
CONST	RUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
CEAT DIAIC	INITEGRAL
SEAT RING TYPE OF DISC	SWING TYPE
	SWING TYPE
ACCESSORIES	NO -
BY-PASS	NO
NOMINAL SIZE	2" - 24"
MAT	ERIALS
BODY	A 351 Gr. CF8
BODY SEAT RING	A 182 Gr. F304 OR INTERGRAL
DISC	AISI 304
HINGE PIN	A 276 Gr. 304
	<del>-</del>
DESIGN (	CONDITIONS
PRESSURE RATING	ANSI B16.34

## DESIGN (ILLUSTRATIVE ONLY)

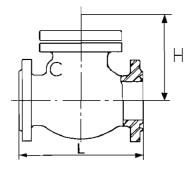
## GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV 511F
PRESSURE RATING CLASS	150
FACE	RF
CONST	RUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
SEAT RING	INTERGRAL
TYPE OF DISC	SWING TYPE
ACCESSORIES	NO
BY-PASS	NO
NOMINAL SIZE	2" - 24"
MAT	ERIALS
BODY	A 351 Gr. CF8M
BODY SEAT RING	INTEGRAL
DISC	AISI 316
HINGE PIN	A 276 Gr. 316
DESIGN C	ONDITIONS
PRESSURE RATING	ANSI B16.34

DESIGN (ILLUSTRATIVE ONLY)

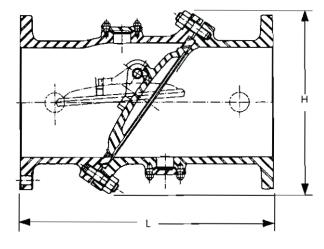
## GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

#### MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	CHV	520
PRESSURE RATING CLASS	150	
FACE	RF	
COI	NSTRUCTION	
BODY	CAST	
BODY CONNECTION	BOLTED	
SEAT RING	RENEWABL	F
TYPE OF DISC	TILTING DIS	
ACCESSORIES	NO	
BY-PASS	NO	
NOMINAL SIZE	26" - 36"	<del>_</del>
	MATERIALS	
BODY	A 351 Gr. 0	
BODY SEAT RING	A 182 Gr. F	304
DISC	A 351 Gr. (	CF8
HINGE PIN	A 276 Gr. 3	304
		<u> </u>
DESIG	IN CONDITIONS	
PRESSURE RATING	ANSI 816.3	34

DESIGN (ILLUSTRATIVE ONLY)

## GENERAL

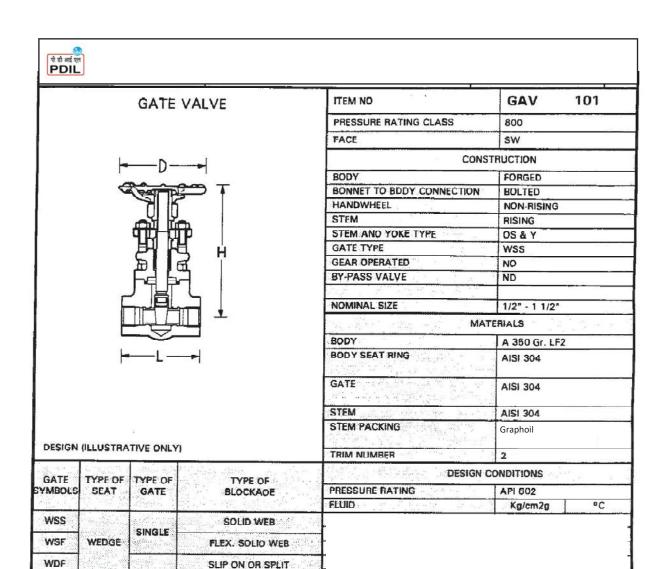
1. COPPER AND COPPER ALLOYS NOT PERMITTED

#### MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ASME B16.47 SERIES B

#### NOTES:

a) DIMENSIONS ACC. TO MANUFACTURERS STANDARD WITH REFERENCE TO ANSI B16.10



PDF

1. COPPER AND COPPER ALLOYS NOT PERMITTED

DOUBLE

2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN

FLEXIBLE

3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

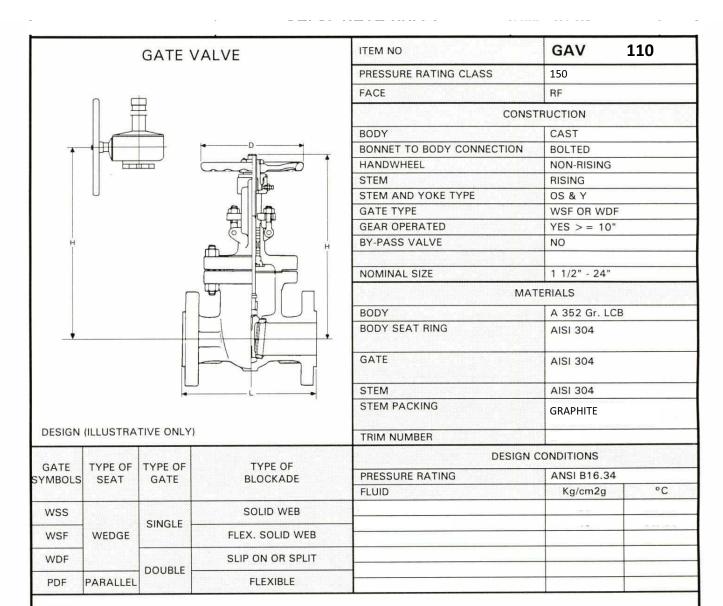
#### MANDATORY STANDARDS:

PARALLEL

API 598, API 602, ANSI 816.11, ANSI 816.34

#### NOTES:

a) LENGTH TO BE VERIFIED BY MANUFACTURER



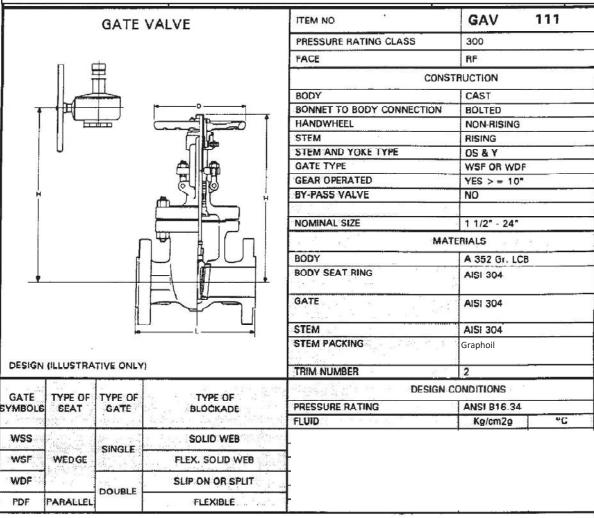
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
- 4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO API 600 AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOM. DIA.	INCH	1 1/2	2	3	4	6	8	10	12	14	16	18	20	24	28	32	36
LENGTH L	mm										varana.	Ambasa	- SYSAMILY				
H OPEN	mm																
H CLOSED	mm																
HANDWHEEL øD	mm																
APPROX WT	Kg																





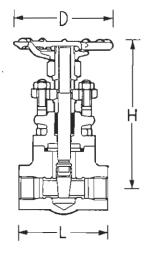
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
- 4. VALVES >= 10" AND >= 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO API 600 AND MSS-SP 46, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45



# GATE VALVE



ITEM NO	GAV	201
PRESSURE RATING CLASS	800	
FACE	sw	
CONSTR	RUCTION	
BODY	FORGED	

BODY	FORGED
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	NON-RISING
STEM (NO CASTING)	RISING
STEM AND YOKE TYPE	OS & Y
GATE TYPE	WSS
GEAR OPERATED	NO
BY-PASS VALVE	NO
	_
NOMINAL SIZE	1/2" - 1 1/2"
MAT	ERIALS

MATERIALS		
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

#### DESIGN (ILLUSTRATIVE ONLY)

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
wss		SINGLE	SOLID WEB
WSF	WEDGE	SINGLE	FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
PDF	PARALLEL	DOUBLE	FLEXIBLE

DESIGN CONDITIONS		
PRESSURE RATING	API 602	

8

## 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:

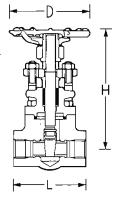
API 598, API 602, ANSI B16.11, ANSI B16.34

#### NOTES:

a) LENGTH TO BE VERIFIED BY MANUFACTURER



## **GATE VALVE**



ITEM NO	GAV	201S
PRESSURE RATING CLASS	800	
FACE	SW IBR	
CONST	RUCTION	
BODY	FORGED	
BONNET TO BODY CONNECTION BOLTED		
HANDWHEEL	NON-RISING	
STEM	RISING	
STEM AND YOKE TYPE	OS & Y	
GATE TYPE	wss	
GEAR OPERATED	RATED NO	
BY-PASS VALVE	NO	
NOMINAL SIZE	1/2" - 1 1/2"	
MATE	RIALS	
BODY	A 105	
BODY SEAT RING	A 182 Gr. F6a STELLITED	3
GATE	A 182 Gr. F6a	3

13 Cr.

8

GRAPHITE

## DESIGN (ILLUSTRATIVE ONLY)

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS	WEDGE	SINGLE	SOLID WEB
WSF		SHAGEE	FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
PDF	PARALLEL	DOOBLE	FLEXIBLE

	DESIGN CONDITIONS		
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

STEM

STEM PACKING

TRIM NUMBER

#### MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

#### NOTES:

- a) LENGTH TO BE VERIFIED BY MANUFACTURER b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

rev.1



#### ITEM NO GAV 202S **GATE VALVE** PRESSURE RATING CLASS 800 FACE CONSTRUCTION BODY FORGED BONNET TO BODY CONNECTION BOLTED HANDWHEEL NON-RISING STEM RISING STEM AND YOKE TYPE 05 & Y GATE TYPE WSS GEAR OPERATED NO **BY-PASS VALVE** NO NOMINAL SIZE 1/2" - 1 1/2" MATERIALS BODY A 105 BODY SEAT RING A 182 Gr. F6a STELLITED GATE A 182 Gr. F6a STELLITED STEM 13 Cr. STEM PACKING GRAPHOIL DESIGN (ILLUSTRATIVE ONLY) TRIM NUMBER **DESIGN CONDITIONS** GATE TYPE OF TYPE OF TYPE OF YMBOLS SEAT GATE PRESSURE RATING API 802 BLOCKADE WSS SOLID WEB SINGLE WSF WEDGE FLEX. SOLID WEB WDF SLIP ON OR SPLIT COUBLE PDF PARALLEL PLEXIBLE

#### 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 STANDAROS:

API 598, API 602, ANSI B16.11, ANSI B16.34

- a) LENGTH TO BE VERIFIED BY MANUFACTURER
- b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION



#### 2045 GAV ITEM NO **GATE VALVE** PRESSURE RATING CLASS 1500 FACE CONSTRUCTION FORGED BODY BONNET TO BODY CONNECTION WELDED HANDWHEEL NON-RISING STEM RISING STEM AND YOKE TYPE 05 & Y **GATE TYPE** WSS GEAR OPERATED NO BY-PASS VALVE NO NOMINAL SIZE 1/2" - 1" MATERIALS BODY A 105 BODY SEAT RING A 182 Gr. F6a STELLITED GATE A 182 Gr. F6a STELLITED STEM 13 Cr. STEM PACKING GRAPHOIL DESIGN (ILLUSTRATIVE ONLY) TRIM NUMBER DESIGN CONDITIONS TYPE OF TYPE OF GATE TYPE OF PRESSURE RATING ANSI 816.34 YMBOLS SEAT GATE BLOCKADE WSS SOLID WEB SINGLE WSF WEDGE FLEX. SOLID WEB WDF SUP ON OR SPLIT DOUBLE PDF PARALLEL FLEXIBLE

#### 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 816.11, ANSI 816.34

- a) LENGTH TO BE VERIFIED BY MANUFACTURER
- b) VALVE TO BE SUPPLIED WITH 18R CERTIFICATION



#### ITEM NO **GAV** 207 **GATE VALVE** PRESSURE RATING CLASS 800 THD **FACE** CONSTRUCTION BODY FORGED BONNET TO BODY CONNECTION BOLTED HANDWHEEL NON-RISING STEM (NO CASTING) **RISING** STEM AND YOKE TYPE OS & Y GATE TYPE WSS Η GEAR OPERATED NO BY-PASS VALVE NO NOMINAL SIZE 1/2" - 1 1/2" MATERIALS BODY A 105 **BODY SEAT RING** A 182 Gr. F6a STELLITED GATE A 182 Gr. F6a STEM 13 Cr. STEM PACKING GRAFOIL/GRAPHITE DESIGN (ILLUSTRATIVE ONLY) TRIM NUMBER 8 **DESIGN CONDITIONS** GATE TYPE OF TYPE OF TYPE OF PRESSURE RATING API 602 SYMBOLS SEAT GATE **BŁOCKADE** WSS SOLID WEB SINGLE WSF WEDGE FLEX. SOLID WEB WDF SLIP ON OR SPLIT DOUBLE PDF PARALLEL **FLEXIBLE**

## 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

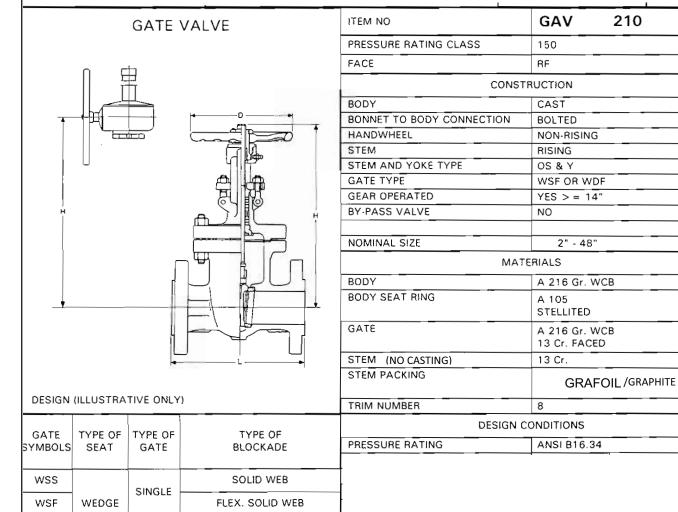
## MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

#### NOTES:

a) LENGTH TO BE VERIFIED BY MANUFACTURER





WDF

PDF

1. COPPER AND COPPER ALLOYS NOT PERMITTED

DOUBLE

2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN

SLIP ON OR SPLIT

**FLEXIBLE** 

- 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:

PARALLEL

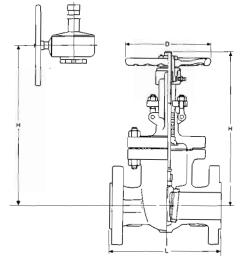
API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45, ASME B16.47

#### NOTES:

a) FLANGES > 24" ACC. TO ASME 816.47 SERIES B



#### **GATE VALVE**



ITEM NO	GAV 210S		
PRESSURE RATING CLASS	150		
FACE	RF IBR		
CONST	RUCTION		
BODY	CAST		
BONNET TO BODY CONNECTION	BOLTED		
HANDWHEEL	NON-RISING		
STEM RISING			
STEM AND YOKE TYPE	OS & Y		
GATE TYPE	WSF OR WDF c)		
GEAR OPERATED YES > = 14"			
BY-PASS VALVE NO			
NOMINAL SIZE	1 1/2" - 48"		
MATERIALS			
BODY	A 216 Gr. WCB		

A 216 Gr. WCB

A 105 STELLITED A 216 Gr. WCB 13 Cr. FACED

13 Cr.

8

GRAPHITE

DESIGN (ILLUSTRATIVE ONLY)

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS		SINGLE	SOLID WEB
WSF	WEDGE	SINGLE	FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
PDF	PARALLEL	DOOBLE	FLEXIBLE

	DESIGN CO	ONDITIONS
PRESSURE RATING		ANSI B16.34

BODY SEAT RING

STEM PACKING

TRIM NUMBER

GATE STEM

## 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
- b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION
  c) WSF IS ACCEPTABLE FOR SIZES < = 12" ONLY

rev.1



# **GATE VALVE** DESIGN (ILLUSTRATIVE ONLY)

ITEM NO	GAV 211	
PRESSURE RATING CLASS	300	
FACE	RF	
CONSTR	RUCTION	
BODY	CAST	
BONNET TO BODY CONNECTION	BOLTED	
HANDWHEEL	NON-RISING	
STEM	RISING	
STEM AND YOKE TYPE	OS & Y	
GATE TYPE	WSF OR WDF a)	
GEAR OPERATED	YES > = 10"	
BY-PASS VALVE	NO	
NOMINAL SIZE	2" - 24"	
MATE	ERIALS	
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	
DESIGN CO	ONDITIONS	
PRESSURE RATING	ANSI B16.34	

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS		SINGLE	SOLID WEB
WSF	WEDGE	SINGLE	FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT

#### GENERAL

PDF

1. COPPER AND COPPER ALLOYS NOT PERMITTED

FLEXIBLE

- 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:

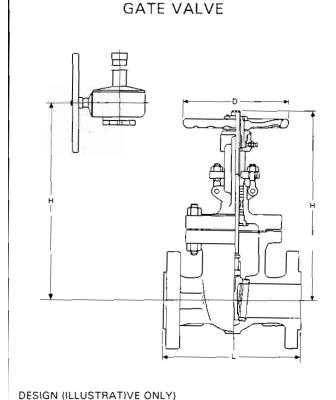
PARALLEL

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

## NOTES:

a) WSF IS ACCEPTABLE FOR SIZES < = 12" ONLY





ITEM NO	GAV 212			
PRESSURE RATING CLASS	600			
FACE	RF			
CONSTR	RUCTION			
BODY	CAST			
BONNET TO BODY CONNECTION	BOLTED			
HANDWHEEL	NON-RISING			
STEM	RISING			
STEM AND YOKE TYPE	OS & Y			
GATE TYPE	WSF OR WDF a)			
GEAR OPERATED	YES >= 8"			
BY-PASS VALVE	NO, SEE GEN, NOTE 4			
NOMINAL SIZE	1 1/2" - 24"			
MATE	RIALS			
BODY	A 216 Gr. WCB			
BODY SEAT RING	A 105			
	STELLITED			
GATE	A 216 Gr. WCB			
STEM	13 Cr.			
STEM PACKING	GRAFOIL			
TRIM NUMBER	8			
DESIGN CONDITIONS				

ANSI B16.34

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS		SINGLE	SOLID WEB
WSF	WEDGE		FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
PDF	PARALLEL	DOOBLE	FLEXIBLE

## 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

PRESSURE RATING

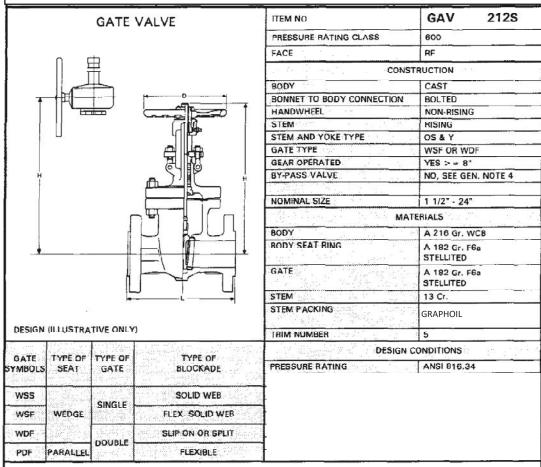
## MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

#### NOTES:

a) WSF IS ACCEPYABLE FOR SIZES < = 6" ONLY





- 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

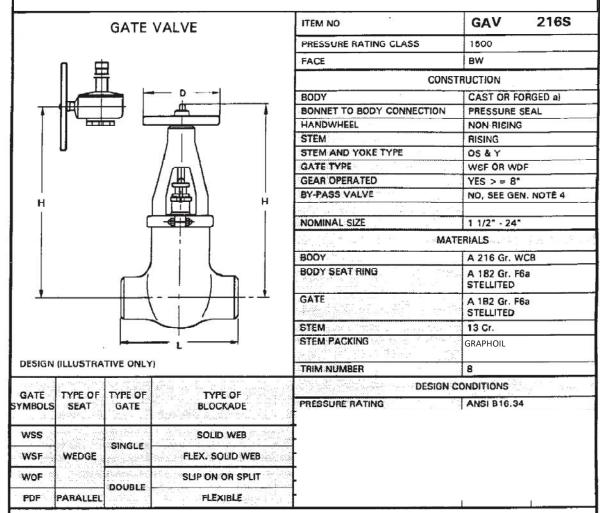
#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

#### NOTES:

a) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





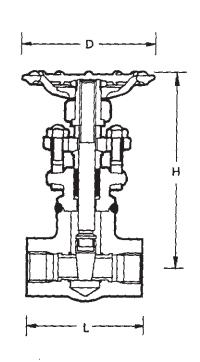
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
- 4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO API 600 AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

- 8) END TO END DIMENSION SHALL BE SHORT PATTERN
- b) VALVE TO BE SUPPLIED WITH IBR CERFITICATION
- c) VALVES > = 6" SHALL HAVE YOKE BUSHING THRUST BEARINGS





**GATE VALVE** 

ITEM NO	GAV	305S
PRESSURE RATING CLASS	2500	
FACE	sw	
CONST	RUCTION	
BODY	FORGED	
BONNET TO BODY CONNECTION	WELDED	
HANDWHEEL	NON-RISING	
STEM	RISING	
STEM AND YOKE TYPE	0S & Y	
GATE TYPE	WSS	
GEAR OPERATED	NO	

NO

5
DESIGN CONDITIONS

ANSI B16.34

1/2" - 1 1/2"

BODY	A 182 Gr. F22
BODY SEAT RING	A 182 Gr. F6a STELLITED
GATE	A 182 Gr. F6a STELLITED
STEM	13 Cr.
STEM PACKING	GRAPHOIL

MATERIALS

**BY-PASS VALVE** 

NOMINAL SIZE

TRIM NUMBER

PRESSURE RATING

#### DESIGN (ILLUSTRATIVE ONLY)

GATE SYMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
WSS		e (NA)	SOLID WEB
WSF	WEDGE	SINGLE	FLEX. SOLID WEB
WDF		DOUD! C	SLIP ON OR SPLIT
PDF	PARALLEL	DOUBLE	FLEXIBLE

#### 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

- a) LENGTH TO BE VERIFIED BY MANUFACTURER
- b) VALVE TO BE SUPPLIED WITH IBR CERFITICATION



#### 326S GAV ITEM NO. **GATE VALVE** 2500 PRESSURE RATING CLASS FACE BW CONSTRUCTION CAST OR FORGED a) BODY BONNET TO BODY CONNECTION PRESSURE SEAL HANDWHEEL NON-RISING STEM RISING STEM AND YOKE TYPE Q5 & Y **GATE TYPE** WSF OR WDF GEAR OPERATED YES > = 8" ND, SEE GEN. NOTE 4 BY-PASS VALVE н NOMINAL SIZE 1 1/2" - 16" MATERIALS BODY A 217 Gr. WC9 BODY SEAT RING A 182 Gr. F6a STELLITED GATE A 182 Gr. F6a STELLITED STEM 13 Cr. STEM PACKING GRAPHOIL DESIGN (ILLUSTRATIVE DNLY) TRIM NUMBER 5 DESIGN CONDITIONS TYPE OF TYPE OF GATE TYPE OF ANSI B16.34 PRESSURE RATING BLDCKADE SYMBOLS SEAT GATE WSS SOLIO WEB SINGLE WSF WEDGE FLEX. SOLID WEB WDF SLIP ON OR SPLIT DOUBLE FLEXIBLE PDF PARALLEL

#### 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

- a) END TO END DIMENSION SHALL BE SHORT PATTERN
- b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION
- c) VALVES > = 6" SHALL HAVE YOKE BUSHING THRUST BEARINGS



#### ITEM NO **GAV 401 GATE VALVE** PRESSURE RATING CLASS 800 FACE SW CONSTRUCTION BODY **FORGED** BONNET TO BODY CONNECTION **BOLTED** HANDWHEEL NON-RISING STEM RISING STEM AND YOKE TYPE OS & Y GATE TYPE WSS Н GEAR OPERATED NO BY-PASS VALVE NO NOMINAL SIZE 1/2" - 1 1/2" MATERIALS BODY A182 GR.F316L BODY SEAT RING A182 GR.F316L GATE A182 GR.F316L STEM A182 GR.F316L STEM PACKING GRAFOIL/GRAPHITE DESIGN (ILLUSTRATIVE ONLY) TRIM NUMBER 2 DESIGN CONDITIONS GATE TYPE OF TYPE OF TYPE OF API 602 PRESSURE RATING YMBOLS BLOCKADE SEAT GATE WSS SOLID WEB SINGLE WEDGE WSF FLEX. SOLID WEB SLIP ON OR SPLIT WDF DOUBLE PDF PARALLEL FLEXIBLE

#### 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

rev.1

rev.1



GATE VALVE

ITEM NO	GAV 410	
PRESSURE RATING CLASS	150	
FACE	RF	
CONST	RUCTION	
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" - 24"	
MAT	ERIALS	
BODY	A351 Gr.CF3M	
BODY SEAT RING	A182 Gr.F316L	
GATE	SS 316L	
STEM	SS 316L	
STEM PACKING	GRAFOIL/GRAPHITE	
TRIM NUMBER	2	
DESIGN C	CONDITIONS	

ANSI B16.34

## DESIGN (ILLUSTRATIVE ONLY)

GATE 'MBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE	PRESSURE RATING
wss		CINCLE	SOLID WEB	
WSF	WEDGE	SINGLE	FLEX. SOLID WEB	
WDF		DOUBL C	SLIP ON OR SPLIT	
PDF	PARALLEL	DOOBLE	FLEXIBLE	
	MBOLS WSS WSF	WSS WEDGE	WSS WEDGE DOUBLE	WSS WEDGE SINGLE SOLID WEB  WDF DOUBLE SLIP ON OR SPLIT

#### 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



GATE VALVE

GAV 411			
300	1		
RF	1		
RUCTION	1		
CAST	1		
BOLTED	1		
NON-RISING	1		
RISING	1		
OS & Y	1		
WSF OR WDF	1		
YES > = 14"			
NO	1		
2" - 24"			
MATERIALS			
A351 Gr.CF3M	rev.1		
A182 Gr.F316L	rev.1		
SS 316L	rev.1		
SS 316L	rev.1		
GRAFOIL/GRAPHITE			
2			
	300  RF  RUCTION  CAST  BOLTED  NON-RISING  RISING  OS & Y  WSF OR WDF  YES > ≡ 14"  NO  2" - 24"  ERIALS  A351 Gr.CF3M  A182 Gr.F316L  SS 316L  SS 316L  GRAFOIL /GRAPHITE		

**DESIGN CONDITIONS** 

ANSI B16.34

## DESIGN (ILLUSTRATIVE ONLY)

GATE YMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE	PRESSURE RATING
WSS		SINGLE	SOLID WEB	
WSF	WEDGE	Silvace	FLEX. SOLID WEB	1
WDF		DOUBLE	SLIP ON OR SPLIT	
PDF	PARALLEL	DOUBLE	FLEXIBLE	

#### 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



#### 501 GAV ITEM NO **GATE VALVE** PRESSURE RATING CLASS 800 FACE SW CONSTRUCTION BODY **FORGED** BONNET TO BODY CONNECTION **BOLTED** HANDWHEEL NON-RISING STEM RISING STEM AND YOKE TYPE OS & Y GATE TYPE WSS Н GEAR OPERATED NO BY-PASS VALVE NO NOMINAL SIZE 1/2" - 1 1/2" MATERIALS BODY A 182 Gr. F304 BODY SEAT RING A 182 Gr. F304 GATE A 182 Gr. F304 STEM A 276 Gr. 304 STEM PACKING GRAFOIL/GRAPHITE DESIGN (ILLUSTRATIVE ONLY) TRIM NUMBER 2 DESIGN CONDITIONS GATE TYPE OF TYPE OF TYPE OF PRESSURE RATING API 602 YMBOLS SEAT BLOCKADE GATE WSS SOLID WEB SINGLE WSF WEDGE FLEX. SOLID WEB SLIP ON OR SPLIT WDF DOUBLE PDF PARALLEL FLEXIBLE

#### 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

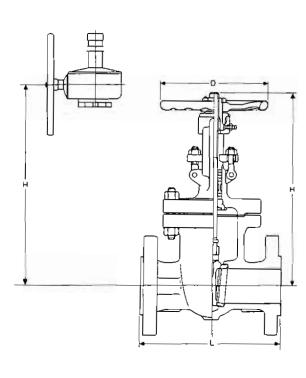
#### MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

#### NOTES:

a) LENGTH TO BE VERIFIED BY MANUFACTURER





**GATE VALVE** 

ITEM NO	GAV 510	
PRESSURE RATING CLASS	150	
FACE	RF	
CONSTR	RUCTION	
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" - 24"	
MATE	RIALS	
BODY	A 351 Gr. CF8	
BODY SEAT RING	A 182 Gr. F304	
GATE	AISI 304	
STEM	A 276 Gr. 304	
STEM PACKING	GRAFOIL/GRAPHITE	
TRIM NUMBER	2	
DESIGN CO	ONDITIONS	

ANSI B16.34

## DESIGN (ILLUSTRATIVE ONLY)

GATE YMBOLS	TYPE OF SEAT	TYPE OF GATE	TYPE OF BLOCKADE
wss	·	SINGLE	SOLID WEB
WSF	WEDGE	SINGLE	FLEX. SOLID WEB
WDF		DOUBLE	SLIP ON OR SPLIT
PDF	PARALLEL	DOOBLE	FLEXIBLE

## 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

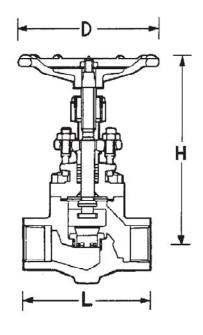
PRESSURE RATING

## MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45



## GLOBE VALVE



ITEM NO	GLV	101				
PRESSURE RATING CLASS	800					
FACE	sw	sw				
CONST	RUCTION					
BODY	FORGED					
BONNET TO BODY CONNECTION	BOLTED					
HANDWHEEL	RISING	RISING				
STEM	RISING					
STEM AND YOKE TYPE	OS & Y					
DISC TYPE	SWIVEL PLUG					
GEAR OPERATED	NO					
BY-PASS VALVE	NO	NO				
NOMINAL SIZE	1/2" - 1 1/2"					
MATI	ERIALS					
BODY	A 350 Gr. LF2					
BODY SEAT RING	AISI 304					
DISC	AISI 304					
STEM	AISI 304					
STEM PACKING	GRAPHOIL					
TRIM NUMBER						
DESIGN C	ONDITIONS					
PRESSURE RATING	API 602					

#### DESIGN (ILLUSTRATIVE ONLY)

## 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

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) LENGTH TO BE VERIFIED BY MANUFACTURER

#### 110 ITEM NO **GLV** GLOBE VALVE PRESSURE RATING CLASS 150 FACE RF CONSTRUCTION BODY CAST BONNET TO BODY CONNECTION BOLTED HANDWHEEL RISING STEM RISING STEM AND YOKE TYPE OS & Y DISC TYPE **PARABOLIC GEAR OPERATED** NO BY-PASS VALVE NO NOMINAL SIZE 2" - 8" MATERIALS BODY A 352 Gr. LCB **BODY SEAT RING** AISI 304 DISC AISI 304 STEM **AISI 304** STEM PACKING **GRAPHITE** TRIM NUMBER **DESIGN CONDITIONS** PRESSURE RATING ANSI B16.34 FLUID Kg/cm2g °C DESIGN (ILLUSTRATIVE ONLY) RATED Cv VALUES: (+-10%) 2" 4" 6" SIZE 3" 10" | 12" Cv 50 | 120 | 220 | 490 | 900 | 1400 | 2100

#### 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 ANSI B16.34 AND MSS-SP 45, LOCATION E-F

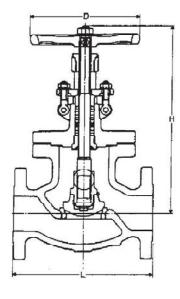
#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

NOM. DIA.			n Pullian			1				
LENGTH L	mm									
H OPEN	mm									
H CLOSED	mm									
HANDWHEEL øD	mm									
APPROX WT	Kg									



## **GLOBE VALVE**



ITEM NO	GLV 111						
PRESSURE RATING CLASS	300						
FACE	RF						
CONS	TRUCTION						
BODY	CAST						
BONNET TO BODY CONNECTION	BOLTED						
HANDWHEEL	RISING						
STEM	RISING						
STEM AND YOKE TYPE	OS & Y						
DISC TYPE	PARABOLIC						
GEAR OPERATED	ND						
BY-PASS VALVE	NO						
NOMINAL SIZE	2" - 8"						
MAT	TERIALS						
BODY	A 352 Gr. LCB						
BODY SEAT RING	AISI 304						
DISC	AISI 304						
STEM	AISI 304						
STEM PACKING	GRAPHOIL						
TRIM NUMBÉR							
DESIGN C	CONDITIONS						
PRESSURE RATING	ANSI B16.34						
FLUID	Kg/cm2g °C						

#### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

SIZE	2"	3"	4-	6"	8"	10"	12"	4. **
Cv	50	120	220	490	900	1400	2100	-

#### GENERAL

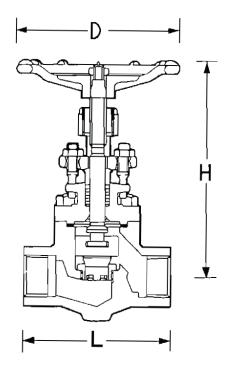
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY DPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
- 4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BDSSES FOR BY-PASS CONNECTION ACC. TO ANSI B16.34 AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45



## **GLOBE VALVE**



ITEM NO	GLV 201				
PRESSURE RATING CLASS	800				
FACE	sw				
CONS	TRUCTION				
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"				
MA	TERIALS				
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					
DESIGN	CONDITIONS				
PRESSURE RATING	API 602				

#### DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

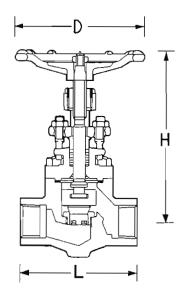
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

#### MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) LENGTH TO BE VERIFIED BY MANUFACTURER





ITEM NO	GLV	2018
PRESSURE RATING CLASS	800	
FACE	SW IBR	
CONSTR	RUCTION	
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"	
MATE	RIALS	
BODY	A 105	
BODY SEAT RING	A 182 Gr. F6a STELLITED	
DISC	A 182 Gr. F6a	
STEM	13 Cr.	
STEM PACKING	GRAPHITE	
TRIM NUMBER		
DESIGN CO	NDITIONS	
PRESSURE RATING	API 602	

DESIGN (ILLUSTRATIVE ONLY)

#### 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:

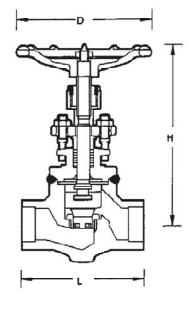
API 598, API 602, ANSI B16.11, ANSI B16.34

#### NOTES:

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602 b) LENGTH TO BE VERIFIED BY MANUFACTURER c) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

rev.1





ITEM NO	GLV	204S			
PRESSURE RATING CLASS	1500				
FACE	sw				
CONS	TRUCTION				
BODY	FORGED				
BONNET TO BODY CONNECTION	WELDED				
HANDWHEEL	RISING				
STEM	RISING				
STEM AND YOKE TYPE	OS & Y				
DISC TYPE	SWIVEL PLUG	i			
GEAR OPERATED	NO				
BY-PASS VALVE	NO				
NOMINAL SIZE	1/2" - 1 1/2"				
MA'	TERIALS				
BODY	A 105				
BODY SEAT RING	A 182 Gr. F6a STELLITED				
DISC	A 1B2 Gr. F6a STELLITED	1			
STEM	13 Cr.				
STEM PACKING	GRAPHOIL				
TRIM NUMBER					
DESIGN	CONDITIONS	1 = 2			
PRESSURE RATING	ANSI B16.34				

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

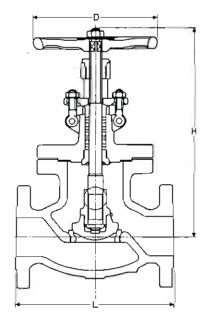
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
  2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
  3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

#### MANDATORY STANDARDS:

API 59B, API 602, ANSI B16.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) LENGTH TO BE VERIFIED BY MANUFACTURER
- c) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	GLV 210					
PRESSURE RATING CLASS	150					
FACE	RF					
CONST	RUCTION					
BODY	CAST					
BONNET TO BODY CONNECTION	BOLTED					
HANDWHEEL.	RISING					
STEM	RISING					
STEM AND YOKE TYPE	OS & Y					
DISC TYPE	PARABOLIC					
GEAR OPERATED	NO					
BY-PASS VALVE	NO					
NOMINAL SIZE	2" - 12"					
MATE	RIALS					
BODY	A 216 Gr. WCB					
BODY SEAT RING	A 105 STELLITED					
DISC	A 216 Gr. WCB 13 Cr. FACING					
STEM (NO CASTING)	13 Cr.					
STEM PACKING	GRAFOIL/GRAPHITE					
TRIM NUMBER						
DESIGN C	ONDITIONS					
PRESSURE RATING	ANSI B16.34					

#### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

SIZE	2"	3"	4"	6"	8"	10"	12"	
Cv	50	120	220	490	900	1400	2100	

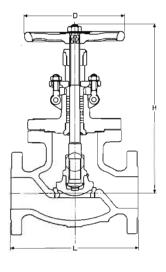
#### GENERAL

- 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 ANSI B16.34 AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	GLV	2105				
PRESSURE RATING CLASS	150					
FACE	RF IBR					
CONSTR	RUCTION					
BODY	CAST					
BONNET TO BODY CONNECTION	BOLTED					
HANDWHEEL	RISING					
STEM	RISING					
STEM AND YOKE TYPE	OS & Y					
DISC TYPE	PARABOLIC					
GEAR OPERATED	NO					
BY-PASS VALVE	NO					
NOMINAL SIZE	2" - 12"					
MATE	RIALS					
BODY	A 216 Gr. WC	В				
BODY SEAT RING	A 105 STELLITED	_				
DISC	A 216 Gr. WCB 13 Cr. FACING					
STEM	13 Cr.					
STEM PACKING	GRAPHITE					
TRIM NUMBER						
DESIGN CO	ONDITIONS					
PRESSURE RATING	ANSI B16.34					

#### DESIGN (ILLUSTRATIVE ONLY)

RATED CV	VALUES:	(+-10%)
----------	---------	---------

SIZE	2"	3"	4"	6"	8"	10"	12"	
Cv	50	120	220	490	900	1400	2100	

#### GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED

- 1. CUPPER 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 ANSI B16.34
  AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

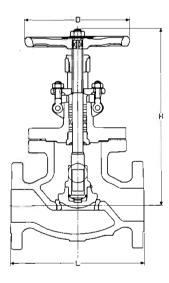
API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

#### NOTES:

a) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION

rev.1





<u> </u>						
ITEM NO	GLV 211					
PRESSURE RATING CLASS	300					
FACE	RF					
CONST	RUCTION					
BODY	CAST					
BONNET TO BODY CONNECTION	BOLTED					
HANDWHEEL	RISING					
STEM	RISING					
STEM AND YOKE TYPE	OS & Y					
DISC TYPE	PARABOLIC					
GEAR OPERATED	NO					
BY-PASS VALVE	NO					
NOMINAL SIZE	2" - 12"					
MAT	ERIALS					
BODY	A 216 Gr. WCB					
BODY SEAT RING	A 105 STELLITED					
DISC	A 216 Gr. WCB 13 Cr. FACING					
STEM (NO CASTING)	13 Cr.					
STEM PACKING	GRAFOIL					
TRIM NUMBER						
DESIGN C	ONDITIONS					
PRESSURE RATING	ANSI B16.34					
****						

#### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

SIZE	2"	3"	4"	6"	8"	10"	12"	
Cv	50	120	220	490	900	1400	2100	

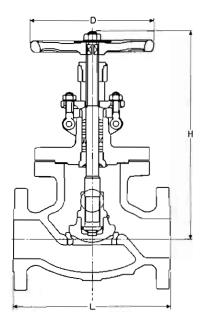
## GENERAL

- 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 ANSI B16.34 AND MSS-SP 45, LOCATION E-F

# MANDATORY STANDARDS:

API 598, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45





ITEM NO	GLV 212
PRESSURE RATING CLASS	600
FACE	RF
CONST	RUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
DISC TYPE	PARABOLIC
GEAR OPERATED	NO
BY-PASS VALVE	NO
NOMINAL SIZE	2" - 8"
MATE	ERIALS
BODY	A 216 Gr. WCB
BODY SEAT RING	A 105 STELLITED
DISC	A 216 Gr. WCB 13 Cr. FACING
STEM	13 Cr.
STEM PACKING	Grafoil
TRIM NUMBER	
DESIGN C	ONDITIONS
PRESSURE RATING	ANSI B16.34

#### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

					<del></del>			 ,
SIZE	2"	3"	4"	6"	8"	10"	12"	
Cv	50	120	220	490	900	1400	2100	Γ

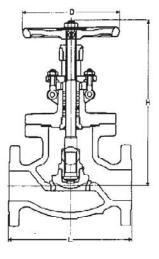
### GENERAL

- 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 ANSI B16.34 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





ITEM NO	GLV 212S				
PRESSURE RATING CLASS	600				
FACE	RF				
CONS	TRUCTION				
BODY	CAST				
BONNET TO BODY CONNECTION	BOLTED				
HANDWHEEL	RISING				
STEM	RISING				
STEM AND YOKE TYPE	OS & Y				
DISC TYPE	PARABOLIC				
GEAR OPERATED	NO				
BY-PASS VALVE	NO				
NOMINAL SIZE	2" - 8"				
MAT	TERIALS				
BODY	A 216 Gr. WCB				
BOOY SEAT RING	A 182 Gr. F6a STELLITED				
DISC.	A 182 Gr. F6a STELLITED				
STEM	13 Cr.				
STEM PACKING	GRAPHOIL				
TRIM NUMBER					
DESIGN (	CONDITIONS				
PRESSURE RATING	ANSI 816.34				

DESIGN (ILLUSTRATIVE ONLY)

RATED CV VALUES: (+-10%)

NATEL	LVVAL	ues.	TIL	701				
SIZE							12"	-
Cv	50	120	220	490	900	1400	2100	

#### GENERAL

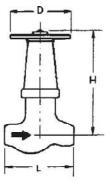
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
  2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
  3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
  4. VALVES > 10" AND > 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO ANSI B16.34 AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

a) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	GLV	2168		
PRESSURE RATING CLASS	1500			
FACE	BW			
CONS	TRUCTION			
BODY	CAST OR F	ORGED a)		
BONNET TO BODY CONNECTION	PRESSURE	SEAL c)		
HANDWHEEL	NON-RISIN	G c)		
STEM	RISING			
STEM AND YOKE TYPE	05 & Y			
DISC TYPE	PARABOLI	C		
GEAR OPERATED	YES > = 8	YES >= 8"		
BY PASS VALVE	NO			
NOMINAL SIZE	1 1/2" - 8"			
MA	ERIALS	1		
BODY	A 216 Gr.	WCB		
BODY SEAT RING	INTEGRAL STELLITED			
DISC	A 182 Gr. F6a STELLITED			
STEM	13 Cr.			
STEM PACKING	GRAPHOIL			
TRIM NUMBER				
DESIGN (	CONDITIONS			
PRESSURE RATING	ANSI 816.3	14		

#### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

SIZE	2*	3"	4"	6"	8"	11/2	
Cv	50	120	220	490	900	30	

#### GENERAL

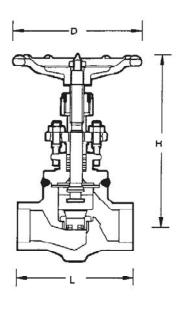
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
- 4. VALVES >= 10" AND >= 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO ANSI B16.34 AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

- a) END TO END DIMENSION SHALL BE SHORT PATTERN
- b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION
  c) WELDED BONNET AND RISING STEM ARE ACCEPTABLE FOR SIZE 1 1/2"
  d) VALVES > = 6" SHALL HAVE YOKE BUSHING THRUST BEARINGS





ITEM NO	GLV	305S			
PRESSURE RATING CLASS	2500				
FACE	sw				
CONS	TRUCTION				
BODY	FORGED	D 20			
BONNET TO BODY CONNECTION	WELDED				
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	n			
ALEN TELEVISION TO THE TARREST THE TARREST MAN	TERIALS				
BODY	A 182 Gr. F	22			
BODY SEAT RING	A 182 Gr. F6a STELLITED				
DISC	A 182 Gr. F6a STELLITED				
	13 Cr.	330000			
STEM	GRAPHOIL				
STEM STEM PACKING	GRAPHOIL				
	GRAPHOIL				
STEM PACKING TRIM NUMBER	GRAPHOIL	SAS= 14			

#### DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

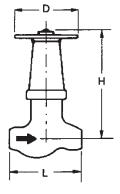
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

## MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602 b) LENGTH TO BE VERIFIED BY MANUFACTURER
- c) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	GLV 326S
PRESSURE RATING CLASS	2500
FACE	BW
CONS	TRUCTION
BODY	CAST OR FORGED a)
BDNNET TO BODY CONNECTION	PRESSURE SEAL
HANDWHEEL	NON-RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
DISC TYPE	PARABOLIC
GEAR OPERATED	NO
BY-PASS VALVE	NO
NOMINAL SIZE	2" - 4"
MA	TERIALS
BODY	A 217 Gr. WC9
BODY SEAT RING	INTEGRAL STELLITED
DISC	A 182 Gr. F6a STELLITED
STEM	13 Cr.
STEM PACKING	GRAPHOIL
TRIM NUMBER	
DESIGN	CONDITIONS
PRESSURE RATING	ANSI B16.34

#### **DESIGN (ILLUSTRATIVE ONLY)**

RATED C	/ VAL	UES: (	+-109	<b>%</b> }			
SIZE	2"	3*	4"	6"	8"		
Cv	50	120	220	490	900		

#### GENERAL

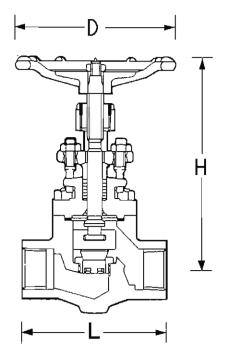
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE
- 4. VALVES > = 10" AND > = 600" RATING SHALL HAVE BOSSES FOR BY-PASS CONNECTION ACC. TO ANSI B16.34 AND MSS-SP 45, LOCATION E-F

#### MANDATORY STANDARDS:

API 598, API 600, ANSI B16.10, ANSI B16.34, ANSI B16.5, MSS-SP 45

- a) END TO END DIMENSION SHALL BE SHORT PATTERN
- b) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	<b>GLV</b> 401	
PRESSURE RATING CLASS	800	
FACE	sw	
CONST	TRUCTION	
BODY	FORGED	$\neg$
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"	
MAI	TERIALS	
BODY	A182 GR.F316L	
BODY SEAT RING	A182 GR.F316L	
DISC	A182 GR.F316L	
STEM	SS316L	
STEM PACKING	GRAFOIL	
TRIM NUMBER		
DESIGN	CONDITIONS	
PRESSURE RATING	API 602	

DESIGN (ILLUSTRATIVE ONLY)

# GENERAL

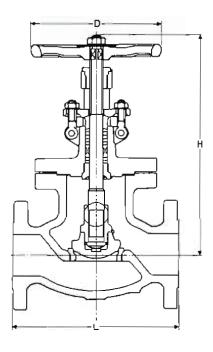
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

#### MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) LENGTH TO BE VERIFIED BY MANUFACTURER





ITEM NO	GLV 410	7
PRESSURE RATING CLASS	150	7
FACE	RF	7
CONST	RUCTION	7
BODY	CAST	┨
BONNET TO BODY CONNECTION	BOLTED	┨
HANDWHEEL	RISING	7
STEM	RISING	7
STEM AND YOKE TYPE	OS & Y	7
DISC TYPE	PARABOLIC	7
GEAR OPERATED	NO	7
BY-PASS VALVE	NO	7
		7
NOMINAL SIZE	2"-24"	7
MAT	ERIALS	7
BODY	A 351 GR.CF3M	rev.1
BODY SEAT RING	A182 GR.F316L	rev.1
7.00		4
DISC	AISI 316L	rev.1
STEM	,AISI 316L	rev.1
STEM PACKING	GRAFOIL	7
TRIM NUMBER		_
DESIGN C	CONDITIONS	7
PRESSURE RATING	ANSI B16.34	1
		_

#### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

SIZE	2"	3"	4"	6"	8"	10"	12"	
Cv	50	120	220	490	900	1400	2100	

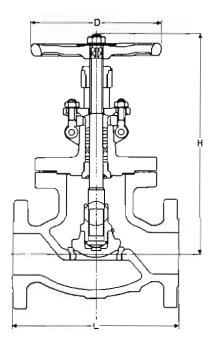
#### GENERAL

- 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 ANSI B16.34 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





ITEM NO	GLV411		
PRESSURE RATING CLASS	300		
FACE	RF		
CONSTR	RUCTION		
BODY	CAST		
BONNET TO BODY CONNECTION	BOLTED		
HANDWHEEL	RISING		
STEM	RISING		
STEM AND YOKE TYPE	OS & Y		
DISC TYPE	PARABOLIC		
GEAR OPERATED	NO		
BY-PASS VALVE	NO		
	-		
NOMINAL SIZE	2"-24"		
MATE	RIALS		
BODY	A 351 GR.CF3M		
BODY SEAT RING	A182 GR.F316L		
DISC	AISI 316L		
STEM	AISI 316L		
STEM PACKING	GRAFOIL		
TRIM NUMBER			
DESIGN CO	ONDITIONS		
PRESSURE RATING	ANSI B16.34		

### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

SIZE	2"	3"	4"	6"	8"	10"	12"	
Cv	50	120	220	490	900	1400	2100	

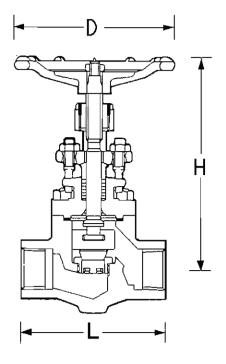
#### GENERAL

- 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 ANSI B16.34 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





ITEM NO	GLV 501				
PRESSURE RATING CLASS	800				
FACE	sw				
CONST	RUCTION				
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"				
MAT	ERIALS				
BODY	A 182 Gr. F304				
BODY SEAT RING	A 182 Gr. F304				
DISC	A 182 Gr. F304				
STEM	A 276 Gr. 304				
STEM PACKING	GRAFOIL				
TRIM NUMBER					
DESIGN C	ONDITIONS				
PRESSURE RATING	API 602				
	+				

DESIGN (ILLUSTRATIVE ONLY)

# GENERAL

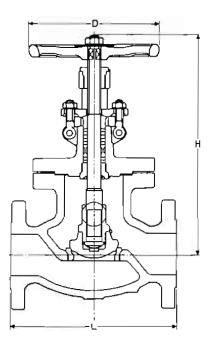
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

#### MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) LENGTH TO BE VERIFIED BY MANUFACTURER





ITEM NO	GLV 510
PRESSURE RATING CLASS	150
FACE	RF
CONSTR	RUCTION
BODY	CAST
BONNET TO BODY CONNECTION	BOLTED
HANDWHEEL	RISING
STEM	RISING
STEM AND YOKE TYPE	OS & Y
DISC TYPE	PARABOLIC
GEAR OPERATED	NO
BY-PASS VALVÉ	NO
NOMINAL SIZE	2" - 8"
MATE	RIALS
BODY	A 351 Gr. CF8
BODY SEAT RING	A 182 Gr. F304
DISC	AISI 304
STEM	A 276 Gr. 304
STEM PACKING	GRAFOIL
TRIM NUMBER	
DESIGN CO	ONDITIONS
PRESSURE RATING	ANSI B16.34

### DESIGN (ILLUSTRATIVE ONLY)

RATED Cv VALUES: (+-10%)

SIZE	2"	3"	4"	6"	8"	10"	12"	
Cv	50	120	220	490	900	1400	2100	

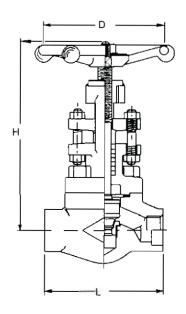
# GENERAL

- 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 ANSI B16.34 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





ITEM NO	NEV	501
PRESSURE RATING CLASS	800	
FACE	sw	
CONS	TRUCTION	
BODY	FORGED b)	
BONNET TO BODY CONNECTION	BOLTED	
HANDWHEEL	RISING	
STEM	RISING	
STEM AND YOKE TYPE	OS & Y	
DISC TYPE	SWIVEL NEEDL	E
GEAR OPERATED	NO	
BY-PASS VALVE	NO	
NOMINAL SIZE	1/2" - 1 1/2"	
MAT	TERIALS	
BODY	A 182 Gr. F31	6
BODY SEAT RING	INTEGRAL STELLITED	
DISC	A 182 Gr. F316 STELLITED	
STEM	A 276 Gr. 316	
STEM PACKING	GRAFOIL	
TRIM NUMBER		
DESIGN	CONDITIONS	
PRESSURE RATING	API 602	
FLUID	Kg/cm2g	٥(

DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

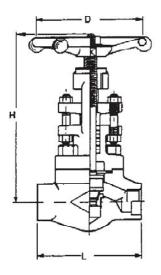
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

#### MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) REDUCED BORE (LOW VOLUME TYPE)





ITEM NO	NEV 501\$	
PRESSURE RATING CLASS	800	
FACE	sw	
ÇON	STRUCTION	
BODY	FORGED b)	
BONNET TO BODY CONNECTION	BOLTED	
HANDWHEEL	RISING	
STEM	RISING	
STEM AND YOKE TYPE	D5 & Y	
DISC TYPE	SWIVEL NEEDLE	
GEAR OPERATED	NO	
BY-PASS VALVE	NO	
NOMINAL SIZE	1/2" - 1 1/2"	
MA	TERIALS	
BODY	A 182 Gr. F316	
BODY SEAT RING	INTEGRAL STELLITED	
DISC	A 182 Gr. F316 STELLITED	
STEM	A 276 Gr. 316	
STEM PACKING	GRAPHOIL	
TRIM NUMBER		
DESIGN	CONDITIONS	
2201011	API 602	

DESIGN (ILLUSTRATIVE ONLY)

#### 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 8E FULL BORE

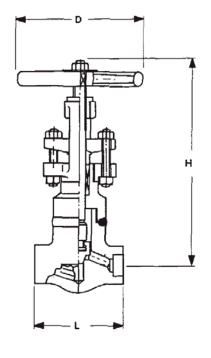
#### MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

#### NDTES:

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) REDUCED BORE (LOW VOLUME TYPE)
- c) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





ITEM NO	NEV	502S
PRESSURE RATING CLASS	1500	
FACE	sw	
CONS	TRUCTION	
BODY	FORGED b)	
BONNET TO BODY CONNECTION	WELDED	
HANDWHEEL	RISING	
STEM	RISING	
STEM AND YOKE TYPE	05 & Y	
DISC TYPE	SWIVEL NEE	DLE
GEAR OPERATED	NO	
BY-PASS VALVE	NO	
	1	
NOMINAL SIZE	1/2" - 1 1/2"	
MAT	ERIALS	
BODY	A 182 Gr. F3	316
BODY SEAT RING	INTEGRAL STELLITED	
DISC	A 182 Gr. F3 STELLITED	316
STEM	A 276 Gr. 31	16
STEM PACKING	GRAPHOIL	
TRIM NUMBER		
DESIGN (	CONDITIONS	
PRESSURE RATING	ANSI B16.34	ļ
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# GENERAL

DESIGN (ILLUSTRATIVE ONLY)

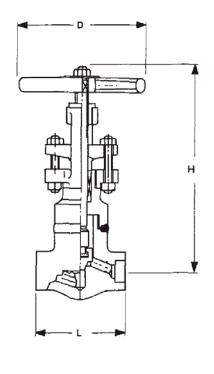
- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
  2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY OPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

# MANDATORY STANDARDS:

API 598, API 602, ANSI B16.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) REDUCED BORE (LOW VOLUME TYPE)
- c) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION





2500 SW RUCTION FORGED b) WELDED RISING RISING OS & Y SWIVEL NEEDLE NO
RUCTION  FORGED b)  WELDED  RISING  RISING  OS & Y  SWIVEL NEEDLE  NO
FORGED b) WELDED RISING RISING OS & Y SWIVEL NEEDLE NO
WELDED RISING RISING OS & Y SWIVEL NEEDLE NO
RISING RISING OS & Y SWIVEL NEEDLE NO
RISING OS & Y SWIVEL NEEDLE NO
OS & Y SWIVEL NEEDLE NO
SWIVEL NEEDLE NO
NO
1
NO
1
1/2" - 1 1/2"
ERIALS
A 182 Gr. F316
INTEGRAL STELLITED
A 182 Gr. F316 STELLITED
A 276 Gr. 316
GRAPHOIL
ONDITIONS
ANSI 816.34
-

# GENERAL

- 1. COPPER AND COPPER ALLOYS NOT PERMITTED
- 2. GLAND SHALL BE SUITABLE FOR REPACKING UNDER PRESSURE WHEN VALVE IS FULLY DPEN
- 3. IF NOT OTHERWISE STATED THE VALVES SHALL BE FULL BORE

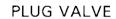
#### MANDATORY STANDARDS:

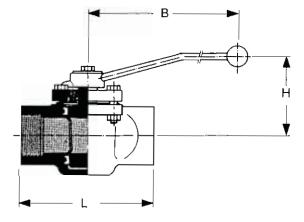
**DESIGN (ILLUSTRATIVE ONLY)** 

API 598, API 602, ANSI 816.11, ANSI B16.34

- a) VALVE DESIGN SHALL GENERALLY COMPLY WITH API 602
- b) REDUCED BORE (LOW VOLUME TYPE)
- c) VALVE TO BE SUPPLIED WITH IBR CERTIFICATION







ITEM NO	PLV 201		
PRESSURE RATING CLASS	600		
FACE	TREADED (NPT)		
CONST	RUCTION		
BODY	FULL BORE NON-LUBRICATED		
PLUG	TAPER PLUG		
WRENCH OPERATED	YES		
GEAR OPERATED	NO		
FIRE SAFE	NO		
NOMINAL SIZE	1/2" - 1"		
MATERIALS			
BODY	A 105 a)		
PLUG	A 105 CHROMEPLATED a)		
BODY SEAT RING	REINFORCED PTFE		
STEM PACKING	PTFE		
DESIGN CO	ONDITIONS		
PRESSURE RATING	ANSI 816.34		

# DESIGN (ILLUSTRATIVE ONLY)

#### GENERAL

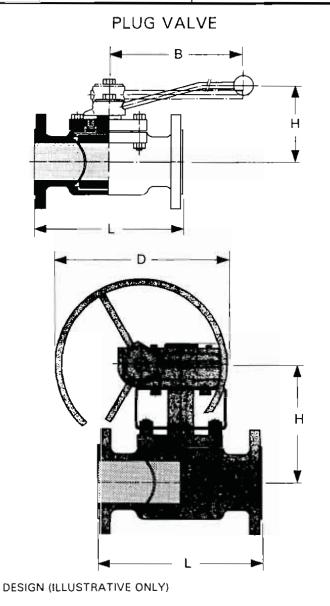
1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, API 6D, ANSI B16.11, ANSI B16.34

#### NOTES:





ITEM NO	PLV 202	
PRESSURE RATING CLASS	150	
FACE	RF	
CO	NSTRUCTION	
BODY	NON-LUBRICATED FULL BORE	
PLUG	TAPER PLUG	
WRENCH OPERATED	1 1/2" - 4"	
GEAR OPERATED	6"	
FIRE SAFE	NO	
NOMINAL SIZE	1 1/2" - 6"	
1	MATERIALS	
BODY	A 216 Gr. WCB	
PLUG	A 105 CHROMEPLATED a)	
BODY SEAT RING	REINFORCED PTFE	
STEM PACKING	PTFE	
DESIG		
PRESSURE RATING	ANSI B16.34	

# GENERAL

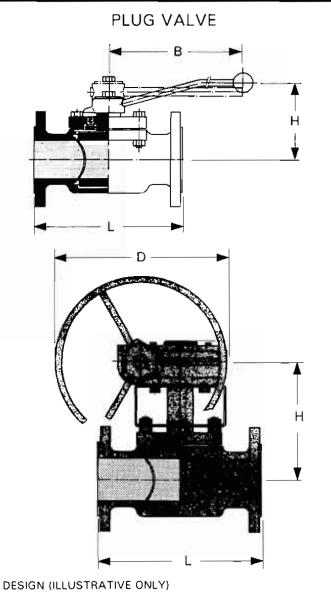
1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, API 599, ANSI B16.10, ANSI B16.5

#### NOTES





ITEM NO	PLV 205
PRESSURE RATING CLASS	300
FACE	RF
CONSTR	RUCTION
BODY	NON-LUBRICATED FULL BORE
PLUG	TAPER PLUG
WRENCH OPERATED	1 1/2" - 4"
GEAR OPERATED	6"
FIRE SAFE	NO
NOMINAL SIZE	1 1/2" - 6"
MATE	RIALS
BODY	A 216 Gr. WCB
PLUG	A 105 CHROMEPLATED a)
BODY SEAT RING	REINFORCED PTFE
STEM PACKING	PTFE
DESIGN CO	ONDITIONS
PRESSURE RATING	ANSI B16.34

# GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

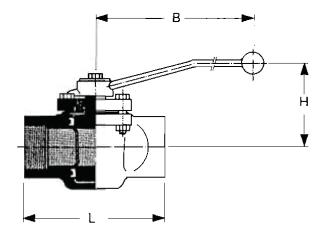
#### MANDATORY STANDARDS:

API 598, API 599, ANSI B16.10, ANSI B16.5

#### NOTES



# PLUG VALVE



ITEM NO	PLV 501			
PRESSURE RATING CLASS	600			
FACE	TREADED (NPT)			
CONSTR	RUCTION			
BODY	FULL BORE NON-LUBRICATED			
PLUG	TAPER PLUG			
WRENCH OPERATED	YES			
GEAR OPERATED	NO			
FIRE SAFE	NO			
NOMINAL SIZE	1/2" - 1"			
MATE	RIALS			
BODY	AISI 316			
PLUG	AISI 316			
BODY SEAT RING	REINFORCED PTFE			
STEM PACKING	PTFE			
DESIGN CO	ONDITIONS			
PRESSURE RATING	ANSI B16.34			

#### DESIGN (ILLUSTRATIVE ONLY)

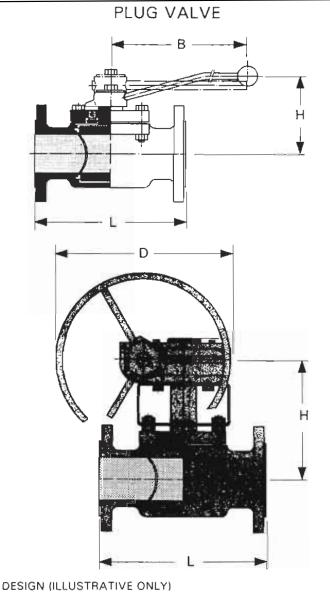
# GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, API 6D, ANSI B16.11, ANSI B16.34





ITEM NO	PLV 510			
PRESSURE RATING CLASS	150			
FACE	RF			
CONS	STRUCTION			
BODY	NON-LUBRICATED FULL BORE			
PLUG	TAPER PLUG			
WRENCH OPERATED	1 1/2" - 4"			
GEAR OPERATED	6"			
FIRE SAFE	NO			
NOMINAL SIZE	1 1/2" - 6"			
MA	ATERIALS			
BODY	A 351 Gr. CF8M			
PLUG	A 182 Gr. F316 a)			
BODY SEAT RING	REINFORCED PTFE			
STEM PACKING	PTFE			
DESIGN	CONDITIONS			
PRESSURE RATING	ANSI B16.34			

# GENERAL

1. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

API 598, API 599, ANSI B16.10, ANSI B16.5

## NOTES:



**GAV500C**: FLANGED GATE VALVE; 150#; CPVC BODY(ASTM F441); POLY PROPYLENE PLUG; EPDM SEALS; TAPERED CYLINDRICAL PLUG DESIGN; BOLTED BONNET; FLAT FACE; FLANGE DIMENSION AS PER ASME B16.1.

**CHV500C**: SOCKET WELD CHECK VALVE; 150#; H OR V; UNION OR BOLTED COVER; BALL TYPE CPVC BODY(ASTM F441); TRIM AS PER BODY MATERIAL; SOCKET WELD ENDS AS PER ASME B16.11 MANUFACTURER'S STANDARD CONSTRUCTION.

**BAV500C**: SOCKET WELD BALL VALVE; 150#; FLOATING BALL; FULL PORT; WRENCH OPERATED; CPVC BODY(ASTM F441); CPVC BALL; VITON O RING SEALS; SOCKET WELD ENDS AS PER ASME B16.11 MANUFACTURER'S STANDARD CONSTRUCTION.

**BAV501C**: FLANGED BALL VALVE; 150#; FLOATING BALL; FULL PORT; WRENCH OPERATED; CPVC BODY(ASTM F441); CPVC BALL; VITON O RING SEALS; FLAT FACE; FLANGE DIMENSION AS PER ASME B16.1; MANUFACTURER'S STANDARD CONSTRUCTION.

**DPV500:** DIAPHRAGM VALVE :150#; RUBBER DIAPHRAGM; FLANGED END; BODY ASTM A216GR.WCB RUBBER LINED; BONNET ASTM A216 GR.WCB; STEM/COMPRESSOR 13% CR.; MANUFACTURER'S STANDARD CONSTRUCTION.

**DPV501:** DIAPHRAGM VALVE:150#; RUBBER DIAPHRAGM; FLANGED END; BODY AUSTENITIC SS 304; BONNET SS304; STEM/COMPRESSOR SS304; MANUFACTURER'S STANDARD CONSTRUCTION.

rev.1

rev.1

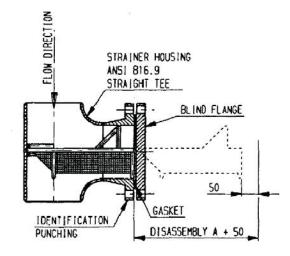


# **PROJECTS & DEVELOPMENT INDIA LTD**

TFL-PDS-600	0
DOCUMENT NO	REV

# **STRAINER DATA SHEETS**





ITEM NO	TTS 2	210
PRESSURE RATING CLASS	150	
FACE	RF	
CONST	RUCTION	
BODY	CAST	
BODY TO BONNET CONNECTION	BOLTED	
STRAINER	PERFORATED PL	ATE
STRAINER HOLES, SIZE	Ø 1,5 MM	
NOS STRAINER HOLES / SQ.CM	18	
BLOW OFF CONNECTION	NOTE 1	
NOMINAL SIZE	2" - 24"	
MAT	ERIALS	
BODY	A 216 Gr. WCB	
STRAINER	AISI 304	
DESIGN C	CONDITIONS	
PRESSURE RATING	ASME 816.34	
FLUID .	Kg/cm2g	•c
	<del>  </del>	

# GENERAL

DESIGN (ILLUSTRATIVE ONLY)

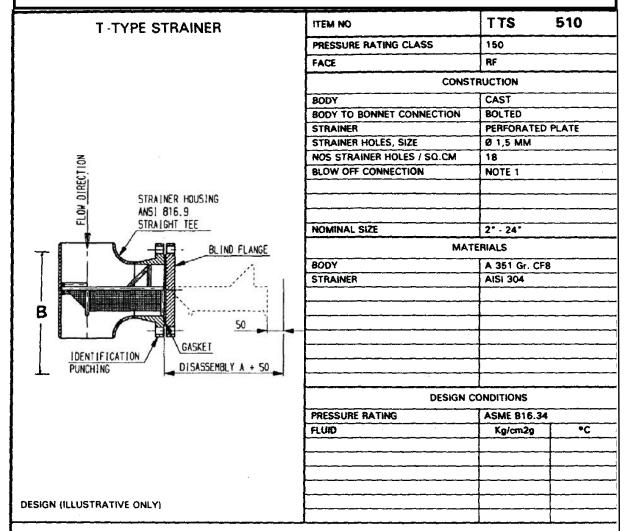
1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

#### MANDATORY STANDARDS:

ASME B16.34, ASME B16.5. MSS-SP 45

1.	STRAINER SIZE	BLOW OFF CONNECTION
	2" - 4"	3/4" NPT PLUG
	6" - 8"	1° NPT PLUG
	10"	1 1/4" NPT PLUG
	12" - 24"	1 1/2" NPT PLUG





#### GENERAL

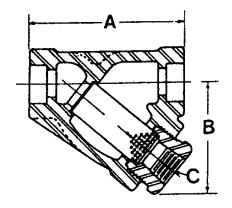
- 1. STRAINER MUST BE REMOVABLE
  2. COPPER AND COPPER ALLOYS NOT PERMITTED

#### MANDATORY STANDARDS:

ASME B16.34, ASME B16.5, MSS-SP 45

1.	STRAINER SIZE	BLOW OFF CONNECTION
	2" - 4"	3/4" NPT PLUG
	6" - 8"	1" NPT PLUG
	10"	1 1/4" NPT PLUG
	12" - 24"	1 1/2" NPT PLUG





ITEM NO	YTS	201
PRESSURE RATING CLASS	600	
FACE	sw	
CONST	RUCTION	
BODY	FORGED	
BODY TO BONNET CONNECTION	SCREWED	
STRAINER	PERFORATED	PLATE
STRAINER HOLES, SIZE	Ø 0,8 MM	
NOS STRAINER HOLES / SQ.CM	40	
BLOW OFF CONNECTION	NOTE 1	
NOMINAL SIZE	1/2" - 1 1/2"	
MAT	ERIALS	
BODY	A 105	
STRAINER	AISI 304	
		· · · · · · · · · · · · · · · · · · ·
DESIGN C	ONDITIONS	
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	*C

# GENERAL

1. STRAINER MUST BE REMOVABLE

DESIGN (ILLUSTRATIVE ONLY)

2. COPPER AND COPPER ALLOYS NOT PERMITTED

#### MANDATORY STANDARDS:

ASME B16.11, ASME B16.34

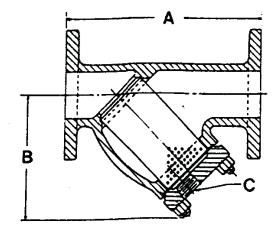
#### NOTES:

 STRAINER SIZE
 BLOW OFF CONNECTION

 1/2" - 3/4"
 1/4" NPT PLUG

 1" - 1 1/2"
 3/4" NPT PLUG





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A 216 Gr. WCB AISI 304			
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# GENERAL

DESIGN (ILLUSTRATIVE ONLY)

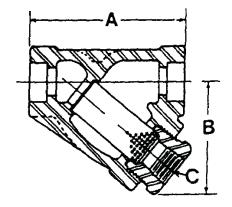
STRAINER MUST BE REMOVABLE
 COPPER AND COPPER ALLOYS NOT PERMITTED

#### MANDATORY STANDARDS:

ASME B16.34, ASME B16.5, MSS-SP 45

1.	STRAINER SIZE	-	BLOW OFF CONNECTION
	2" - 4"		3/4" NPT PLUG
	6" - 8"		1" NPT PLUG
	10"		1 1/4" NPT PLUG
	12" - 24"		1 1/2" NPT PLUG





ITEM NO	YTS	501		
PRESSURE RATING CLASS	600			
FACE	sw			
CONST	RUCTION			
BODY	FORGED			
BODY TO BONNET CONNECTION	SCREWED			
STRAINER	PERFORATED	PLATE		
STRAINER HOLES, SIZE	Ø 0,8 MM			
NOS STRAINER HOLES / SQ.CM	40			
BLOW OFF CONNECTION	NOTE 1			
	<del> </del>			
	<del> </del>			
NOMINAL SIZE	1/2" - 1 1/2"			
MAT	ATERIALS			
BODY	A 182 Gr. F30	4		
STRAINER	AISI 304			
	<u> </u>	· · · · · ·		
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	<del> </del>			
	<del> </del>			
DESIGN (	CONDITIONS	<del></del>		
PRESSURE RATING	ASME B16.34			
FLUID	Kg/cm2g	*c		
	1			
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# GENERAL

1. STRAINER MUST BE REMOVABLE

DESIGN (ILLUSTRATIVE ONLY)

2. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

ASME B16.11, ASME B16.34

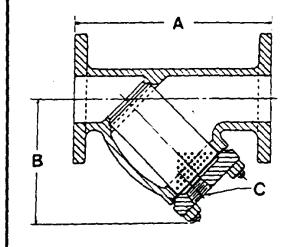
## NOTES:

1. STRAINER SIZE 1/2" - 3/4" 1" - 1 1/2"

BLOW OFF CONNECTION

1/4" NPT PLUG 3/4" NPT PLUG





ITEM NO	YTS	510
PRESSURE RATING CLASS	150	
FACE	RF	
CONST	RUCTION	
80DY	CAST	
BODY TO BONNET CONNECTION	BOLTED	
STRAINER	PERFORATED	PLATE
STRAINER HOLES, SIZE	Ø 1,5 MM	
NOS STRAINER HOLES / SQ.CM	18	
BLOW OFF CONNECTION	NOTE 1	
	<b></b>	
<u> </u>	<del> </del>	<del></del>
NOMINAL SIZE	2" - 24"	
MATE	RIALS	
BODY	A 351 Gr. CF8	,_,_,_,_,_,_,_,_,_,_,_,_,_,_,_,_,,,
STRAINER	AISI 304	
<u> </u>	<b></b>	
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<u>                                     </u>	<b></b>	
<del> </del>	ļ	
DESIGN C	ONDITIONS	
PRESSURE RATING	ASME B16.34	
FLUID	Kg/cm2g	•c
1000	Ng/Ciney	<del> </del>
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<del> </del>		
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		1

#### GENERAL

DESIGN (ILLUSTRATIVE ONLY)

1. STRAINER MUST BE REMOVABLE
2. COPPER AND COPPER ALLOYS NOT PERMITTED

# MANDATORY STANDARDS:

ASME 816.34, ASME 816.5, MSS-SP 45

1.	STRAINER SIZE	BLOW OFF CONNECTION
	2" - 4"	3/4" NPT PLUG
	6" - 8"	1" NPT PLUG
	10"	1 1/4" NPT PLUG
	12" - 24"	1 1/2" NPT PLUG

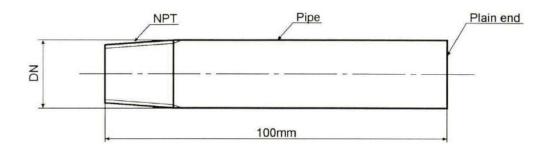


TFL-PDS-600	0
DOCUMENT NO	REV
	•

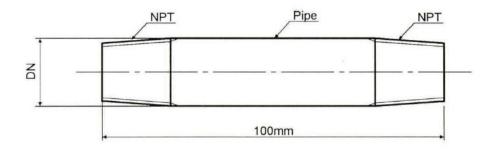
# **OTHER STANDARDS/DATASHEETS**

# **NIPPLES**

# 1) Half nipple (1/2-nipple)



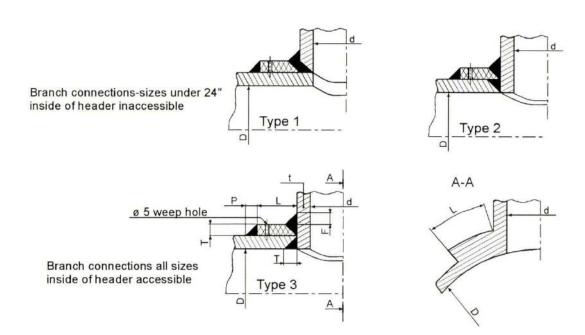
# 2) Nipple



DN = 1/2", 3/4", 1" or 11/2" Schedule and material of pipe acc. to piping class specification

Threading acc. to ANSI B 1.20.1-1983

#### REINFORCING RINGS



- 1. Reinforcing of branch connections shall be in accordance with limitations given in the General Piping Specification.
- "Reinforcing rings" shall conform to the requirements of this specification.
- 2. All welds are to be continuous. Fillet welds to have concave contour.
- 3. Backchipping or gouging to sound metal before welding reverse side is required.
- 4. The periphery of the cut hole should be examined for laminations when using type 1.
- 5. Weld details for inclined nozzles are to be similar to the details shown for 90 degree nozzles.
- 6: The type must be determined by the frabricator.

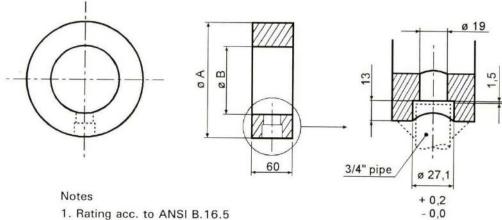
#### Legend

- T Thickness of reinforcing ring, to be of the same thickness as header and of equal or better material. Preferably cut from header.
- P Fillet weld leg dimension, equal to T.
- F Fillet weld leg dimension equal to t.
- L Width of reinforcing ring, see table. For branch sizes > 36" L = d/2

#### Reinforcing ring table

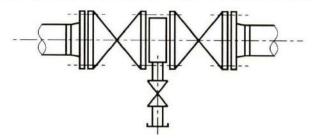
Nom. Branch size "d" inch.	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	26"	28"	30"	32"	34"	36"
Ring width "L" mm	30	45	55	80	105	130	150	170	190	215	240	290	310	330	360	380	405	430

# **DRIP RING**



- 1. Rating acc. to ANSI B.16.5
- 2. Material in accordance with piping class
- 3. Faces to be machined parallel and finish to be in accordance with ANSI B.16.5
- 4. Nom. dia., rating and material to be engraved on edge in letters min. 5mm high e.g. 3"-CL. 600-A 182 Gr. F1

DN	Class	150 RF	Class	300 RF	Class 600 RF		
Inch.	A mm	B mm	A mm	B mm	A mm	B mm	
2"	100	52	107	52	107	52	
3"	132	78	145	78	145	78	
4"	170	102	177	102	190	102	
6"	220	154	247	154	263	154	
8"	276	206	304	205	317	198	
10"	336	260	358	254	396	247	
12"	406	311	418	303	453	295	
14"	447	343	480	334	487	317	
16"	510	394	535	381	560	363	
18"	545	445	592	429	608	409	
20"	602	495	650	478	678	455	
24"	713	590	770	575	786	547	



Only where no alternative installation is possible, driprings shall be used.

### **DRIP LEG ON STEAM HEADERS** Header To trap Branch acc. to pipe spec. Header < 2" DL To trap \*) $D_L$ = Header size 8" 12" 14" 20" 24" = < 2" 3" 4" 6" 10" 16" 18" DH \*) 8" 12" 3" 4" 6" 6" 8" 10" 12" 12" 12" DL 250 300 300 350 350 400 400 450 500 525 550 DD 3/4" 3/4" 3/4" 1" 1" 1" 1 1/2" 1 1/2" 1 1/2" 1 1/2" 1 1/2" 1 1/2" 1" 3/4" 1" 3/4" 1" 1" 1" 3/4" 3/4" 3/4" 1" DT 3/4"

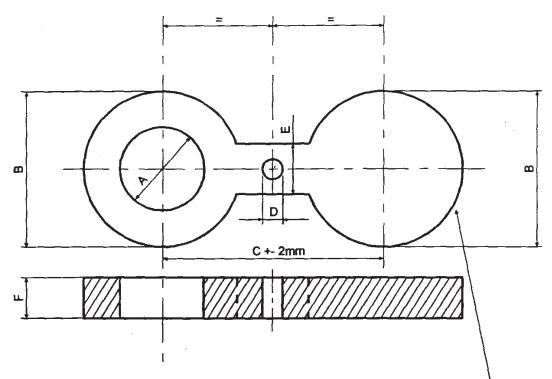
# SPECTACLE PLATE CLASS 150 RF

Spectacle plate suitable for flanges acc. to ANSI B16.5. Material as for flanges acc. to piping class.

Nom. dia., rating and material to be engraved on edge in letters min. 5 mm high for example thus: 3"-class 150 -A105

Nominal diameter inches	Min. reqd. overlength bolt	А	В	С	D	E	F
1"	8	33	64	79	16	38	6
1 1/2"	8	48	83	99	16	38	6
2"	8	60	102	121	20	51	6
3"	8	89	133	152	20	64	6
4"	8	114	171	191	20	64	6
6"	12	168	218	241	22	76	10
8"	15	219	277	299	22	76	13
10"	18	273	337	362	26	102	16
12"	24	324	407	432	26	102	22
14"	27	356	447	476	30	108	25
16"	27	406	511	540	30	108	25
18"	27	457	546	578	33	114	25
20"	31	508	603	635	33	121	29
24"	37	610	714	749	36	140	35
	1	1	1		1	,	

### **SPECTACLE PLATE CLASS 300 RF**

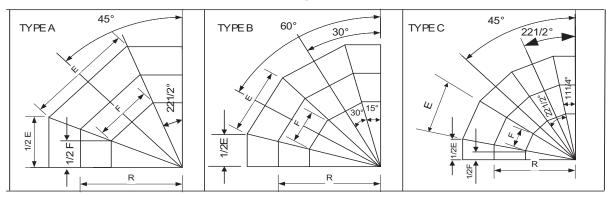


Spectacle plate suitable for flanges acc. to ANSI B16.5. Material as for flanges acc. to piping class.

Nom. dia., rating and material to be engraved on edge in letters min. 5 mm high for example thus: 3"-class 300 -A105

Nominal diameter inches	Min. reqd. overlength bolt	A	В	С	D	E	F
1"	8	33	70	89	20	38	6
1 1/2"	8	48	92	114	22	51	6
2*	8	60	108	127	20	51	6
3"	12	89	146	168	22	64	10
4"	15	114	178	200	22	64	13
6"	18	168	248	270	22	76	16
8"	21	219	305	330	26	89	19
10"	27	273	358	387	30	102	25
12"	31	324	419	451	33	102	29
14"	34	356	482	514	33	121	32
16"	39	405	537	572	36	124	37
18"	43	457	594	629	36	114	41
20"	46	508	651	686	36	121	44
24"	56	610	772	813	42	140	54

### MITRE BENDS

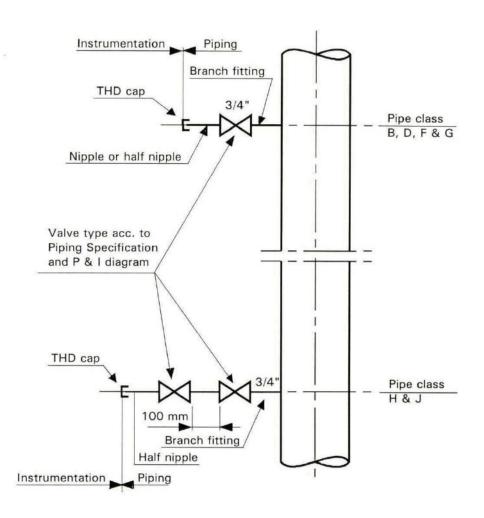


NOM	OUTSIDE	R	000	450	000	22 <sup>1</sup> / <sub>2</sub> °	DIMENSION					
SIZE	DIAM	=1.5D	30°	45°	90°							
INCH	D	mm	60°									
	mm						T\/F		T)/D			(DE 0
								PE A	TYP			YPE C
							E	F	E	F	E	F
_	CO 0	7.0					mm	mm	mm	mm	mm	mm
2	60.3	76	В	Α	Α	С	88	38	57	24	42	18
3	88.9	114	В	A	Α	С	131	58	85	37	63	28
4	114.3	152	В	A	Α	С	173	79	112	51	83	38
6	168.3	229	В	Α	A	С	259	120	168	78	125	58
8	219.1	305	В	Α	В	С	343	162	222	105	165	78
10	273.1	381	В	Α	В	С	429	203	277	131	206	97
12	323.9	457	В	Α	В	С	513	244	332	158	246	117
14	355.6	533	В	С	В	С			381	190	283	141
16	406.4	610	В	С	В	С			436	218	323	162
18	457	686	В	С	В	С			490	245	364	182
20	508	762	В	С	В	С			544	272	404	202
22	559	838	В	С	В	С			599	300	445	222
24	610	914	В	С	В	С			654	327	485	243
26	660	991	В	С	С	С			707	354	525	263
28	711	1,067	В	С	С	С			762	381	566	283
30	762	1,143	В	С	С	С			817	408	606	303
32	813	1,219	В	С	С	С			871	436	647	323
34	864	1,295	В	С	С	С			926	463	687	344
36	914	1,372	В	С	С	С			980	490	727	364
38	965	1,448	В	С	С	С			1,034	517	768	384
40	1,016	1,524	В	С	С	С			1,089	544	808	404
42	1,067	1,600	В	С	С	С			1,144	572	849	424
44	1,118	1,677	В	С	С	С			1,198	599	890	445
46	1,168	1,752	В	С	С	С			1,252	626	929	465
48	1,219	1,829	В	С	С	С			1,307	653	970	485
52	1,321	1,982	В	С	С	С			1,416	708	1,051	526
56	1,422	2,134	В	С	С	С			1,524	762	1,131	566
60	1,524	2,286	В	С	С	С			1,633	817	1,213	606
64	1,626	2,439	В	С	С	С			1,743	871	1,294	647
68	1,727	2,591	В	С	С	С			1,851	925	1,374	687
72	1,829	2,743	В	C	С	С			1,960	980	1,455	728
76	1,931	2,897	В	С	С	С			-	•	1536	768

P1	27.12.2017		FOR REVIEW/COMMENT	NAZ	NS	GL/HOD
Р	21.10.2017		FOR REVIEW/COMMENT	NAZ	NS	DM
REV	REV DATE	EFFDATE	PURPOSE	PREPD	REVWD	APPD

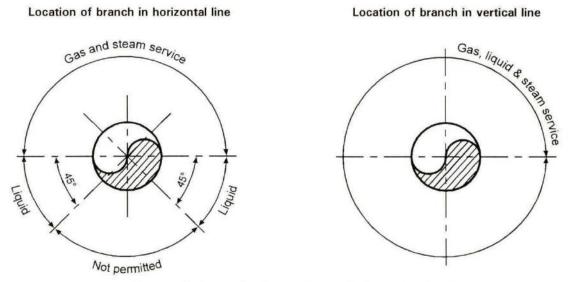
### BRANCH FOR ANALYSIS - AND PRESSURE CONNECTIONS ON PIPING

(FOR ANALYSIS CONNECTIONS WITH PROBE SEE SPECIAL DRAWINGS)



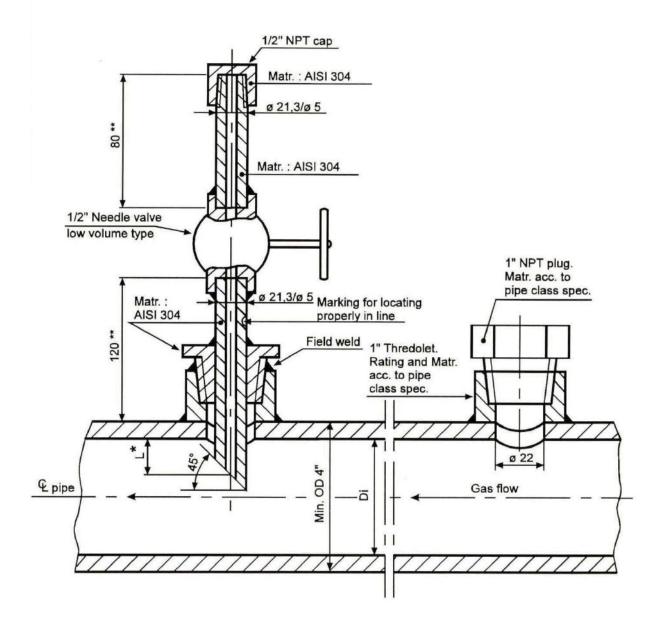
### Location of branch in horizontal line

### Location of branch in vertical line



All branch fittings and valves to be specified acc. to pipe class.

### ANALYSIS CONNECTION WITH PROBE ON PIPE FOR RATINGS <= CLASS 900



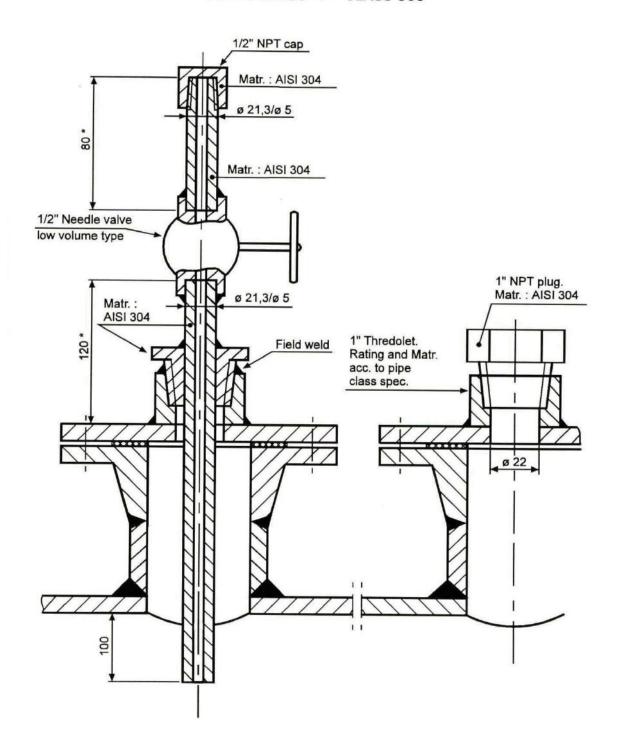
Final execution Instrumentation supply

During pressure test and cleaning Piping supply

<sup>\*</sup> For Di > 6", L = 1/3 Di +- 1/6 Di For Di < = 6", L = 1/2 Di+- 1/6 Di

<sup>\*\*</sup> Shortest possible

## ANALYSIS CONNECTION WITH PROBE ON EQUIPMENT FOR RATINGS <= CLASS 900

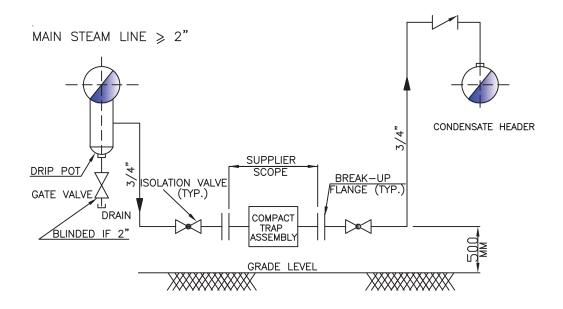


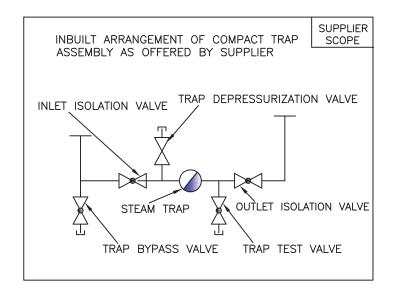
Final execution Instrumentation supply

During pressure test and cleaning Piping supply

<sup>\*</sup> Shortest possible

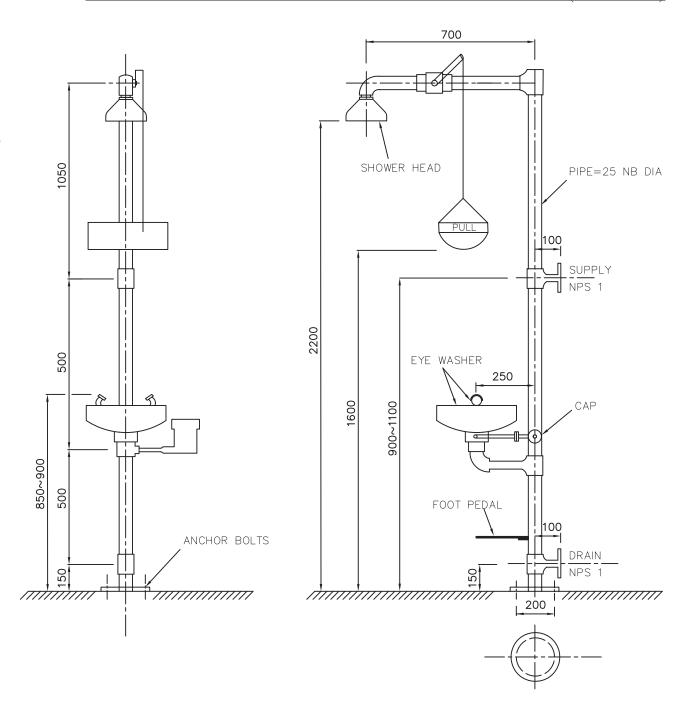
### TYPICAL ARRANGEMENT OF DRAIN FOR STEAM LINES AND STEAM TRAP





1

### DATASHEET FOR SAFETY SHOWER AND EYE WASH UNIT (COMBINED)



### SUPPLY WATER CONDITIONS

1) SUPPLY WATER : POTABLE WATER

2) DESIGN PRESS. : 7 kg/cm2g

3) DESIGN TEMP. : 70 °C

4) HYDRO. TEST PRESS. : 1.5 times of Design Pr.

5) MINIMUM FLOW.

a) SAFETY SHOWER : 110 Lit/min. b) EYE WASH : 12 Lit/min.

L WASH .

### MATERIAL

1) PIPE : SS304

2) FITTING : SS304

3) FLANGE SS304

4) VALVES/STRAINER : SS304

5) BOWL FOR EYEWASH : SS304

6) EYE WASH NOZZLE : SS304

7) SHOWER HEAD : SS304

8) PULL CHAIN : SS304

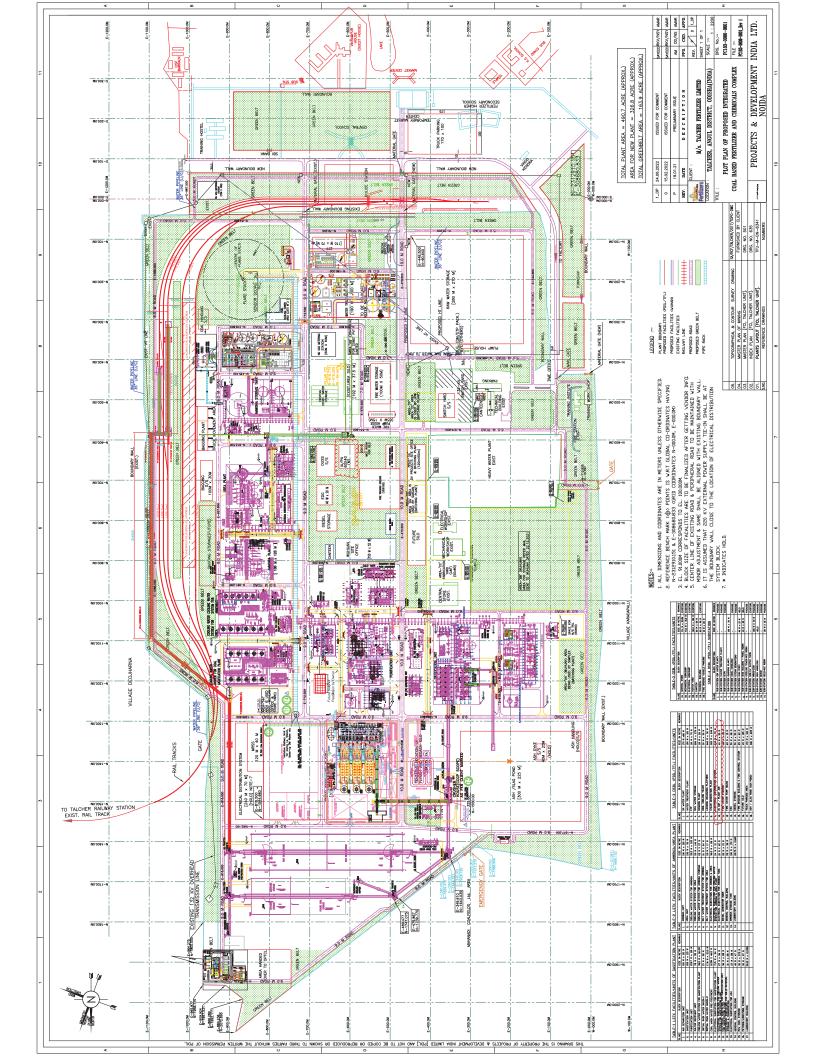
9) FOOT PEDAL : SS304

10) SPRING : SS304

CODE/STANDARD : IS 10592

### NOTES:

- 1) THE GIVEN DIMENSIONS ARE ONLY FOR REFERENCE; THE MANUFACTURER'S STANDARD DIMENSIONS MAY BE APPLIED, SUBJECT TO APPROVAL .
- THE COMBINED UNIT OF SAFETY SHOWER & EYE WASH SHALL BE PULL ROD AND FOOT PEDAL OPERATED AND PROVIDED WITH DUST COVER & FILTER.
- 3) ALL SAFETY SHOWER & EYE WASH UNIT SHALL BE PAINTED WITH FLOURESCENT PAINT SO THAT IT CAN BE VISIBLE IN NIGHT. NAME PLATE TO BE PROVIDED ON EACH SAFETY SHOWER & EYE WASH UNIT.
- 4) SAFETY SHOWER & EYE WASH UNIT SHOULD BE ISI MARKED.
- 5) THE COMBINED UNIT OF SAFETY & EYE WASH SHOULD BE CAPABLE TO PROVIDE A CUPIOUS FLOW OF WATER FOR ATLEAST 15 MINUTES.
- 6) ALL DIMENSIONS ARE IN MILLIMETERS.
- 7) OTHER SIZES BY VENDOR.
- 8) The spray nozzles shall be so designed as to deliver a spray of rinse water without harsh jets or misting. The water cone shall have vortex angle of 45°.





### **PROJECTS & DEVELOPMENT INDIA LTD**

PC183/E/4016/SEC-VI/ Part-3.3

DOCUMENT NO



0

REV

SHEET 1 OF 31

### **DESIGN SPECIFICATION- ELECTRICAL**

### **FOR**

### **INSTRUMENT AIR/PLANT AIR SYSTEM**

# AT TALCHER FERTILIZERS LIMITED

0	20.02.22	20.02.22	FOR CLIENT'S REVIEW	RK	RKP	SKB
REV	REV DATE	EFF DATE	PURPOSE	PREPD	REVWD	APPD



# DESIGN SPECIFICATION- ELECTRICAL FOR INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

PC183/E/4016/SEC-VI/Part-3.3 0

DOCUMENT NO REV

SHEET 2 of 31



### CONTENT

SECTION NUMBER	DESCRIPTION
1.0	Scope
2.0	Basis of Design
3.0	Area Classification
4.0	System details & Utilisation Voltage
5.0	Equipment Specification
6.0	Spares
7.0	Testing & Inspection
8.0	Vendor List
9.0	Installation, Testing and Commissioning
10.0	Coordination With Other Bidders
11.0	Bill of quantity
12.0	Drawing & documents
	Specification sheets & Technical particulars (Blank) of various
	Electrical Equipments



# DESIGN SPECIFICATION- ELECTRICAL FOR INSTRUMENT AIR/PLANT AIR SYSTEM

**TALCHER FERTILIZERS LIMITED** 

PC183/E/4016/SEC-VI/Part-3.3 0

DOCUMENT NO REV

SHEET 3 of 31



### **LIST OF ATTACHMENTS**

Technical Specification No.	Description
PC183-TS -0809	Lighting sub distribution board
PC183-TS -0810	Induction Motors
PC183-TS -0817	Local Control Stations
PC183-TS -0819	Electricals for EOT crane
PC183-TS -0843	Electrical Erection Testing & Commissioning



# FOR INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

PC183/E/4016/SEC-VI/Part-3.3 0

DOCUMENT NO REV

SHEET 4 of 31



### 1.0 SCOPE

- 1.1 This scope of works covers the complete Design, Engineering, Manufacture, Testing at works, Supply of all electrical equipment, Dispatch, Storage, Handling, Erection, Testing and Commissioning at site of complete electrical system required for setting up Instrument/Plant air Package for Coal Based Ammonia Urea Fertilizer Plant at Talcher.
- 1.2 This specification shall be read in conjunction with all drawing and doc uments, specification sheets attached and other relevant reference as specified therein.
- 1.3 The minimum scope of work shall include supply, Installation, Testing & commissioning of the following:-
  - Motors
  - Local control stations for motors
  - UPS Distribution Boards
  - FCMA based starter for HV Motors
  - Electric Heater & control panel for Air dryer system
  - Any other items not specified but required for the safe and complete operation of the system.
- 1.4 The Owner shall make the following provisions in their respective switch boards/ panels for the Instrument/Plant air package: (bidder to indicate power requirement of respective feeders)
  - 3 nos. of 11kV/3.3kV (As applicable) ±10%, 50Hz±5%, Breaker feeder for main motor.
  - 2 nos. of 415V ± 10%, 50Hz ± 5%, Power Outlets (Normal/Emergency) for Heater control panel.
  - 415V ± 10%, 50Hz ± 5%, starter feeder for HP Air Compressor, Lube oil pumps, heater etc, as required.
  - 2 Nos. AC 115V ± 10%, 50 Hz ± 2%, UPS supply for UPS distribution board incomer
- 1.5 The owner shall supply & lay all HT power cables from their HT switchboards located in Offsite & Utility Substation to Motors for Main Compressor.
- 1.6 The owner shall supply & lay LT Power Cables, Control Cables from PMCC/EPMCC/MCC, UPSDB at Offsite & Utility Substation to Lube oil Pump Motor, Lube oil Heaters, Heater Control Panel, UPS DB etc.
- 1.7 Heater Control Panel and UPS Distribution Boards shall be installed in Offsite & Utilities substation. UPS Distribution Boards shall have additional 6 N os. 32 A Feeders for Owner' use.
- 1.8 Bidder shall provide the UPS distribution board with all necessary control & monitoring component
- 1.9 Bidder to furnish Load List, Heater rating, Maximum Power Consumption, UPS power requirement and Nos. & rating of feeders required to be provided by owner with bid.



# FOR INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

PC183/E/4016/SEC-VI/Part-3.3 0

DOCUMENT NO REV

SHEET 5 of 31



- 1.10 This specification contains specifications of the major equipments to indicate the basic requirement and serve as a guideline. However, it shall be the responsibility of the bidder to offer a complete 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.
- 1.11 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. However for the sake of standardization of the electrical equipment and material used for the electrical installation, the bidder shall supply all items of a particular type or make for whole plant of the same manufacturing company for ease of maintenance and less spares inventory.
- 1.12 Bidder shall furnish construction power requirement during offer stage. Owner shall provide Construction Power at one point only, through 1 No. 63A, 415V feeder at Existing Substation (for location refer plot plan attached elsewhere in bid document) Near 132 kV Switchyard and bidder to arrange tap off Power from this feeder and its further distribution as per bidder's requirement.

Bidder shall ensure that the minimum power factor of 0.9 shall be maintained at their end by providing suitable power factor improvement devices. In Arrangement of construction power bidder scope shall also include adequately rated distribution and sub distribution boards/feeder pillars, power supply cables and other associated materials etc for feeding loads to carry out construction and fabrication activities at his own cost.

However during non availability of construction power bidder to arrange suitable Diesel generator set with all accessories/DB's/cables etc for carry out site construction, erection/commissioning activities uninterruptedly.

- 1.13 Mandatory Electrical spares for operation and maintenance of the electrical system shall be provided by the bidder as listed elsewhere in this bid package.
- 1.14 The scope shall also include obtaining all required statutory approval pertaining to equipments installed & commissioned by bidder from all statutory bodies. Modifications/alterations, if any, required by statutory authority shall be carried out by bidder in full compliance of statutory authorities.

### 2.0 BASIS OF DESIGN

### 2.1 General

- a) System shall be designed considering following aspects in general :-
  - To facilitate inspection, cleaning and maintenance with the care to safety in operation and personnel protection.
  - To minimise turnaround times.
  - To provide safety, reliability and flexibility of service.



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- Adequate provision for future extension and modification.
- Maximum interchangeability of equipment.
- Desired level of operator interface to achieve coordinated efficient and fail-safe operation, data logging and maintenance of the equipment.
- To decide redundancy, stand by, spares and overload capacities to achieve desired reliability and flexibility requirement.
- To get cost effective and t echno commercially proven technology. Economic
  considerations shall cover capital and running costs and an assessment of the
  reliability and consequent availability of the system.
- b) All the electrical consumers in the bidder's scope shall be correctly identified and listed to have complete details of rating, efficiency, power factor, operating duty cycle (continuous, intermittent, standby), category of supply required (emergency, normal, critical) etc.
- c) Bidder while performing design and engineering activities shall adhere to following guidelines.
  - i) If any equipment is not covered in this specification but required for successful operation of the Plant, Bidder 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.
  - ii) The standard drawings attached with this package define the basic system design and distribution philosophy for the package. This is for guidance purpose only. Bidder shall develop detailed drawings and submit for owner's approval.
  - iii) Bidders shall consider any other requirement which is not covered in this bid package, but required for successful operation of the plants without any extra cost and time implications.
  - Bidder shall assist in Liaison and in all interface coordination with bidders of other units of project at construction, erection, testing & commissioning phase for any common facility.
  - v) Equipment specification sheet/data sheets for all equipment shall be submitted by the bidder based on relevant codes and specifications. Data sheet shall contain all technical data and information which are essential for review and t echnical acceptability, detailed engineering, installation, testing, repair and maintenance, replacement etc.
    - vi) Bidder shall clearly specify in their purchase specifications, the requirement of conducting other special tests/type tests, which are envisaged for various electrical equipment, which shall have no impact on cost and time.
    - vii) Bidder shall visit the site and collect all relevant information required for designing of complete system before quoting.
    - viii) All the electrical equipments shall be of proven design and technology.



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### 2.2 Statutory requirement Codes and Standards

The design and the installation shall be in accordance with established codes, good engineering practices and shall conform to the statutory regulations applicable in the country. Bidder shall be responsible for obtaining necessary approvals from the statutory authorities e.g. Electrical Inspectorate, PESO as applicable before commissioning of electrical facilities. The CEA clearance for electrical equipment and components as applicable thereof shall be obtained by the bidder.

The relevant Indian Standards are:-

- a) IS 13118 High Voltage Alternating Current Circuit Breakers.
- b) IS 10118 Selection, Installation, Maintenance of Switch gear and Control gear.
- c) IS 3247 Metal enclosed Switch gear & Control gear for voltage above 1000V but not exceeding 11000V.
- d) IS 3156 Voltage Transformer.
- e) IS 2705 Current Transformer.
- f) IS 11353 Marking and arrangement of switch gear bus bars.
- g) IS 13947 Degree of protection provided by enclosures for Switch gear and Control gear.
- h) IS 3202 Climate proofing of electrical equipment.
- i) IS 13703 HRC cartridge fuse links up to 650V.
- j) IS 325 Three phase Induction motors
- k) IS 7098 XLPE FRLS PVC Cable.
- I) IS 1248 Direct acting Electrical indicating instruments.
- m) IS 722 Integrating instruments.
- n) IS 1271, IS 2584 IS 2260 Insulating materials.
- o) IS 2099 Bushing for alternating voltages above 1000V.
- 2.3 Latest version of main codes, standards and s tatutory regulations shall be considered as minimum requirements are as given below:
  - Indian Standard Specification
  - Indian Electricity Act
  - Indian Electricity Rules
  - International Electro-Technical Commission
  - The Factory Act
  - API Standards/IEEE
  - Statutory requirement of Govt of Odisha and Govt. of India.
  - Guidelines of Insurance Companies Association.



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Any other applicable Rules/Acts/Regulations.

### 2.4 Site Conditions

The equipment shall be designed for the following site conditions:-

A. Maximum ambient temperature 46°C
B. Minimum ambient temperature 1°C
C. Design Reference Temperature 50°C
D. Relative Humidity 100%
E. Altitude above mean sea level < 1000 M</li>

dust and corrosive due to presence of

vapours of Ammonia.

### 3.0 AREA CLASSIFICATION

3.1 The hazardous zones, if applicable, within the project area shall be classified according to the requirement of IS/IEC. The bidder shall furnish area classification drawing.

3.2 All electrical equipments, if installed, in the areas classified as hazardous shall be certified for such use by a recognized international certifying authority such as CIMFR, Dhanbad /PESO, Nagpur etc.

### 4.0 SYSTEM DETAILS AND UTILIZATION VOLTAGES

4.1 The various voltage levels for distribution shall be as follows:

Distribution Equipment	a) 11KV ± 10%, 50 Hz ± 5%, 3 Ph, 3 W with resistance earthed neutral
	b) 3.3KV ± 10%, 50 Hz ± 5%, 3 Ph, 3 W with resistance earthed neutral
	c) 415V ± 10%, 50 Hz ± 5%, 3Ph, 4W solidly grounded neutral.
	d) 415V ± 10%, 3 Ph, 4 W/240V ± 10%, 1Ph, 2W, 50Hz± 5% solidly grounded neutral.
Combined variation in voltage & frequency	± 10%
Control Supply for:	
- HV motors	DC 110V±5% (For breaker controlled HV/LV motors)
- 415V motors	240V±10%, 50Hz±5%, 1Ph (For contactor controlled motors)
Instrumentation and Automation, DCS &	AC 115V ± 5%, 50 Hz ± 2% 1Ph, 2W



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auxiliaries	
Voltage Ratings	
Motors up to 150 KW	415V, 3 Ph AC
Motors above 150 KW up to 1000 KW	3.3 KV, 3 Ph AC
- Motors above 1000 KW	11 KV, 3 Ph AC
Heaters	415V, 3 Ph AC

### 4.2 Fault Level:

11kV: 750 MVA

3.3KV: 150 MVA

415V: 36 MVA

### 5.0 EQUIPMENT SPECIFICATION

### 5.1 General Constructional Features

5.1.1 The equipment shall be suitable for tropical climate conditions and corrosive and saline atmosphere.

All electrical equipment accessories and wiring shall have fungus protection involving special treatment of insulation and metal against fungus, insects and corrosion.

Fine mesh screen of corrosion resistant material shall be furnish on all ventilating openings to prevent entry of insects.

- 5.1.2 The equipment excluding motors to be installed in outdoor plant area shall have IP 65 enclosure. Motors of plant shall have IP 55 enclosure.
- 5.1.3 4 mm FRP (fire retardant and UV stabilized) canopies shall be provided for all outdoor equipments like motors, LCS, SDBs, etc.
- 5.1.4 All mating surfaces shall be properly machined. Neoprene gaskets shall be used for dust and weather proofing. The gaskets shall be without any discontinuity.
- 5.1.5 Only non-hygroscopic materials shall be used for insulation. All insulation shall be specially impregnated to withstand ambient conditions and atmospheric pollution.
- 5.1.6 All live parts shall be adeq uately protected to prevent inadvertent or accidental contact.
- 5.1.7 All external hardware's of diameter less than 8mm shall be of stainless steel and those of diameter 8mm and above shall be of mild steel cadmium plated or zinc passivated.



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- 5.1.8 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 250V and one for those rated 250V and below.
- 5.1.9 All equipment shall be provided with stainless steel nameplates containing the particulars as per relevant IS/IEC along with the description and C ode Nos. of equipment.
- 5.1.10 All the electrical equipment shall be provided with weather proof heavy duty double compression type Stainless steel cable glands, proper Cu/Al crimping lugs and terminal blocks suitable for the cable sizes required.
- 5.1.11 All detailed drawings, equipment sizing make & type of equipment shall be subject to approval of TFL/PDIL.
- 5.1.12 The rating of the electrical equipment wherever specified in the bid package are the minimum ratings. The bidder shall check & revise the ratings (up words) if required based on actual load and furnish the calculations for owner's review / approval.
- 5.1.13 All motors and heaters shall have provisions for control from local as well as owner's PLC/DCS. Cables from local control panel to owner's remote control panel shall be provided by owner. However bidder shall coordinate with owner's other vendor for proper identification & termination of those cables.
- 5.1.14 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 paint.

### 5.2 MOTOR AND SOFT STARTER COORDINATION

Bidder shall be responsible for motor & soft starter coordination, in particular to following: -

- a. To ensure that main drive motor and soft starter are both adequately rated and sized for the drive requirements stated and to recommend & provide alternative configurations where appropriate (like separate cooling fan, choice of starting current limit etc.)
- b. To arrange wherever necessary for testing with Soft starter unit to confirm compliance with requirements of load, noise, vibration, temperature rise, etc.
- c. To recommend any additional motor protection arrangements, this may be necessary to prevent motor winding damage.
- d. Bidder to note that the minimum acceleration time of the induction motor shall meet driven equipment requirements.
- e. Bidder to ensure that the main drive electric motor shall be capable of operating continuously at any of the load conditions within the range. Bidder shall state derating factor, if any, for the motor.
- f. Bidder to provide Rotor heat withstands calculation during starting and 100% locked rotor condition.
- g. Motor shall be suitable for starting on starter as well as on DOL.



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- h. Following data for Motor and Driven equipment shall be informed by motor / driven equipment vendor:
  - Super imposed Motor/Load Torque Speed characteristic.
  - Motor rated kW Motor/Load GD<sup>2</sup> value.
  - Motor current speed curve.
  - Motor thermal withstand curve.

### 5.3 **Motors**

- a) All the motors shall be 3 Ph, squirrel cage induction type.
- b) The rating of motors shall be selected from the sizes as recommended in relevant Indian Standard/IEC.
- c) All electric motors shall meet the standard IS/IEC 60034.
- d) The margin between the installed power and abs orbed 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%
22W to 55 KW	15%
75 KW and above	10%

- e) The duty cycle of motors shall match the driven machine requirement.
- f) 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.
- g) 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 C lass-F insulated with temperature rise limited to that of Class-B.
- h) Normally the motors shall be suitable for DOL starting.
- i) All motors 30 KW and above shall have space heater provision.
- j) All HV motors shall have winding, hot air and bearing RTDs.
- k) All LV motors shall be energy efficient type having efficiency class of 'IE3' as per IS 12615: 2011 and high power factor type.
- The starting current i.e. breakaway current of 415V Motors shall not exceed the values indicated in IS: 12615. Also there shall be no further positive tolerance on the values of breakaway current.



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- m) The starting current of 11 KV & 3.3 KV motors shall not exceed 550% of FLC. No positive tolerance is acceptable over 550% FLC.
- n) Type test certificate of similar motor for use in specified hazardous area (if applicable) shall be furnished.
- o) The duty cycle of the motor shall meet the process and driven machine requirement.
- p) In case of 11 KV & 3.3 KV motor, the terminal box shall be suitably designed for proper termination of XLPE insulated Aluminium cables through heat shrink termination kit.
- q) 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. Generally, all motors, except for application such as crane, hoist, turbine/engine starting, shall be designed for continuous duty with rated load.
- r) Motor rated above 30KW shall have on line greasing provision and for motor rated above 45 KW, grease outlet feature shall be provided.
- s) Motors rated 1000kW 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. Also sizing calculation of differential protection CT shall be submitted after order for TFL/PDIL review.
- t) 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.
- u) 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.
- v) 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.
- w) Shaft voltage shall be limited to 200 mV.
- x) For all other specifications, refer PC183-TS-0810.

### 5.4 **Heaters**

### 5.4.1 **Heater Elements**

a) Tubular heater elements (in U-shaped Tubular-type) shall be constructed from 80/20 Ni/Cr resistance wire surrounded by compacted magnesium oxide powder and the outer sheath of the heating elements shall be of Incoloy 800, and of thickness



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suitable to provide corrosion/erosion resistance suitable for the application with stainless steel nipple of suitable rating to obtain the desired output temperature.

- b) The elements shall be designed to minimize peak inrush current. The bidder shall state the inrush current in the specification sheet and technical particulars.
- c) Heater elements shall be protected against over-temperature by means of at least two temperature sensing devices. The temperature sensing devices may be either thermocouple elements/ PT 100 devices. The devices shall be clamped or welded to the sheaths of different elements and located in an area of highest anticipated sheath temperature. Temperature sensing wiring shall be brought out to a separate terminal box with the same degree of protection as the main terminal box.
- d) The heating elements shall be grouped into sections for controlling purpose. The heater controls shall be generally stepped by connecting or disconnecting group of elements to the supply system to maintain constant output temperature with the air flow quantity varying as indicated elsewhere.

### 5.4.2 **Heater Terminal Box**

- a) Suitable terminal box shall be provided with terminals for external connections.
- b) The installation of a sun cover/canopy (FRP material) over the terminal box shall be provided to avoid direct rain/ solar radiation on terminal box.
- c) The Bidder shall consider the need for a space heater in the terminal box. If installed, the space heater shall be connected between phase and neutral, controlled from the power and c ontrol assembly and s ized so that the maximum allowable air temperature inside the terminal box does not exceeded.
- d) The heater elements shall be star or delta connected depending upon the size of the load and shall be specified by the Bidder. Neutral linking for star connected loads shall be done inside the terminal box.
- e) Heater terminal box shall be provided with double compression Stainless steel type cable glands & cable lugs.
- f) Heater terminal box shall be dust proof and weather proof and shall be suitable for outdoor use with minimum IP55 degree of protection. The box shall be suitably thermal insulated from the shell to avoid the effect of temperature on the terminals.
- g) Protection against corrosion shall be ensured by using epoxy paints. All nuts and bolts used shall be either cadmium plated or zinc passivated.
- h) The terminal box should have adequate space for cabling, tightening etc.

### 5.5 **Heater Control Panel (Thyristor Controlled)**

a) The control panel shall be suitable for outdoor installation having IP-55 protection and shall be fabricated out of 2.5 mm thick CRCA sheet steel.



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- b) Thyristors shall have peak inverse voltage rating of approximately 2.5 times the absolute maximum root-mean-square line voltage.
- c) Thyristor protection shall include metal-oxide varistor over-voltage limiters suitable for the peak inverse voltage rating of the thyristor, current limiting fuses designed for semiconductor protection, and dv/dt protection networks.
- d) Thyristor power controllers including equipment protection devices for use on 415V, 3ph, 50Hz heaters. The controllers shall operate in the zero-crossover mode (to minimize generation of radio frequency interference) with a controlled output power range down to 3% (single-cycle control). The outlet air temperature shall be use in both the automatic and manual mode.
- e) Burst firing control shall not be utilized; single cycling control should be used instead. The load should be configured in either four-wire star or delta, with three-leg control using Thyristor pairs adopted for the star configuration and two-leg control for the delta configuration.
- f) In order to enhance reliable operation, the thyristors employed shall be sized so that the maximum current flowing through them shall not exceed 70 % of their continuous rated current.
- g) Thyristor protection shall include over-current protection by means of ultra-rapid fuses and voltage transient suppressers. Where deemed necessary by the bidder, di/dt limiting reactors and dv/dt protection networks shall be provided.
- h) Manual/auto selection for output power/heat control shall be provided. In auto-mode, power output shall be controlled by the controller and the outlet air temperature shall be user-adjustable. In the manual mode the power output shall be controlled via a keypad/multi-turn potentiometer. The auto/manual mode for power output shall selectable via selector switch. A ramp unit shall prevent the heater being switched directly to full load. This potentiometer and associated switch shall be designed to be tamper-proof.
- i) Each heater panel shall have 1 no. incoming voltmeter and ammeter with selector switch and Output voltmeter and current meter with selector switch. KWH meter shall also be provided. A transducer (4-20 mA) for remote current display shall be provided for each phase.
- j) The following alarm and protection functions shall be provided as a minimum:
  - Heater Earth Leakage Trip (in output side).
  - Control Panel Fan Failure Alarm.
  - > Thyristor Over-Temperature Alarm.
  - Thyristor Over-Temperature Trip.
  - Heater Element Over-Temperature Alarm.
  - Heater Element Over-Temperature Trip.



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- A ramp unit shall be provided in order to protect the heater or power system from damage that could occur as a result of Electrical, Mechanical and thermal shocks caused by direct full-load switching.
- > Lamp indication shall be provided for heater on/off, alarms (like Heater Over Temperature, fluid Over Temperature, etc). Selector switch shall be provided in panel for selection of fluid temperature RTD input.
- Overload protection by means of ultra rapid fuses.
- k) The control panel shall house the following components for control of electrical items-
  - Auto manual switch
  - Equipment selection switch
  - ON-OFF indicating lamp for different sections of heater bank.
- 1) Each panel incomer shall comprise of one incoming MCCB/ACB of suitable rating.
- m) The incoming MCCB/ACB shall have mechanical interlocking feature with the panel door for preventing the door to open until the MCCB/ACB is in off position.
- n) Contactors used shall comply with IS/IEC 60947-4-1 and be rated for uninterrupted duty and intermittent duty of at least Class 1.
- Ultra-rapid fast acting semiconductor fuse shall be provided for the protection of the thyristors.
- p) In the incomer, one voltmeter with selector & one ammeter with selector switch along with suitable CT shall be provided.
- q) Different outgoing heater section circuits shall be controlled by using Thyristor, MCCB and contactors.
- r) An ammeter with selector switch shall be provided for measuring the current in different outgoing sections.
- s) For external cable connections, terminal blocks with 20% spares terminals and suitable number of cable glands shall be provided. At least two nos kick holes shall be provided for future provision of cable glands.
- t) The panel wiring shall be made by not less than 2.5 mm<sup>2</sup> copper wire.
- u) The design of control panel and c abinet/enclosure should provide sufficient component spacing to allow cooling by natural air circulation. In addition forced draft fans shall be installed with 100% redundancy. The control of the fans shall be such that the fans operate only when the heater is energized.
- v) All live terminals of equipments and c omponents mounted within the enclosure having a maximum (peak) voltage of greater than 24V shall be s hrouded or otherwise protected by barriers to a degree of protection of at least IP 20. Barriers



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shall be of rigid insulating material, yet transparent to enable the screened components to be identified.

- w) A tinned copper earth bus bar of adequate size, with a suitable number of earthing bolts or screws, shall be provided. The enclosure shall also be fitted with two (02) nos. external earth points for connection to the main earth grid.
- x) All components of the panels for example MCCB, thyristor, contactors etc. shall conform to relevant Indian standards and make of the components shall be indicated. Make shall be subject to TFL/PDIL approval.
- y) Two nos of earth terminals with lugs shall be provided on the terminal box and on the control panels.

### 5.6 HV MOTOR SOFT STARTER (FCMA Type)

- 6.6.1 The motor starter shall be Flux compensated magnetic amplifier (FCMA) type with bypass breaker/contactor.
- 6.6.2 FCMA based HV Soft starter with all accessories to be provided which shall be suitable for instrument air compressors to provide an adjustable minimum starting current with incremental voltage & torque characteristics to accelerate the motor & driven equipment from stand still to full load speed smoothly without jerk and trouble free operation.

### 6.6.3 TECHNICAL PARTICULARS FOR HV MOTOR SOFT STARTER

- a) The motor starter shall be Flux compensated magnetic amplifier (FCMA) type with bypass breaker/contactor.
- b) The motor starter shall be designed to restrict starting current up to 3.0 times of motor full load current (inclusive of any tolerance) at Supply bus.
- c) The Soft Starter shall be installed either on the Line side or neutral side of HV Induction Motor.
- d) The Motor Starter shall be so rated as to allow at least three consecutive starts from cold or two hot starts per hour.
- e) Soft Starter shall be air-cooled.
- f) The motor shall be started with the soft starter in line for smooth and stepless acceleration by switching ON the main upstream vacuum circuit breaker (VCB). Bypass breaker shall remain open during this starting operation till the rated speed is achieved. When motor rated speed is reached, the bypass breaker shall be switched ON to bypass the soft Starter. The upstream main breaker will be controlled to start or stop the motor.
- g) Soft starter may be taken in line with the motor, in case of reacceleration of motor due to power interruptions for a period of 1.5 sec.



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- h) The actual rating of soft Starter (ampere rating, start duration, no. of consecutive starts etc) to start the motor shall be worked out by vendor based on final motor / driven equipment details
- i) Motor Starter shall be provided with suitably rated ammeter to indicate the motor current during starting. Indicating instruments (96 x 96 m m) shall be switchboard type, with 240o scale, anti-glare glass and accuracy class of ± 2% full scale. Meter shall have zero adjuster on the front.
- j) Soft Starter Vendor shall check for suitability of starter for actual measured test results of Job Motors like Locked rotor test data, values of R1X1, R2X2 & RnXn etc. and revalidate Soft Starting Characteristics for seamless System Integration. Measured values obtained from Motor Vendor and further revalidation of Soft Starter Characteristics shall be submitted to the purchaser for review/approval.
- k) Insulation of FCMA shall be H class insulation with temperature rise limit up to class B.
- I) It shall have Close loop monitoring of temperature and current of FCMA modules.
- **m)** Soft Starter panel shall have adequate provision for terminating Incoming & Outgoing 11KV/3.3KV grade (UE), Aluminum conductor, XLPE insulated, armoured cables with Raychem Heat shrinkable termination kit gland / lugs etc. The preliminary cable size for the Soft Starter is 3C X 300mm<sup>2</sup>.
- n) Vendor to ensure that the reduced starting voltage is suitable to develop necessary starting torque requirement to start and accelerate the driven equipment. The motor starter shall be so designed that the minimum possible supply voltage drop shall occur keeping in mind the accelerating torque requirement of the drive motor and the load. Vendor shall suitably co-ordinate with the motor vendor.
- o) All rear panel doors shall be provided with handle for ease of maintenance.
- p) The Flux Compensated Magnetic Amplifier (FCMA) shall work on the principle of unsaturated core in the working zone and shall not lead to generation of harmonics. The Motor Starter shall have Silicon steel core. The windings of the Motor Starters shall be with insulation class F Max. Temperature rise of winding shall be limited to that of class B. The FCMA Motor Starters should be suitable for indoor mounting.
- q) FCMA Motor Starter shall not contain any active electronic components.
- r) FCMA starter shall be provided with current dependent ramp up with adjustable bypass time.
- s) Following interlocks and indications shall be provided on FCMA motor starter.
  - FCMA temperature high
  - Bypass supervision trip
  - Analogue voltmeter and Ammeter (input) of 96mmm X 96mm, class 1.0
  - Indication lamps for Breaker ON/OFF, spring charging, trip and etc.
- t) Remote Indications of above mentioned signals shall be provided.



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- u) The soft starter unit shall be pr ovided with inherent self protection like surge suppressors against transient over voltages introduced by input power supply. Short circuits, open circuits, earth fault protection provided by upstream Motor protection relay.
- v) Soft starter (PCMU) shall be provided with RS 485 port to communication with SCADA. DCS interface is not envisaged from soft starter.
- w) FCMA starter shall be provided with appropriate number of taps on FCMA to take care of changes in TS curve of Motor/ Compressor after manufacturing.
- **x)** Sensing/ isolating Locked rotor condition during starting shall be implemented through Rotor heat monitoring system.

# 6.6.4 <u>EQUIPMENT SPECIFICATION FOR HV SOFT STARTER</u> CONSTRUCTIONAL REQUIREMENTS

- a) Soft Starter panel shall be totally enclosed, dust proof, vermin proof, floor mounted, self supporting, metal-clad, free standing cubicle type. If necessary louvers with wire mesh shall be provided for ventilation. The enclosure shall have complete protection against approach to live parts or contact with internal moving parts as per IS: 3427.
- b) Degree of protection shall not be less than IP 5X.
- c) Soft Starter cubicle shall comprise rigidly welded structural members, partition covers between panels, Rear/side cover, and partition for LT chamber of 2.0mm CRCA. All front doors of LT chambers and front door for VCB chamber shall be of 2.5mm CRCA. All Shutter, Top Cover / explosion cover shall be 2.0mm CRCA. All metal enclosures shall be earthed effectively.
- d) Soft Starter design shall be fully compartmentalized. Access to operating mechanism shall be so arranged as not to expose high voltage circuits. Cubicles shall be provided with hinged doors on the front with facility for padlocking the door handles.
- e) Instruments, meters & control devices shall be flush mounted on the hinged door of the metering compartment located in the front portion of Soft Starter panel.
- f) Main Functioning parts of the Soft Starter shall be accessible for maintenance from the front side.
- g) Soft Starter Panel shall be fitted with a removable gland plate of minimum 4mm thick aluminum sheet at the both of the cubicle for fixing glands for power & control cable termination. Where Single core power cables are used, the gland plate shall be of non-magnetic material.
- h) Soft Starter Panel shall be designed for cable entry from the bottom. Ample space shall be provided to terminate incoming and outgoing power cables at Soft Starter panel. In case standard panel depth cannot accommodate the specified no. of cables, a rear extension panel of uniform height shall be provided.



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- i) The Soft Starter panels shall be supplied complete with supports for clamping outgoing and incoming cables. The minimum clearance between cable gland and terminal lugs shall not be less than 600mm.
- j) All insulating material shall be flame resistant, non hygroscopic and anti tracking.
- k) All hardware used inside the panels shall be zinc passivated or cadmium plated.
- I) Independent pressure release flaps shall be provided for each compartment of Soft Starter panel.

### 6.6.5 PAINTING

- a) After cleaning, the surfaces shall be given a phosphate coating followed by 2 coats of high quality primer and stoved after each coat.
- b) The switch gear shall be finished in light gray Shade RAL-7032 Powder coated.
- c) Sufficient quantity of touch up paint (approx 5 ltrs.) shall be furnished for application at site.

### 6.6.6 SAFETY INTERLOCKING FEATURES

Following interlocks shall be provided for Soft Starter Cubicle.

- a) The draw out carriage of Bypass Circuit Breaker/contactor shall have three positions "Service". "Test" & "Draw out". Withdrawal or engagement of Bypass Circuit Breaker shall not be possible unless it is in the open position.
- b) Interlock of soft starter with upstream breaker shall be provided.
- c) Operation of Bypass circuit Breaker/contactor shall not be possible unless it is fully in "service", "test" or fully drawn out position. It shall not be possible to close the Breaker electrically in service position, unless the auxiliary circuit connection between the fixed and moving portion are made.
- d) Circuit breaker cubicle shall be provided with safety shutters operated automatically by the movement of the circuit breaker carriage, to cover the stationary contacts when the breaker is withdrawn.
- e) Closing and tripping circuits shall be interlocked electrically with equipment and the vendor shall arrange for the necessary wiring terminals.
- f) Caution plate "Caution Live Terminals" shall be provided at all points where the terminals are like to remain live and isolation is possible only at remote end.
- g) Danger Board shall be provided on the front and backside of the Soft starter panels.

### **6.6.7 SPARES**

**Commissioning Spares:** 



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Bidder to recommend list of commissioning spares as required. The commissioning spares shall form an integral part of the scope of supply. Vendor shall be responsible for the quantification of the commissioning spares for the smooth start up of the plant/package system.

### **Mandatory Spares:**

Mandatory spares shall form an integral part of the scope of supply. Mandatory Spares as per spare list attached with NIT, shall be supplied.

Any other spare parts not specified, but required, shall also be quoted along with the recommended quantity in the offer.

### 6.6.8 INSPECTION AND TESTING

- a) Manufacturer shall provide test certificates for type and routine check tests on equipment which shall include in particular following tests plus other tests as specified in relevant standards.
- b) Physical inspection for dimensions, bill of materials, layout / accessibility of components, cabling space, shrouds, barriers for live parts etc.
- c) All routine tests like continuity test for wiring, operation/functional tests, checking of interlocks, IR/HV test on power/control circuit. Purchaser reserves right to witness all above tests.

### 6.6.9 SITE TESTING AND COMMISSIONING

Site testing and commissioning shall include at least (but not limited to) following tests:

- a) Operation of motor / soft starter panel with load.
- b) Setting up and recording all on site adjustments.
- c) Checking up operation of all front of panel indicators / alarms / lamps.
- d) Checking operation of bypass system.

### 5.7 Local Control Stations

- a) 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:
- b) 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.
- c) 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



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motors having rating 5.5 KW and abov e. If required from process point of view, ammeter shall be provided for motors below 5.5 KW also.

- d) Provision for pad locking in OFF position shall be provided.
- e) 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.
- f) The enclosure for LCS shall be of die cast LM-6 Aluminium alloy in weather proof construction with minimum IP65 enclosure.. A rain-hood shall also be offered. It shall be made of 14 gauge Aluminium sheet bent to shape. The enclosure shall be suitable for mounting on wall or on steel structure. 4 Nos. holes suitable for 12mm bolts shall be provided outside the enclosure for fixing the control stations.
- g) All the components shall be mounted on a bas e plate inside the enclosure. Necessary actuating system for push buttons/control switches, non y ellowing 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.
- h) All local control stations shall have weather proof IP-65 enclosure and be suitable for installation in relevant hazardous areas (if applicable), gas group and temperature class. Canopies of suitable size shall be provided with all local control stations.
- i) Each control station shall be provided with minimum 2 mm thick stainless steel name plates indicating the code number and description of the equipment controlled by it. Similar labels shall be provided for all indication lamps, push buttons, control switches. The name plate and label shall be fixed with screws only.
- j) The ammeter shall be flush mounting, moving iron spring controlled type, of accuracy class 1.5 with square face of minimum size 72mmx72mm having scale range 0-240°. The ammeter for motor shall be provided with uniform scale up to CT primary current and compressed end scale up to the 6 times the C.T. primary current. Adjustable red pointer shall be provided to indicate the full load current of the motors. Zero adjusters shall be provided for operation from the front of the meter. All ammeters shall be operated through 1 Amp. CTs only.
- k) Local/Remote (Lockable) selector switch shall be single pole stay put type having three positions LOCAL-OFF-REMOTE. Provision shall be made to padlock the switch in the OFF position
- The LCS shall have provisions as indicated in specification sheet of LCS.
- m) Emergency stop button shall be provided near compressor which shall be directly connected to switchgear panel.
- n) Each element for start and stop shall be provided with 1NO + 1NC contact. The push button construction shall be such to avoid mal-operation due to vibrations.
- o) All components shall be completely wired up to terminal block and also provided with earthing terminals.



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- p) Preferably Ring Type lug and suitable TB to be used for connection, to avoid loose connection.
- q) Inscriptions on corrosion resistant metal strips giving drive description, mechanism number and functional requirement shall be provided.
- r) All spare hole to be plugged with suitable metal plugs.
- s) For all other specifications, refer PC183-TS-0817.

### 6.0 SPARES

### 6.1 Commissioning Spares

The commissioning spares shall form an integral part of the scope of supply. Contractor shall be responsible for the quantification of the commissioning spares for the smooth commissioning start up of the plant/ package system. Item wise list of commissioning spares with recommended quantity shall be furnished for information. The same shall be Part of LSTK price.

- 6.2 2 years operational spares (Mandatory)
- 6.3 Contractor shall supply Mandatory spares for all equipments as per Section VI- Part 5.0: Spare Parts of NIT. The same shall be Part of LSTK Price.
- 6.4 Recommended Spares (Other than Mandatory spare))

Contractor shall provide List of Recommended Spares (other than Mandatory spare) for all the equipment (item-wise) with recommended quantity & item-wise price. Owner will review and decide the recommended spares required for the project. However, these spares shall not be considered in Price evaluation.

- 6.5 All spare parts shall be identical to the parts used in the equipments.
- Any special tools not specified, but required, shall also be provided. The same shall be part of LSTK Price.
- 6.7 Spares and consumables required including short fall during erection, testing, cold trials, commissioning, performance evaluation tests, guarantee tests etc and till handing over of Plant shall be supplied by the Contractor as part of LSTK contract.

### 7.0 TESTING & INSPECTION

- 7.1 Testing of electrical equipments shall be done in accordance with relevant IEC/BIS codes.
- 7.2 The bidder shall submit the certificates of type tests performed on identical equipment as evidence of the compliance of the equipment with the type tests.
- 7.3 All equipment shall be routine tested as per relevant Indian/ International Standard Specifications.



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- 7.4 All the routine/acceptance tests shall be performed at the manufacturer's works in the presence of owner's representative.
- 7.5 The owner or their representative shall be allowed to visit the manufacturing works for stage inspection during manufacturing stage.
- 7.6 The bidder shall intimate the owner 4 weeks in advance of the tests and submit the detailed schedule of tests.
- 7.7 In addition, the equipment shall be inspected at site for final acceptance.
- 7.8 Certified reports of all the tests carried out at the works shall be furnished in six (6) copies for approval of the Owner.
- 7.9 The owner's inspection shall, however, not absolve the bidder from his responsibility for making good any defect which may be noticed subsequently.

### 8.0 VENDOR LIST

- 8.1 Make of all electrical equipment shall be as per Section VI: Part 8.0 Vendor List attached with this bid package.
- 8.2 Any other vendor shall be subject to TFL/PDIL's approval.
- 8.3 Any other item for which vendors are not mentioned in NIT, Bidder 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.

### 9.0 INSTALLATION, TESTING AND COMMISSIONING

- 9.1 The bidder 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.
- 9.2 The bidder shall arrange all the necessary erection tools and tackles, testing and measuring instruments and shall supply the required erection materials including structural steel.
- 9.3 Bidder shall furnish field inspection and test data sheets for all equipments for owner's approval.
- 9.4 The bidder 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.
- 9.5 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.



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- 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.
- 9.6 The tests shall be witnessed by the representatives of Owner/ Consultant.
- 9.7 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

### 10.0 COORDINATION WITH OTHER BIDDERS

10.1 The successful vendor shall coordinate with Owner's other vendors and shall freely exchange all technical information required for this purpose.

### 11.0 BILL OF QUANTITY

The bidder shall furnish the Bill of quantity for all electrical items duly signed and stamped after order. Bill of quantity shall only be for our information. Actual quantity as required shall be supplied by the bidder

### 12.0 DRAWING & DOCUMENTS

- The bidder shall submit the documents for electrical equipments as per the drawing and documentation list enclosed with this bid package.
- 12.2 All drawings and documents shall have the following descriptions written boldly:
  - --Name of Client.
  - -- Name of Consultant i.e. PDIL.
  - --Enquiry / Order Number with Project/Plant name.
  - -- Equipment Code No. and Description.
- 12.3 At the time of handing over of the installation, the vendor shall supply as built drawings taking into consideration the actual execution carried out at site.
- The vendor shall furnish a Bill of Materials covered in their offer. However, this shall be treated for information only and shall not absolve them from his obligation to supply the required items and quantities for making the plant complete as per intent of the specification.



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12.5 Drawings and doc uments shall be submitted as per Drawing & Document list enclosed with NIT in number of copies as indicated below:

- i) With bid: 4
- ii) For approval: 4
- iii) For information:4



### **DESIGN SPECIFICATION- ELECTRICAL** FOR INSTRUMENT AIR/PLANT AIR SYSTEM **TALCHER FERTILIZERS LIMITED**

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### **SPECIFICATION SHEET INDUCTION MOTOR**

PROJECT: Coal B	ased Fertilizer Plant			PLANT : In	strument/Plan	t air	
ISSUED FOR: P	ROPOSAL	ENQUIRY 🗵	ORD	ER [	] FIN	AL 🗌	
II NI		GEN	NERAL	10. 🗖		IFO 17	
Item No. :			Ref. Stds. :	IS 🛛		IEC 🛛	
Quantity:			Encl. Docs. :	<u> </u>			
Description : 3 Pha Code No. :	ase Induction Motor		Make: As per e Maker's Type.:		ndor list		
TESTS: R	Routine 🛛	Туре		Others			
		SERVI	CE CONDITION				
	SYSTEM DETAILS				NT CONDITIC		
Rated Voltage with	ı <u>+</u> % : 11KV/ 3.3K\	/ /415V ± 10%	Temp. Max./Mir	_			
No. of phases :	3		Relative Humid			ve sea: <1000 M	
	Nith <u>+</u> %: 50 Hz ± 5%	, D	ATMOSPHERI				
Combined V & F va			POLLUTION	Vapour:	Ammonia		
Fault Level :	750 MVA (Min) / 150 (	Min) /36 MVA (Min)	Area	Safe		lazardous 🗌	
Space Heater Sup	-		Haz. Area clas		Temp. class :		
Low Voltage Heati			Location :	Indoor		Outdoor 🛛	
INSTRUMENT	A.C. :				NG WATER	0	
CONTACT RATIN			Inlet Press.:	Kg/sq.m.			
Aux. Motor Supply	:		Fauling Factor	:	Outlet Ten	np. <sup>o</sup> C	
		BASI	C DATA				
	RATING & DUTY		_	DRIVE	EN M/C DATA		
Rated Output :			Type:		kW at Max.		
Syn. Speed :			Make :			eed:	
Duty :			Absorbed Powe	er:	Rotation of		
Rotor Type :	Squirrel Cage		Coupling :	/ \$ 4	From coupl	-	
Starting Method :	DOL	0 :: ::	Torque-Starting		Starting Co		
Max I Start/I Rated		•	GD <sup>2</sup> at Motor S <sub>I</sub>		Pulsation R		
Min. V Start at Terr		tage	Thrust - Radial	/ Axiai :	Driven Equ	ipment:	
Min. Starting Torqu	EXECUTION		Addl. Data :	400	SECCODIFC.		
Degree of Protection			Foundation Bolt		Space Heater	. 🔻	
Addl. Degree of Pr			Lifting Eye Bolt		Space Heater Drain Plug		
Mounting Arranger			Cable Glands		Cable Lugs		
Direction of Rotation			Diff. C.T.s		C.W. Flow Inc		
Insulation Class:	'F' with temp. rise	limited to 'B'	RTDs for HT	<u> </u>	Hot Air	Bearings 🛛	
		, illilited to B	Motor				
Cooling Method :	IC411		Thermometer Motor		Hot Air 🛛	Bearings 🛚	
Stator Connection			Earthing Term		On Body 🛚	In T.B.	
	CABLING DATA		Name Plate :		Addl. name p		
	be indicated on the recei		Rain Protecting Hood :				
Heater cable :3x2.5 Sq.mm (Cu) subject to Cl.no.7.1 of ES: 8102.			SPARE PARTS				
C.T. cable :	. 6102.		Required			riod of 2 Years	
R.T.D. cable :			Bearings (DE &	NDE):	Cooling		
Alarm cable :	_		Grease Nipple			ver 🛛	
CABLE	Type: Heavy Duty Do	nuble Compression	RTD for: windin	•		_	
GLAND	Material : Stainless Ste	•	Terminal Plate			ing link : 🕅	
CLAND	Material . Otalilless St	JOI	Inner & Outer o				
	Туре: Ероху		Terminal Block/			· 5 · 🖂	
PAINTING	Shade: 631 of IS: 5		. S.IIIII DIOON	. O	[]		

Note: 1) All unfiled data shall be filled by LSTK Contractor and submitted for Owner's review/approval.

<sup>2)</sup> Space heater shall be provided for all motors rated 30KW & Above.
3) Power cables shall be of 11/3.3KV/1.1KV grade XLPE-A-FRLS and space heater cables shall be of 1.1 KV grade XĹPE-A-FRLS PVC.



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TECHNICAL PARTICULARS (INDUCTION MOTOR)

PROJECT: Coal Based Fert		ANTICOLAIN	N NO L DO VII	T : Instrument/Plant air	air
ISSUED FOR: PROPO		ENQUIRY 🛛	ORDER	T FINAL	all
TOOLD TOR.	O/ (L	GENER		1 1111/12	
Item No.					
Quantity					
Description					
Code No.					
Ref. Standard					
Make					
Maker's Type					
Detect Octoor		ELECTRICAL	. DATA		
Rated Output					
Rated Voltage No. of Starts - Hot / Cold					
Torque - Starting / Pull Up /	Dull ∩ut				
Starting Time at min. V Star					
Safe Stall Time at V <sub>R</sub> / 1.1V					
Stator Time Constant	K				
Temp. Rise at Full Load - W	/da. / Hot Air / Bra.				
TEMP. RISE OF STATOR	3 Starts From Cold				
/ ROTOR AFTER	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 F	L / Start				
Push Pull Voltage withstand					
Max. V dip for 1 sec. / 10 se					
Losses - Fixed / Copper / To	otal				
Space Heater Rating					
Suitable for Low Voltage He					
C.T. Ratio & Accuracy Class	S				
C.T. V <sub>K</sub> & Imag. at V <sub>K</sub> / 2					
Heating Time Constant					
Cooling Time Constant		MECHANICA	DATA		
Frame Size / Ref. Dimensio	nal Dra	MECHANICA	LUAIA		
Weight - Stator / Rotor / Tot					
Heaviest Weight to be Lifted					
Rotor GD <sup>2</sup> in Kgm <sup>2</sup>	u				
Rotor GD III Rgili	S/C Condition				
REACTION AT	Starting Condition				
SUPPORTS FOR	Running Condition				
	Push Pull Condition	1			
Max. Vibration Limit	T don't dil Condition				
Max. Noise Level					
Suitable for Outdoor Use		Yes	з П	No 🗌	
Suitable for Bi-directional Ro	otation	Yes		No 🗌	
Material of Insulation			<b></b>	_	
Treatment of Insulation					
Winding Coils Replaceable	at Site				
Type & Material of Fan					
Material & Thickness of Coc					
Cooling Water Required in I	Mˇ / hr				
Lubrication Type					
Lubricant Specn.					
Interval of Lubrication	l DE				
BEARING	DE				
NOS. & TYPE	NDE				
On Line Lubrication	GUIDE				
Type & Rating of Main Cable	e Box				
No. of Cable Glands in Conf					
110. Of Gabie Glarius III Coll	I OI OUDIO DOX	t			

**Note:** Technical Particulars shall be filled by the LSTK Contractor and submitted for Approval <u>after order</u> in line with NIT/Contract requirement before commencement of manufacturing.



### FOR INSTRUMENT AIR/PLANT AIR SYSTEM **TALCHER FERTILIZERS LIMITED**

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PROJECT: C	nal Baser	Fertilizer Plant	ATION SHEET	LUCAL				nt/Plant air		
ISSUED FOR		OPOSAL	ENQUIRY D	<u></u> ⊼1	ORDE		7	FINAL		
.CCGLD I OF		BENERAL		ORDER FINAL   AMBIENT CONDITION						
Ref. Stds. :IS		JEHLIVAL		Temp. Max./Min./Design Ref. 46° C / 1° C / 50° C						
Encl. Docs. :	PC183-TS	5-0817		Relative H	Relative Humidity: 100% Alt. above Sea : Less than 1000 m					
Vendor :	1 0 100 10			Atmos		Dusts		oust / Coal Dus		
Vendor Ref. N	lo. :				ıtion	Vapours		onia Vapour		
				Ar	ea	Safe : [		Hazardous :		
Sample: R	leqd.:	☐ Not	Reqd.: 🛛	Hazardo	us Area	Zone :		Encl. Gr. :		
	outine :	⊠ Ty	pe: 🔲	Cla		Temp. C	CI.			
Tests : Ot	hers:	•		Location	: In	door 🗵		Outdoor	$\square$	
			RΔ	SIC DATA					_	
Item No.			1	OIO DAIA		2		3		
			LCS FOR HV/ LV			R LT MO	_	LCS FOR LT I		
			(Breaker con	trolled)	(above 2	22KW to 5	5KW)	(up to 22h	(W)	
			TYPE -	1	Т	YPE – 2		TYPE -	. 3	
Quantity  Reted Central	\/al+=	iith 1 0/	4401/ DO	LE0/	0.4	101/1400/		04017.4	00/	
Rated Control Rated Freque		<u>/IUI + %</u>	110V DC 50Hz±5			<u>I0V±10%</u> 0Hz±5%		240V±1 50Hz±5		
Enclosure for		s Area	3011213	7.0	J.	U1 12±U /0		JUI 1210	, , ,	
			Provisions	s required in						
	Start					Required		Require		
PUSH	Stop				R	Required		Require	ed	
BUTTON	Rever Forwa									
		gency stop push	Require	ed						
	TNC		Require							
CONTROL		Service								
SWITCH		AUTO / ON Remote	Require		Б	Required		Poquir	24	
	Local	Remote	rtequired			kequirea		Required		
ON		Require	ed	R	Required		Require	ed		
	OFF		Require	ed Required			d Requ			
INDICATIO		/ for Service	Require							
LAMP		<u>Heater ON</u> ripped	Require			Required				
	C.D. t	прреч	Required							
	Amme	eter	Require	ed Rec		Required		Require	ed*	
METERS	Range									
	C.T. 8	Sec. Current	1 Amp			1 Amp.		1 Amp.		
	Reqd		Require	ed Require		Required	uired		2d	
RAIN HOO			rtoquire	<i>,</i> u	Nequired			Require	Ju	
Control Cable		APVC (Cu)	F 0: : -	04 ( 10 =	E 0: 100:11:5 =		( 10 5			
Painting Type Period For wh		Pend	Epoxy Shade6	310f IS 5	Epoxy Shade63		of IS 5   I	Epoxy Shade6	310f IS 5	
T CHOUT OF WIT	non opare:	, roqu.	2Years	 S		2Years		2Year	s	
			MAKE OF	COMPON	ENTS					
Push Buttons			L & T / Siemen			ishnav				
TNC Switches	3		L & T / Siemen AEP / IMP / Me							
Ammeter Indication Lan	Vaishnav	Sai								
Cable Gland	CEAG F	CGPL / FEI	PL							
Terminal Box			Elemex / Sieme	ens/ L& T						
NI-4- AP 6"			littel de							
Note :- All unfille	ed data sha ncess point	Il be filled in by the	e bidder. shall be provided for	motore helo	w 5 5 K\M					
		Fertilizer Plant	anan be provided for	motors DEIO		ΙΔΝΤ·Ι	nstrument	t/Plant air air		
ISSUED FOR		POSAL	ENQUIRY 🗵	]	ORDER			FINAL		
			Details Of Lo	cal Contro	I Stations	•	-		_	
SI.No.	ITEM NO	. CODE NO.		ESCRIPTIO			IFL	C.T. Ratio	Remarks	



## FOR INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

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Tälcher Fertilizers

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	TECH	INICA	L PARTIC	ULARS	S (LOCAL CO	NTROL ST	ATIONS)	
PROJECT: Coal E	Based Fertilizer	Plant			-	PLANT : Instr	ument/Plant air	
ISSUED FOR:	PROPOSAL		ENQUIRY	$\boxtimes$	ORDEF		FINAL	
				G	ENERAL			
Maker's Type								
M + : 1 (O +			CON	STRUC	IONAL FEATUR	ES		
Material of Constr Thickness of Encl								
IP Class of Enclose								
Mounting Arrange								
Door hinged or no								
Gasketing Materia								
External Hardwar								
Rainhood regd. o								
Mounting	On Door							
Component	On Base Pla	ate						
Provision of Padlo	ocking provided	with						
Dimensions LxBx	H / Dimensiona	l Drg. F	Ref. No.					
Type Test Certific								
Type rest dertine	ate No.			١	VIRING			
Wiring Material &	Size							
External Cable Si								
			TER	/INATIC	N ARRANGEME	NT		
Termination Arrar	ngement							
Cable Glands	Material							
	Types							
<b>-</b>	Make							
Terminal	Туре							
	Rating			DUCI	LDUTTONS			
Make & Maker's 7	Γνης			PUSI	H BUTTONS			
Ref. Standards	турс							
Rated Voltage								
No. of Contacts N	I.O. / N.C.							
Contact Rating ( \	V / A )							
				Al	MMETER			
Make & Maker's 7	Гуре							
Ref. Standards								
Rated Current / V	A							
Accuracy Class								
Scale Band								
Size				CONTR	OL SWITCHES			
				CONTR	OF SMILCHES			
Make & Maker's 7	Гуре							
Ref. Standards	. ,,,,,							
Rated Voltage								
No. of Contacts N	I.O. / N.C.							
Contact Rating ( \	V/A)							
Utilization Catego								
		· · · · ·		SIGN	IAL LAMPS			
Make & Maker's 7	Гуре							
Ref Standards								

**Note:** Technical Particulars shall be filled by the LSTK Contractor and submitted for Approval <u>after order</u> in line with NIT/Contract requirement before commencement of manufacturing.

Rated Voltage / Watts Type of Holder Safety Resistor



# FOR INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

PC183/E/4016/SEC-VI/Part-3.3 0

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			THON SHEET FO	RELECTRI				
PROJECT: Coal						Ins	trument/Plant air	
ISSUED FOR:	L 🗆	ENQUIRY 🛛	ORDER  FINAL					
		GEN	ERAL					
Item No. :			Ref. Stds. : IS / IEC					
Quantity :				Encl. Docs.	:			
Description : El	FCTRIC	HEATER		Make	•			
Code No. :				Maker's Typ				
TESTS:	Routine	$\square$	Heat Run	Burn-ir			Others:	
ILSIS .	Noullile				<u>'                                    </u>		Others.	
	0)/075			ONDITIONS	41451		- COUDITIONS	
		M DETAILS					CONDITIONS	
Nom. Voltage w	_	: 415V±	10%	•			ef. 46 <sup>0</sup> C / 1 <sup>0</sup> C / 50 <sup>0</sup> C	
Highest System	Voltage	: 456V					Alt. above Sea < 1000M	
Number of phas	ses	: 3PHAS	SE 4WIRE	Atmospher			: Urea Dust / Coal Dust	
Rated Frequenc	y with + 9	%: 50Hz ±	3 %	Pollution	Vap	ours	s: Ammonia Vapour	
Combined (V &	F) Variation	on: ± 10 %	)	Location	Indo	oor	: Outdoor :	
Fault Level		: 36MVA	1		Н	aza	rdous Area	
Earthing Mode		: Solidly						
Reference Sign		: 4-20 m						
		0%, 50Hz <u>-</u>						
				0 ( 15)	<u>.                                      </u>	- 1	The winter and the last	
Data A.C.	: 115V ±1	0%, 50HZ =	± 2% UPS Supply	Control Ph	iiosopny	<b>/</b>	Thyristor control	
				DATA				
	HEATE	R RATING			CC	)NT	ROL PANEL	
Rated Capacity	:			Installation			Indoor & Floor Mounted	
Highest Voltage	for Eqpt.			Degree of F	Minimum IP-5X			
Heat Flux Dens	ity · 2 0 W	//cm² (Max	)	Cable Entry	Bottom Side			
Max. Allowable		•	•	Noise Leve			Less than 75 D b at full	
		emperature		load @ 1 meter distance				
Design temp. sh				Cooling in Panel				
No. of heating b	undle	1 (one) si	ngle shell	Auto/ Manu	ıal Contr	ol	Required	
Heater Element	Material	80Ni-20 Incoloy-80	Cr and s heath				arth Fault Trip hyristor Over Temperature Trip	
Mounting		Horizonta		PROTEC	TION	Н	eater Element Over	
		 					emperature Trip	
	Powe	er Rating		Process Air Over Tempe				
		1 400/		Trip				
		•	positive margin.	Alarm / Interlock				
		eating Ele					hyristor Over Temperature larm	
		us 10% to	be provided as				eater Element Over	
unconnected sp	ares.			temperature			emperature Trip	
Heater termina	I Box: As	per technic	al specification	Process trip	interlock	Al	arm shall actuate hooter	
				through PLC	<u> </u>	ar	nd give lamp indication	
<b>Heater Glands</b>	& Lugs: o	double com	pression Stainless		Ind	ica	tion in Panel	
steel cable glan			•	Voltmeter	Ammet	er		
Process Fluid				KWh			re indicator	
				Meter	'			
Power factor :		PID Controller	Alarm/T Spec.	rip/	Power /On /Off etc. as per			
	Sna	re Parts		Controller	орос.	P	Painting	
Required as po			a per iod of 2	Type: EF	POXY		uniting	
Years O&M.	o abecilio	auon IUI	a per iou or Z		AL – 703	2/1	IS-631	
1 Gai 3 Gaivi.				onauc. K				
							ds and Lugs	
		Double compression SS cable glands						
				Internal Pro	tection :	All	Live parts shall be shrouded	
On a sea Headen	Doguirodi		well as control pan	ما				

TECHNICAL PARTICULAR FOR ELECTRIC HEATER



# FOR INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED

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IEGIIEN END : [		PLAN I : Instrument/Plant air
1330ED FOR . F	PROPOSAL 🗌 ENQUIRY 🛛	ORDER  FINAL
Bidder's referen	ce / Model No	
Applicable code:	s/standards	
Heater Rating		
Heater Full Load	Current	
	t & Sheath Material	
	provided (with calculation)	
No. of heater ba		
Overall Element		
Unheated Eleme		
Element Sealing	Method	
Overall Dimensi	on (L x W x H) of Heater	
Thyristor Full Lo	ad Current	
	emperature Alarm (in Deg.)	
	emperature Trip (in Deg.)	
Harmonics Disto		
Tiaitiioilios Disto	JI LIOIT	Voltage :
Input power sup	ply ratings Basic Design	<u> </u>
		Frequency:
Overload capabi	шту	
		Voltage :
AC Output		Frequency:
AC Output		Voltage accuracy :
		Voltage unbalance :
Transient voltag	e	
g	-	Heater start :
		Heater stop :
Controls		Auto/Manual Operation : Yes
		Remote trip push button :
	100 % load	Remote trip push button.
Overall		
efficiency	75 % load	
	50 % load	
	Make	
	Type/Model No.	
	Total No. of Thyristor &	
	l	
	configuration	
	configuration  Efficiency	
Power	Efficiency	
Power converter	Efficiency Controls provided at the front of	
	Efficiency Controls provided at the front of the panel	
	Efficiency Controls provided at the front of the panel Measuring devices at the front of	
	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel	
	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and	
converter	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel	
converter	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type	
converter	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type Redundancy in cooling Units	
Cooling System	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type Redundancy in cooling Units Main incomer switch/breaker	
converter	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type Redundancy in cooling Units	
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Cooling System	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type Redundancy in cooling Units Main incomer switch/breaker Main outgoing contactor	
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Cooling System Make/Rating Dimension Paint shade	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type Redundancy in cooling Units Main incomer switch/breaker Main outgoing contactor Length x Height x Depth Weight of cubicle	
Cooling System Make/Rating Dimension Paint shade Heat output of P	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type Redundancy in cooling Units Main incomer switch/breaker Main outgoing contactor Length x Height x Depth Weight of cubicle	
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Cooling System  Make/Rating  Dimension  Paint shade  Heat output of P Control supply v Degree of protect Size of Power C	Efficiency Controls provided at the front of the panel Measuring devices at the front of the panel Status indication and Annunciation on panel Type Redundancy in cooling Units Main incomer switch/breaker Main outgoing contactor Length x Height x Depth Weight of cubicle  anel oltage and Aux. Power requirement ction for enclosure able to be supplied introl Cable to be supplied	



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# TECHNICAL SPECIFICATION LIGHTING SUB DISTRIBUTION BOARDS



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3.0	SERVICE CONDITIONS
4.0	OPERATING REQUIREMENTS
5.0	GENERAL DESIGN AND CONSTRUCTIONAL FEATURES
6.0	SPECIAL FEATURES FOR FLAME PROOF LIGHTING SUB DISTRIBUTION BOARDS
7.0	COMPONENT DETAILS
8.0	PAINTING
9.0	TESTS AND INSPECTION
10.0	DRAWINGS AND DOCUMENTS
11.0	SPARES
12.0	PACKING
ANNEXURE - I	DOCUMENTATION FOR LIGHTING SUB 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 lighting sub distribution boards.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy Electrical.

### 2.0 STANDARDS TO BE FOLLOWED

2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of the following Indian Standards. Equipment complying with equivalent IEC standards shall also be acceptable

IS/IEC:60947

- Low voltage switchgear and control gear

IS: 8623

Specification for low voltage switchgear and control gear assemblies

- 2.2 The design and operational features of the equipment offered shall also comply with the provisions of latest issue of the Indian Electricity Rules and other relevant statutory acts and regulations. The supplier shall, wherever necessary, make suitable modification in the equipment to comply with the above.
- 2.3 Wherever any requirement, laid down in this standard, differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

#### 3.0 SERVICE CONDITIONS

#### 3.1 Ambient Conditions

These shall be as indicated in Design Philosophy - Electrical.

### 3.2 System Details

These shall be as indicated in Design Philosophy - Electrical.

#### 4.0 OPERATING REQUIREMENTS

The lighting sub-distribution boards shall be suitable for operating continuously under the ambient conditions and with the voltage and frequency variations, without exceeding the specified temperature rise and without any detrimental effect on any part.

#### 5.0 GENERAL DESIGN AND CONSTRUCTIONAL FEATURES

- 5.1 The lighting sub distribution boards shall be fabricated out of 2.5 mm thick cold rolled sheet steel and shall be suitable for mounting on wall/structure. These shall have dust and vermin proof construction conforming to IP-65 as per IS/IEC:60947. For outdoor installation, the enclosure shall conform to IPW-55. Suitable canopy made out of 2 mm thick Aluminium sheet shall be supplied along with the board.
- 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.
- 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.
- 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.
- The sub-distribution board must be certified by Central Mining Research Institute, Dhanbad or other statutory authority for use in specified hazardous area.

### 7.0 COMPONENT DETAILS

7.1 The lighting sub-distribution board shall be wired and have components as per SD-8083 (copy attached).

### 7.2 Miniature Circuit Breaker (MCB)

The MCB shall be of duty category M-9 and shall conform to IS/IEC:60898-1:2002. It shall be provided with overload and short circuit protective devices. MCB shall be of C Curve Type.

7.2.1 The incoming MCB's or switches shall be of triple pole and switched neutral type and outgoing MCB's of single pole and switched neutral type, single phase earth leakage protection in each phase of the incomer shall be provided.

### 7.3 Terminal Block

Pressure clamp type terminal blocks shall be provided both for incoming and outgoing cables. The rating of the terminal block shall be at least 1.5 times the rating of the MCB.

#### 7.4 Cable Glands

Heavy duty double compression type Aluminium cable glands suitable for PVC insulated, armoured and PVC sheathed 1.1 KV grade incoming and outgoing cables shall be provided.



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### 8.0 PAINTING

- 8.1 The enclosure after suitable pre-treatment shall be painted with two coats of anti rust paint followed by two coats or anticorrosive paint.
- 8.2 Epoxy based paint shall be used.
- 8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- The finishing shade shall be light grey shade no.631 as per IS: 5.

### 9.0 TESTS AND INSPECTION

- 9.1 All the lighting sub-distribution boards shall be subjected to routine tests as per IS: 8623.
- 9.2 Additional tests, wherever specified, shall be carried out on one lighting sub-distribution board of each type.
- 9.3 The above mentioned tests shall be carried out in the manufacturer's works in the presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection at works and inspection at site for final acceptance.
- 9.4 The purchaser's inspection shall, however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.

### 10.0 DRAWINGS AND DOCUMENTS

- 10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 10.2 All drawings and documents shall have the following description written boldly.
  - Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description

### 11.0 SPARES

- 11.1 Commissioning Spares: Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 11.2 Spare for 2 Years Operation (Mandatory), as specified shall be supplied.
- 11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 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.
- The packing box shall contain a copy of the installation, operation and maintenance manual.



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## ANNEXURE - I DOCUMENTATION FOR LIGHTING SUB DISTRIBUTION BOARDS

SI NO	Description	Doscription					
SL.NO.	Description	With Bid	For Approval	Final			
1.	Specification Sheet	N	Υ	Υ			
2.	Technical particulars	N	Υ	Y			
3.	General arrangement Drgs.	N	Υ	Y			
4.	Certificate for flameproofness from statutory testing authority wherever applicable	N	N	Y			
5.	Schematic diagram	N	Υ	Y			
6.	Descriptive literature of Various equipment	N	N	Y			
7.	Guarantee certificate	N	N	Υ			
8.	Test certificate	N	N	Υ			

### 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 INDUCTION MOTOR



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5.0	PERFORMANCE
6.0	COUPLING DETAILS
7.0	ACCESSORIES
8.0	VIBRATIONS
9.0	NOISE LEVEL
10.0	PAINTING
11.0	TESTS AND INSPECTION
12.0	PACKING
13.0	DRAWINGS AND DOCUMENTS
14.0	SPARES
ANNEXURE - I	DOCUMENTATION FOR INDUCTION MOTORS



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### 1.0 SCOPE

- 1.1 This standard covers the technical requirements of design, manufacture, testing at works and delivery in well-packed condition of medium voltage and high voltage induction motors.
- 1.2 This standard shall be read in conjunction with relevant part of Design Philosophy -Electrical.

### 2.0 STANDARDS TO BE FOLLOWED

- 2.1 The design, manufacture and testing of the equipment covered by this standard shall comply with the latest issue of IS-325 and other relevant Indian Standards, unless otherwise specified. Equipment complying with equivalent IEC standards shall also be acceptable.
- 2.2 The design and operational features of the equipment offered shall also comply with the provisions of latest issue of the Indian Electricity Rules and other relevant Statutory Rules & Regulations. The supplier shall, whenever necessary, make suitable modification in the equipment to comply with the above mentioned rules.
- 2.3 Flame proof motors shall, in addition, comply with the requirements laid down in IS: 2148.
- 2.4 Increased safety motors shall, in addition, comply with the requirements laid down in IS: 6381.
- 2.5 Motors with type of protection "n" shall, in addition, comply with the requirements laid down in IS: 9628.
- 2.6 Wherever any requirement laid down in this standard differs from that in Indian Standard Specifications, the requirement specified herein shall prevail.

### 3.0 SERVICE CONDITIONS

### 3.1 Ambient Conditions

The ambient conditions shall be as indicated in the Design Philosophy - Electrical.

### 3.2 System Details

- 3.2.1 The details of power system to which the motors will be connected shall be as indicated in the Design Philosophy Electrical.
- 3.2.2 The motors shall be suitable for connection to a power system where transient disturbances are very likely to occur. During the transient disturbances, voltage of the system may completely disappear and return in a short time with the motors still running and connected. Under this condition, the return of voltage may occur at such an instant that the induced e.m.f. in the motor is in phase with the applied voltage giving rise to current surges which may reach a value equal to 1.6 times the starting current and also cause transient torques of large magnitudes.

### 4.0 GENERAL DESIGN FEATURES

#### 4.1 Enclosure

- 4.1.1 The enclosure of motors for indoor and outdoor services shall be IP-54 and IPW-55 respectively as per IS/IEC:60529, unless otherwise specified.
- 4.1.2 Motors for outdoor service shall be provided with special seals for the enclosure, joints, bearing housing, terminal boxes etc. so that no extra protective covering for ingress of water shall be required.



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- 4.1.3 Vertical motors for outdoor installation shall be provided with a rain protective hood.
- 4.1.4 All external hardware shall be zinc passivated or cadmium plated.
- 4.1.5 The enclosure shall be provided with threaded metallic plug to permit drainage of condensed water from the inside.
- 4.2 Cooling
- 4.2.1 All motors shall be totally enclosed fan cooled conforming to IC-0141 as per IS: 6362 unless otherwise specified.
- 4.2.2 In case of CACA construction, the same shall conform to IC-0161 as per IS: 6362.
- 4.2.3 In case of CACW construction, the same shall conform to ICW 37A 91 as per IS: 6362.
- 4.2.4 Wherever service conditions are such that corrosive agents are present in the surroundings, the following materials of construction for cooling tubes shall be adopted, unless otherwise specified.

For CACA motor - Aluminium tubes having minimum thickness of 1.6 mm

For CACW motor - Low carbon alloy steel

- 4.2.5 In case of CACW motors, the cooling tubes and flanges shall also be suitable for the cooling water analysis. Trays shall be provided for collection of leaking water with arrangement for its drainage.
- 4.2.6 The cooling fans shall be suitable for bidirectional rotation of motors. These shall be fastened to the motor shaft by means of compensating rings or will be balanced independent of the motor. Guide key or reference points shall be supplied to prevent wrong assembly. The cooling air shall be sucked from the non-driving end.
- 4.2.7 The cooling fans shall be made of non-sparking materials such as cast Aluminium (LM-6 alloy) / cast iron.
- 4.3 **Direction of Rotation**
- 4.3.1 Motors shall be suitable for both directions of rotation. In case of any design limitation, the same shall be indicated in the offer.
- 4.3.2 In either case, a plate showing the direction of rotation corresponding to the phase terminal markings shall be fitted at the driving end shield of the motors.
- 4.4 Stator
- 4.4.1 The stator laminations shall be made from suitable magnetic sheet iron varnished on both sides. Where ventilation is required, these shall be arranged in suitable packs, each pack being separated by spacers to form ventilating ducts for circulation of air.
- The slot shall be open type with coils so arranged that the coils can be easily removed for inspection and repair.
- 4.5 **Rotor**
- 4.5.1 The rotor shall be of squirrel cage construction, unless otherwise specified.
- 4.5.2 For small motors, the squirrel cage shall preferably be of pressure die-cast construction. For large motors, the rotor bars and the end rings shall be of copper or copper alloy. The bars shall be firmly placed in slots to prevent vibration during start up / locked rotor condition. Conductor ends shall be securely fixed to the end rings using the latest brazing techniques. Retaining rings shall be provided for high speed machines for the end rings. The rotor cage shall be designed for the required starting and duty cycles.



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4.5.3 Wherever wound rotor is specified, the windings shall have the same features as detailed for the stator windings. The rotor voltage shall not exceed the stator voltage.

- 4.5.4 The rotor shall be dynamically balanced and shall rotate perfectly with no preferential stop points. The rotor shall be constructed such as to allow the removal or addition of material for balancing.
- 4.5.5 The rotor shaft shall be electrically and magnetically so balanced that the induced shaft voltage does not exceed 200 millivolt. Otherwise the bearing housing at non-driving end shall be insulated for 2 KV.

### 4.6 Windings and Insulation

- 4.6.1 The motor coils shall be made out of insulated electrolytic grade copper conductor. Successive coils shall be connected by accessible joints, well brazed and finished smooth to prevent damage to insulation.
- 4.6.2 The motors shall be insulated assuming the power system neutral as isolated.
- 4.6.3 All motors shall be insulated with F insulation with tropical and fungicidal treatments.
- 4.6.4 Wherever class F insulation is specified, the windings shall be easily replaceable type and the temperature rise shall not exceed that of class B insulation.
- 4.6.5 The winding coils shall be dried, properly impregnated with suitable varnishes to withstand the site conditions and properly baked. At least two additional impregnations and baking shall be applied to the assembled stator coil, making a total of three impregnations and baking. Finally the windings shall be painted with special anti-acid and anti-alkali paints to withstand the site conditions.
- 4.6.6 The windings shall be well brazed and capable of withstanding thermally and mechanically the transient disturbances specified under clause 3.2.2.
- 4.6.7 Lead-in wire between the windings and the outside terminals shall be made through bushings in H.V. motors. For M.V. motors, heat resistant insulated conductors shall be used as lead-in wire.
- 4.6.8 The windings shall be star connected for high voltage motors and delta connected for medium voltage motors.

### 4.7 Slip Rings and Brushes

- 4.7.1 Slip rings shall be located in the non-driving side. The material of construction shall be copper alloy. The slip rings and the brush gear shall be cooled by the motor cooling fan.
- 4.7.2 For explosion proof motors, the slip rings and brush gear shall be housed in a flameproof housing. In case this is not possible, the housing shall be pressurised type with flameproof pressure switch for interlocking with the motor. In either case, glass covers shall be provided for inspection.
- 4.7.3 The starting rheostats shall be designed for intermittent duty and rated for 10 minutes. Where speed regulation is required, the rheostats and the controllers shall be suitable for such duty and be continuously rated. Auxiliary contacts shall be provided on the controllers for connections to the motor supply controls to prevent wrong operations during starting.

### 4.8 **Bearings**

4.8.1 All motors shall be provided with bearings suitable for the application. The bearings shall have a smooth operation and a life not shorter than 30,000 hrs.



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4.8.2 Where external thrusts are specified, the motors shall be fitted with special roller thrust bearings capable of withstanding the specified thrust. In such cases, the life of the bearings shall not be less than 20,000 hours.

- 4.8.3 The bearing housing shall be effectively sealed against ingress of dust and water and creep age of lubricants along the shaft.
- 4.8.4 The bearing shall be suitable for both directions of rotation of the motor.
- 4.8.5 All motors shall be provided with on-line grease lubrication arrangement for both DE and NDE side bearings except for motors of frame size 112 and less and flange mounted M.V. motors. The arrangement shall be complete with grease nipple and drain plug located at convenient locations.
- 4.8.6 All oil lubricated bearings shall be fitted with oil level indicator and resistance temperature detector/dial type thermometer with alarm and trip contacts.
- 4.8.7 Self cooled bearing system shall be preferred.
- 4.8.8 The manufacturer shall specify the type of lubricant and the time interval of lubrication for the bearings of each motor.
- 4.8.9 The bearing temperature shall not exceed 90°C for grease lubricated bearings and 70°C for oil lubricated bearings.
- 4.8.10 Wherever shaft end-play has been specified, the bearings shall be capable of providing the specified end-play.

### 4.9 Terminal Box

- 4.9.1 All the terminal boxes shall have identical degree of protection as that of the motor.
- 4.9.2 The power terminal box shall be mounted on the right hand side of the motor as viewed from the coupling end. For M.V. Motors, design of terminal boxes shall be such that it may be possible to arrange top/bottom/side entry of cables at site.
- 4.9.3 The power terminal boxes shall be as follows:
  - a) For H.V. motors Phase segregated type capable of with standing the system fault level for 0.2 Sec. or more.
  - b) For M.V. motors Manufacturer's standard box with epoxy or SRBF moulded terminal board.
- 4.9.4 The mounting arrangement of power and neutral side terminal boxes for HV motors shall be identical so that it shall be possible to interchange the boxes at site.
- 4.9.5 In case of H.V. motors, all the six leads of the motors shall be taken out, three on one side and three on the other side to separate terminal boxes. However, neutral shorting link shall be provided on the neutral box for star connection.
- 4.9.6 In case of M.V. motors, all the six leads of the motors shall be taken out to a common terminal box. Shorting links for delta connections shall be provided in the terminal box for motors 112 frame and above.
- 4.9.7 For increased safety motors and for motors with type of protection "n", the terminals shall be provided with positive locking device so that they do not become loose during normal operation.
- 4.9.8 The power terminal boxes shall have adequate clearances in between the terminals and also between the terminals and cable gland for proper termination of cables. Where more than one cable is required to be terminated in parallel, the spacing in the box shall be adequate for easy termination.



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4.9.9 Separate terminal boxes shall be provided for connection of power, control and space heater cables.

4.9.10 All terminal boxes shall be complete with heavy duty double compression type cable glands and lugs/connectors to receive the external cables.

4.9.11 Where cross linked polyethylene cables are specified, the terminal box shall be suitably designed for proper termination of such cables.

4.9.12 The cable lugs shall be of tinned copper and suitable for crimping.

### 4.10 Geared Motors

Where geared motors are specified, the gears shall be oil lubricated, heavy duty as per AGMA class III and capable of transmitting the rated motor power continuously. They shall be capable of withstanding moderate shock loads having a service factor of 2 and the starting duties. They shall be silent and smooth in operation. Inspection glass shall be provided to indicate the oil level in the gear box.

#### 5.0 PERFORMANCE

### 5.1 Starting

- 5.1.1 The motors shall be capable of being started direct-on-line, unless otherwise specified.
- 5.1.2 The starting torque of each motor shall be higher than the initial resisting torque of the driven load throughout the starting period even at a feeding voltage of 85% of the rated voltage for normal purpose motor and 80% of the rated voltage for special purpose motor.
- 5.1.3 The starting current of 415 V Motors shall not exceed the values indicated in IS: 12615. Also there shall be no further positive tolerance on the values of starting current.

The starting current of 11 KV & 3.3 KV motors shall not exceed 550% of FLC. No positive tolerance is acceptable over 550% FLC.

- 5.1.4 The motors shall be suitable for the following starting cycle:
  - a) With the motor at ambient temperature 2 successive starts and 3rd start after 5 minutes.
  - b) With the motor at steady state load temperature 1 immediate start and 2nd start after 5 minutes. This sequence shall be repeated in the next hour.
- 5.1.5 Speed switch shall be provided, wherever required, to fulfil the starting conditions.

### 5.2 Locked Rotor Condition

- 5.2.1 The locked rotor withstand time  $(t_E)$ , under hot condition at 110% of rated voltage shall be more than the starting time of the motor coupled to the load even at the lowest stipulated starting voltage by 2 secs. for motors, having starting time up to 10 secs. and by 5 secs. for motors, having starting time more than 10 secs.
- 5.2.2 For increased safety motors,  $t_E$  under hot condition shall not be less than 10 secs. The value of  $t_E$  shall be determined in the presence of purchaser's representative unless test certificate from an independent testing authority is submitted for similar motors. The time  $t_E$  and the locked rotor current shall be stamped on the name plate as well as indicated in the test certificates.
- 5.2.3 For deciding the time  $t_E$  in all cases, the temperature of the insulated stator and rotor shall not exceed the value stipulated under clause no. 5.4.3.

### 5.3 Running



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5.3.1	All motors	shall	be	continuous	maximum	rated	(S1	duty	as	per	IS:	325),	unless
	otherwise s	pecifie	ed.										

- 5.3.2 The motors shall be capable of delivering the rated output without exceeding the specified temperature rise under the system voltage and frequency variation conditions.
- 5.3.3 The motors shall be suitable for running at the rated load for 5 minutes duration at 80% voltage and for 1 Sec. duration at 70% voltage, without exceeding the specified temperature rise.

### 5.4 **Temperature Rise**

- 5.4.1 The total temperature of the stator winding under full load running condition shall not exceed the values permissible for the specified insulation class. For increased safety motors, the total temperature shall be 10°C less than for normal motors.
- 5.4.2 For explosion proof motors, the maximum surface temperature shall not exceed the values applicable for temperature class of the hazardous gases / vapours present in the surrounding area. However for type 'n' motors, the maximum allowable temperature shall not exceed 200°C.
- 5.4.3 In case of starting and locked rotor conditions stipulated under clause nos. 5.1.4 and 5.2.1 respectively, the maximum temperature in the rotor shall not exceed the following values:

For squirrel cage rotor

- 300°C

For wound rotor

- As applicable to the insulation class

For explosion proof motor

 As per temperature class of the hazardous gases / vapours, without exceeding the above temperature as applicable

#### 6.0 COUPLING DETAILS

- 6.1 Unless otherwise specified, all motors shall be coupled to the driven equipment through flexible coupling.
- 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 ±66% of the rated current while delivering full load.
  - ii) The measurement of armature current shall be done with the oscillograph.
  - iii) The additional fly wheel, if any, shall be assembled at such a distance from the motor so as to allow easy inspection of the windings.
  - iv) All necessary coordination with driven equipment manufacturer shall be carried out by the motor manufacturer.



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6.6 i) Wherever belt drive is specified, the motor supplier shall ensure that the shaft extension and the bearings are suitable for the duty specified.

ii) Unless otherwise specified, the slide rails for all belt driven motors shall be supplied by the motor manufacturer.

### 7.0 ACCESSORIES

The motors shall be complete with all the accessories.

### 7.1 Space Heaters

- 7.1.1 Space heaters rated for 240 V A.C. shall be provided to keep the winding dry for all high and medium voltage motors, except for motors rated below 30 KW which shall be suitable for space heating by connecting 24 V A.C to any of the two motor winding terminals.
- 7.1.2 The location of the space heaters shall be such as to allow easy access for inspection, maintenance and replacement.

#### 7.2 Name Plates

- 7.2.1 The name plates shall be of stainless steel with letters embossed on them.
- 7.2.2 The name plate shall contain all the relevant details as per IS: 325 and in addition shall indicate the following:
  - i) The description and code no. of motor
  - ii) Degree of protection of enclosure
  - iii) Temperature rise of windings under running condition
  - iv) Designation of bearings
  - v) Recommended type of lubricant and interval of lubrication
  - vi) Direction of rotation
  - vii) Mounting Arrangement
- 7.2.3 Flameproof motors shall have additional name plate containing relevant particulars as per IS: 2148.
- 7.2.4 Increased safety motors shall have additional name plate containing relevant particulars as per IS: 6381.
- 7.2.5 Motors with type of protection "n" shall have additional name plate containing relevant particulars as per IS: 9628.

### 7.3 Embedded Temperature Detectors

- 7.3.1 All high voltage motors shall be provided with 6 nos. of evenly distributed embedded resistance temperature detectors for measurement of winding temperature. These shall be located in positions at which the highest temperatures are likely to occur.
- 7.3.2 In addition, the high voltage motors shall be provided with
  - i) 1 no. RTD for hot air temperature measurement
  - 2 nos. RTDs (1 on each side) for bearing temperature measurement of oil lubricated bearings. For grease lubricated bearings, RTD shall be provided only where specified



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7.3.3 These RTDs shall be of platinum having 100 ohm resistance at 0°C and temperature coefficient as 3.850 x 10<sup>-3</sup>.

- 7.3.4 The RTDs shall be 3 lead type having power frequency insulation level of 2KV.
- 7.3.5 The RTDs shall comply with the requirements laid down in IS: 2848.

### 7.4 **Dial Type Thermometers**

- 7.4.1 In high voltage motors, the measurement of hot air and bearing temperature (of oil lubricated bearings) by dial type thermometers shall be provided wherever specified.
- 7.4.2 The arrangement shall consist of a dial type of mercury-in-steel thermometer so mounted that its stem shall be located in the maximum temperature region.
- 7.4.3 The thermometer shall have two potential free contacts for alarm and trip.
- 7.4.4 All contacts shall be rated for 2 Amps. at 110 V D.C.
- 7.4.5 For bearing temperature measurement, separate thermometers shall be provided for each bearing.
- 7.4.6 For grease lubricated bearings, temperature measurement arrangement shall be provided only where specified.

### 7.5 Oil Supply System

- 7.5.1 For large sized motors, where forced oil lubrication system is considered, a common oil supply system for the motor and the driven equipment shall be provided by the driven equipment manufacturer.
- 7.5.2 However, the motor supplier shall quote separate price for the complete oil system of the motor.
- 7.5.3 The system shall be suitable for location near the motor.
- 7.5.4 The oil supply system for each motor shall include:
  - i) 2 Nos. 100% rated motor driven pumps with motors
  - ii) 1 No. oil tank complete with oil level gauge and thermometer
  - iii) 1 No. oil cooler
  - iv) 1 No. oil filter
  - v) 1 No. differential pressure switch for filter
  - vi) 2 Nos. pressure switches
  - vii) Necessary piping
  - viii) Necessary control and interlocks

### 8.0 VIBRATIONS

The motor vibrations measured at the bearings must not exceed the limits specified in IS: 12075.

### 9.0 NOISE LEVEL

The motor noise level shall not exceed 85 dB measured at a distance of 1 metre from the motor.

### 10.0 PAINTING

10.1 Enclosures of the motor and its accessories shall be painted with two coats of anti-rust paint and two coats of anti-corrosive paint after suitable pre-treatment.



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10.2 Epoxy paint shall be used.

10.3 Unless otherwise specified, the finishing shade shall be light grey having shade No. 631 as per IS: 5.

#### 11.0 TESTS AND INSPECTION

- 11.1 All motors shall be routine tested as per relevant standards.
- 11.2 Additional tests, wherever specified, shall be carried out on one motor of each rating.
- 11.3 For high voltage motors of each rating, polarization index test shall also be carried out.
- 11.4 All the above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the motor shall be subject to stage inspection at works and inspection at site for final acceptance.
- 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

- Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 13.2 All drawings and documents shall have the following descriptions written boldly:
  - Name of client
  - Name of consultant
  - Enquiry / order number with plant / project name
  - Motor Code No. and Description

### 14.0 SPARES

- 14.1 Commissioning Spares: Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 14.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 14.4 All spare parts shall be identical to the parts used in the equipment.



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ANNEXURE - I
DOCUMENTATION FOR INDUCTION MOTORS

el No	Document Description	Documents Required (Y / N)					
SI. NO.	No. Document Description		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	Υ			
	b) Load Vs FL current	N	Υ	Υ			
	c) Load Vs Efficiency	N	Υ	Υ			
	d) Load Vs Power factor	N	Y	Υ			
	e) Load Vs Speed	N	Y	Υ			
	f) Voltage Vs Thermal Withstand time	N	Υ	Υ			
	g) Starting current Vs Time	N	Y	Υ			
6.	Connection diagram for RTDs, thermometer etc.	N	Y	Y			
7.	Terminal Box drawings	N	Υ	Υ			
8.	Illustrative and Descriptive catalogues	N	N	Υ			
9.	Catalogues of bought out accessories	N	N	Υ			
10.	Spare parts list	N	N	Υ			
11.	Installation, Operation and Maintenance manual	N	N	Υ			
12.	Test certificates						
	a) Routine	N	N	Υ			
	b) Type	N	N	Υ			
	c) For enclosure	N	N	Υ			
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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# TECHNICAL SPECIFICATION LOCAL CONTROL STATION



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6.0	SPECIAL FEATURES FOR FLAMEPROOF LOCAL CONTROL STATION
7.0	COMPONENT DETAILS
8.0	PAINTING
9.0	TESTS AND INSPECTION
10.0	DRAWINGS AND DOCUMENTS
11.0	SPARES
12.0	PACKING
ANNEXURE - I	DOCUMENTATION FOR LOCAL CONTROL STATIONS



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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.
- 5.5 All external hardware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated. For fibre glass enclosure Nylon PVC bolts of diameter 8 mm may be used.
- 5.6 The control station shall preferably be with bolted cover. The bolts for retaining the cover in position shall be provided with 10 mm dia. stainless steel and these shall be so arranged that they do not pierce into the door gasket.
- 5.7 All the components shall be mounted on a base plate inside the enclosure. Necessary actuating system for control switch, push button, non yellowing acrylic/ glass cover for



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ammeter and indication lamps shall be provided on the front cover. No wiring shall be carried out on the front cover.

- 5.8 The layout of components in the control station shall be liberal and standardised.
- 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.
- The control stations shall be suitable for hazardous area of enclosure group and temperature class as indicated in Design Philosophy Electrical.
- 6.3 Cables shall enter the terminal box through flame proof cable gland. From the terminal chamber to the main enclosure, the connections shall be made through proper bushings. Direct entry of external cables into the main enclosure shall not be accepted. All entries shall be provided with stainless steel inserts.
- 6.4 An additional earthing terminal inside the terminal chamber shall be provided.
- 6.5 Local control stations and cable gland must be certified by the Central Mining Research Institute, Dhanbad or any other statutory authority for use in the specified hazardous area.

### 7.0 COMPONENT DETAILS

### 7.1 Trip-Neutral-Close Switch

TRIP-NEUTRAL-CLOSE switch shall be double pole, 3 position, pistol grip, rotary type having self spring return feature to neutral position. The contacts shall be of phosphor bronze and shall be provided with two breaks in series. Mechanical sequence device to prevent two successive movements to the same position shall be fitted. The switch shall be capable of being padlocked in the 'TRIP' position.



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7.2 'Auto-Manual' Switch

'Auto-Manual' switch shall be single pole stay put type having three positions "AUTO-OFF-MANUAL". Provision shall be made to padlock the switch in the "OFF" position.

7.3 Selector Switch / Lock Service Switch

These shall be single pole stay put type having two position with a pistol grip handle and capable of being padlocked in one of the position.

- 7.4 All the switches shall be rotary type with snap or wiping action contact and having a set of normally open and closed contacts in each position. All switches shall be provided with pistol grip handle.
- 7.5 'Off-Auto-On' Switch
- 7.5.1 'OFF-AUTO-ON' switch shall be in minimum three stack configuration, each stack having three positions with spring return from 'ON' to 'Auto' position and lockable in 'OFF' position by means of padlock.
- 7.5.2 The switch shall have sliding contact between 'AUTO' and 'ON' position. In 'OFF' position the contact shall be completely broken from 'AUTO' position.
- 7.6 **Push Buttons**

These shall be spring loaded, with a set of normally closed and open contacts. The push buttons for 'start' shall be shrouded type and coloured green while 'stop' push buttons shall be un-shrouded type and coloured red. Provision shall be made to padlock the 'stop' push button in 'OFF' position. The fixing ring shall be metallic white. An oil proof rubber cap shall preferably be provided.

- 7.7 The switches and push buttons shall conform to utilization category AC11/ DC11 as per IS/IEC:60947. The contact shall be rated to make, break and carry inductive current of 5 Amp. at 415 V AC and 1 Amp of 220V DC. The contact arrangement shall be as shown in the terminal drawings. Built in locks instead of padlocking are not acceptable.
- 7.8 **Indication Lamps**
- 7.8.1 LED type indication lamps shall be provided to indicate the various circuit conditions as shown in the terminal drawings.
- 7.8.2 The LEDs shall provide good illumination through a viewing angle of 180°. The LEDs shall have lumen output of 200 milli Candella in the axial direction.
- 7.8.3 The colour of the LED indication for various functions shall be as follows:-

RED : For 'ON' Indication
GREEN : For 'OFF' Indication

WHITE: For "Ready for Service" Indication

### 7.9 A.C. Ammeters

The ammeter shall be flush mounting, moving iron spring controlled type, of accuracy class 1.5 as per IS:1248, with square face of minimum size 72 mm x 72 mm having scale range 0-240°. The ammeter shall be provided with uniform scale up to CT primary current and compressed end scale up to 6 times the CT primary current. Adjustable red pointer shall be provided to indicate the full load current of the motors. Zero adjusters shall be provided for operation from the front of the meter. All ammeters shall be operated through 1Amp. CTs only.



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#### 7.10 **D.C. Ammeters**

The D.C. ammeter shall be shunt operated. These shall be moving coil or moving iron type of accuracy class 1.5 as per IS: 1248.

### 7.11 Terminal Blocks

All control stations shall be provided with terminal blocks. Terminal blocks shall be located at a minimum distance of 50 mm from the bottom of the enclosure. The terminal blocks for the control station shall be suitable for conductor sizes of 2.5 mm<sup>2</sup>. These shall be of pressure clamp type design mounted on the base channel. The minimum rating of terminal block shall be 16 Amp.

### 7.12 Cable Glands

The cables for the external connections, shall enter the terminal chamber through heavy duty double compression type rolled Aluminium cable glands suitable for 2.5 sq. mm PVC insulated, armoured, and PVC sheathed copper conductor 1.1 KV grade cables. The number and cores of control cables shall be as per requirement. The cable gland shall be fitted in a threaded hole.

### 8.0 PAINTING

- 8.1 The enclosure after suitable pre-treatment shall be painted with two coats of anti-rust paint followed by two coats of anticorrosive paint.
- 8.2 Epoxy based paint shall be used.
- 8.3 All paints shall be carefully selected to withstand tropical heat and extremes of weather. The paint shall not scale off, crinkle or be removed by abrasion due to normal handling.
- Unless otherwise specified, the finishing shade shall be of light grey having shade no. 631 as per IS: 5.

#### 9.0 TESTS AND INSPECTION

- 9.1 All equipment shall be routine tested as per relevant standards.
- 9.2 Additional tests, wherever specified, shall be carried out.
- 9.3 All the above mentioned tests shall be carried out in the presence of purchaser's representative. In addition, the equipment shall be subjected to stage inspection at works and inspection at site for final acceptance.
- 9.4 These inspections shall, however, not absolve the vendor from their responsibility for making good any defect which may be noticed subsequently.

### 10.0 DRAWINGS AND DOCUMENTS

- 10.1 Drawings and documents as per Annexure-I shall be supplied, unless otherwise specified.
- 10.2 All drawings and documents shall have the following descriptions written boldly.
  - Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description

### 11.0 SPARES

11.1 Commissioning Spares: Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.



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- 11.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 11.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- All spare parts shall be identical to the parts used in the equipment.

### 12.0 PACKING

- The local control stations shall be properly packed to safeguard against weather conditions and handling during transit. It shall be wrapped in polythene bags and an additional wrapping of bitumen paper shall also be provided to make it completely water proof before the equipment is packed in wooden crates.
- 12.2 The packing box shall contain a copy of the installation, operation and maintenance manual.



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## ANNEXURE - I DOCUMENTATION FOR LOCAL CONTROL STATIONS

SI. No.	Document Description	Documents Required (Y / N)		
		With Bid	For Approval	Final
1.	Specification Sheet	N	Y	Y
2.	Technical Particulars	N	Υ	Y
3.	General Arrangement Drawings	N	Y	Y
4.	Schematic Diagrams	N	Υ	Y
5.	Illustrative and Descriptive catalogues	N	N	Y
6.	Catalogues of bought out accessories	N	N	Y
7.	Spare parts list	Ν	N	Y
8.	Installation, Operation and Maintenance manual	N	N	Y
9.	Test certificates  a) Routine  b) Type (only for flameproof equipment)  c) For enclosure	N N N	N N N	Y Y Y
10.	Guarantee Certificates	Ν	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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10.0	MAKE OF ELECTRICAL ITEMS
11.0	TESTS AND INSPECTION
12.0	INSTALLATION, TESTING AND COMMISSIONING
13.0	DRAWINGS AND DOCUMENTS
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.

3.3 The owner shall provide only three phase power at the specified medium voltage. For lighting, control and plug supply the vendor shall provide necessary single phase step-down transformers.



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3.4 All the electrical equipment shall be so designed that enable the crane / hoist to operate at its rated capacity and specified duty cycle with the system variation under the ambient conditions without exceeding the permissible temperature rise and without any detrimental effect on any part.

### 4.0 GENERAL DESIGN AND CONSTRUCTIONAL REQUIREMENTS

- 4.1 The electrical system and installation shall be designed as per latest practice to provide maximum reliability, flexibility, safety to personnel and equipment and ease of operation and maintenance.
- 4.2 All equipment shall have adequate and standard ratings as per ISS.
- 4.3 All electrical equipment to be located in indoor plant area shall be enclosed in dust, damp and vermin proof enclosure equivalent to IP-54 as per IS/IEC:60529.
- 4.4 Equipment to be located outdoor shall be weather proof and have IPW-55 protection as per IS/IEC:60529 and shall also be provided with canopy as far as practicable.
- 4.5 The equipment to be located in hazardous area shall have additional protection as follows:
  - a) Zone I All the equipment shall be in flameproof execution.
  - b) Zone II The equipment producing sparks under normal operation shall be in flameproof execution and others shall be in increased safety execution.

The equipment shall be suitable for the enclosure group and temperature class as indicated in Design Philosophy - Electrical. The equipment selected shall conform to relevant Indian Standard Specification and must be certified by Central Mining Research Institute, Dhanbad or any other statutory authority for use in the specified hazardous area.

- 4.6 The pendant push button shall be light weight enclosure of aluminium/ polypropylene etc. In case of hazardous areas, the loop between the pendant push button and the crane control panel shall be made intrinsically safe by using suitable isolators. Alternatively certified flame proof components and increased safety terminals can be hosed in the hose proof aluminium / polypropylene enclosure.
- 4.7 Special care shall be taken to ensure that the parts to be opened for inspection and maintenance retain their dust tightness even after repeated opening and closing operations.
- 4.8 All mating surfaces shall be properly machined. Neoprene gaskets shall be used for dust and weather proofing. The gaskets shall be without any discontinuity.
- 4.9 Only non-hygroscopic materials shall be used for insulation. All insulation shall be specially impregnated to withstand ambient conditions and atmospheric pollution.
- 4.10 All live parts shall be adequately protected to prevent inadvertent or accidental contact.
- 4.11 The minimum clearance and creepage distance of M.V. equipment shall be 20 and 28 mm respectively and shall be positively maintained after connections.
- 4.12 All external hardware of diameter less than 8 mm shall be of stainless steel and those of diameter 8 mm and above shall be of mild steel cadmium plated or zinc passivated.
- 4.13 Earthing terminals complete with sockets and identification marks shall be provided on the enclosure of all electrical equipment. The number of terminals shall be two for equipment rated above 240V and one for those rated 240V and below. Additional internal earthing arrangement shall be provided for flameproof equipment.



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- 4.14 All equipment shall be provided with stainless steel name plates containing the particulars as per relevant IS along with the description and code nos. of equipment
- 4.15 All the electrical equipment shall be provided with separate terminal box, heavy duty double compression type rolled aluminium cable glands, proper crimping lugs and antivibration type terminals suitable for the cable sizes required.
- 4.16 Enclosure for limit switches, pendant push button, junction boxes and magnets etc. shall be of cast aluminium. Enclosure for control panel, transformer and resistors may be of sheet steel. The thickness of the sheet steel for the enclosure shall not be less than 2.5 mm. All enclosures shall be suitably painted to withstand atmospheric pollution as mentioned in the Design Philosophy Electrical.
- 4.17 The doors or inspection covers shall be provided with threaded knobs or butterfly nuts made of plated carbon steel. Copper or copper alloys shall not be used outside the enclosures.
- 4.18 To facilitate maintenance and testing of all electrical equipment:
  - a) Disconnecting links shall be provided where necessary.
  - b) All cable lugs and terminals shall be numbered in a permanent form corresponding to the wiring diagram.
  - c) Easy access and adequate working space shall be provided around all motors, panels, limit switches etc. safety railing shall be provided, where necessary.

### 5.0 EQUIPMENT SPECIFICATION

### 5.1 **Power Connection**

- 5.1.1 The main supply shall be obtained by flexible cable or otherwise as per requirement.
- 5.1.2 In case of overhead bare conductors, they shall be of copper and mounted on side of the crane bridge. Four number of gunmetal type current collector with renewable carbon inserts shall be used for power connection. One end of the bare conductor shall be connected to the owner's isolator by means of fixed cable.
- 5.1.3 In case of flexible cable arrangement, the cable shall be connected at one end of the crane and the other end to owner's isolator. The cable shall be hung at intervals by festooned type arrangement.
- 5.1.4 In either case the power fed to the trolley shall be by means of flexible cables fixed and supported by festooned arrangement.
- 5.1.5 The arrangement of fixing and supporting the flexible cables shall be such that the cable is not damaged due to repeated travelling of the crane and trolley. Supporting G.I. wire shall be provided, wherever required.
- 5.1.6 The collector rollers and shoes shall be designed to avoid sparking.

### 5.2 **Power Control Panel**

- 5.2.1 The panel shall house all the necessary electrical equipment for distribution of power and control of individual equipment / circuit.
- 5.2.2 The panel shall be totally enclosed, floor mounting, dead front, free standing type in cubicle construction.
- 5.2.3 The panel shall house the following:
  - i) For incoming supply
    - Triple pole switch fuse units
    - Supply 'ON' signal lamps (LED Type)



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The above switch shall cut off all power driven and associated equipment on the crane except lighting and plug supply circuits.

- ii) For motors
  - Reversing type starter with necessary contactors and timers.
  - Other controlling relays and devices.
- iii) For lighting, control and plug supply
  - Single phase transformers
  - Isolating switch fuse units on primary and secondary sides.
- 5.2.4 All switches shall be motor duty type (AC 23) and rated for 1.5 times of the full load current of the circuit. The incoming switch shall be interlocked with the panel door.
- 5.2.5 All contactors shall be air break type and of AC4 utilization categories. The thermal rating of the contactor shall be 1.5 times the full load current of the circuit.
- 5.2.6 The power contactors shall be interlocked electrically and mechanically so that there shall be no possibility of simultaneous operation of two contactors for the same motor.
- 5.2.7 Electrical interlock shall be provided between main hoist and micro hoist motors.
- 5.2.8 All thermal overload relays shall have in-built single phasing feature and ambient compensated, separately mounting and hand reset type. The reset push bottom for thermal overload relays shall be provided on the cover of the control panel so that it is possible to reset the relay from outside without opening the cover of the panel. Also indication shall be provided for hoisting/travel motors tripping on overload.
- 5.2.9 The panel shall be installed on properly levelled base frame fabricated out of channels of suitable size.
- 5.3 Motors
- 5.3.1 The design and specification of all motors shall comply with requirements stated elsewhere in the specifications.
- 5.3.2 The power rating of the motors shall be 25% higher than the design requirement of the driven equipment, under the specified service and duty conditions.
- 5.3.3 All motors shall preferably be of squirrel cage type and so designed that smooth acceleration or deceleration of the load is possible without any jerks. Further a maximum displacement of 2 mm when starting and stopping the motor in quick succession shall be guaranteed.
- 5.3.4 The motors for main hoist and micro hoist shall be suitable for intermittent duty type S4 with 60% C.D.E. and 300 starts / stops per hour. The motors for long travel and cross travel shall be suitable for S2 duty for 60 minutes.
- 5.3.5 The motors shall be so located that all parts are accessible for inspection and maintenance without affecting normal ventilation.
- 5.4 Brakes
- 5.4.1 The brakes for each motor shall be suitable for duties as specified below:
  - a) Main / Micro hoist S4 duty
  - b) Long / cross travel S2 duty
- 5.4.2 The coil of the brake shall be wound with fibre glass covered annealed copper conductor suitable for class H application. An additional covering with glass taps shall



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be provided over the coil. The maximum temperature of the coil for continuous operation shall be limited to  $140^{\circ}$  C. The coil shall be vacuum impregnated.

- 5.4.3 For other design details refer mechanical engineering standard.
- 5.5 Limit Switches
- 5.5.1 Limit switches of both shunt and series type shall be used in control and power circuit.
- 5.5.2 These shall be heavy duty type and of sturdy construction in cast aluminium enclosure.
- 5.5.3 The mode of operation of these limit switches shall be positive and direct acting type.
- 5.5.4 The contacts shall be rated 50% more than the required current ratings.
- 5.5.5 The width of the roller of limit switches shall be sufficient to avoid slippage of contact with the striker.
- 5.5.6 The striker provided for operating these limit switches shall have rubber padding on surface which will make contact with roller to actuate it. The limit switches and its roller should be designed to withstand the frequent impact pressure.
- 5.5.7 Switches in which the contacts are operated by spring or gravity or both on the withdrawal of a chain or similar devices, shall not be used.
- 5.6 Transformers
- 5.6.1 These shall be of dry type, class H insulated, air cooled, double wound and mounted inside the panel.
- 5.6.2 The transformers shall be provided with switch fuse unit on their primary side of suitable rating. One side of secondary windings of the transformers shall be earthed and other shall be provided with fuse of suitable rating.
- 5.7 The rating of the transformers shall be at least 2.5 times the continuous load.
- 5.8 **Junction Box**
- 5.9 Junction boxes shall be of cast aluminium construction and adequately sized to enable easy termination of cables.
- 5.10 Hand Lamps
- 5.10.1 Provision shall be made in the crane for use of hand lamps by installing 2 nos. 24 volts, 2 pin metal clad switch sockets. One of the sockets shall be on the bridge (outside the panel) and the other on the trolley.
- 5.10.2 The transformer primary and secondary voltage shall be 250V and 25V respectively.
- 6.0 CABLES, CABLE TERMINATION AND CONNECTIONS
- 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.
- The internal power wiring of panels shall be carried out by PVC insulated stranded copper flexible cable.



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- 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 (AI) & 2.5 sq. mm (Cu) respectively.

#### 7.0 EARTHING

- 7.1 The earthing of all electrical equipment shall be carried out in accordance with IS: 3043.
- 7.2 The enclosures of electrical equipment shall be connected to an aluminium earth ring on the crane which in turn shall have effective electrical connection with the bridge.
- 7.3 The crane bridge shall be earthed through the bridge travel runway rails on both sides which in turn shall be earthed to owner's earth ring located on the ground floor.
- 7.4 Further the power supply cable for the crane shall have an additional conductor for earth connection. Both sides of this conductor shall be earthed.
- 7.5 All earth conductors shall be of aluminium.
- 7.6 This size of earth conductor shall be equal to half the size of the power conductor subject to a minimum size of 10 sq. mm.

#### 8.0 CONTROL DESK / CONTROL STATION

- 8.1 The crane shall be controlled either from the floor by means of a pendant control station or from bridge mounted control desk as indicated in the mechanical data sheet.
- 8.2 In either case, the units shall have the following control devices:
  - Main off push button with padlocking arrangement.
  - Indication lamps for supply 'ON'
  - Control push buttons, as specified in the mechanical data sheet.
  - All other devices required for safe and proper operation of the crane / hoist.
- 8.3 All push buttons shall be momentary contact type, coloured as per IS: 6875 and have 1 NO and 1 NC contacts.
- The bridge mounted control desk, where specified, shall be of totally enclosed and dust tight construction. All controlling equipment shall be mounted on the top. It shall be located at most convenient location to allow movement of the operator. The installation shall be equipped with adjustable chair, fan, light and main isolating switch.
- 8.5 The pendant control station, where specified, shall be in a single enclosure and in totally enclosed dust light execution. The unit shall be suspended and supported from the bridge platform by flexible steel wire rope. The connection shall be made with a multi core flexible copper conductor cable and shall have 20% spare cores. One core shall be provided for earth connection of the circuit.

#### 9.0 PAINTING

Enclosures of all electrical equipment shall be painted with two coats of epoxy based primers after suitable pre-treatment. Two coats epoxy based paint of approved colour shall be provided.



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#### 10.0 TESTS AND INSPECTION

- 10.1 All equipment shall be routine tested as per relevant Indian Standard Specifications.
- 10.2 Additional tests, wherever specified, shall be carried out on one equipment of each rating.
- 10.3 All the above mentioned tests shall be carried out in presence of owner's representative.
- The owner's inspection shall, however, not absolve the vendor from his responsibility for making good any defects which may be noticed subsequently.
- 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.
- The vendor shall arrange all the necessary erection tools and tackles, testing and measuring instruments and shall supply the required erection materials including structural steel.
- 11.3 Following tests shall be specifically conducted before commissioning in presence of owner's representative. All the test results shall be recorded and submitted to the owner.
  - i) Insulation test.
  - ii) Continuity test.
  - iii) High voltage test.
  - iv) Simulation test.

#### 12.0 DRAWINGS AND DOCUMENTS

- 12.1 Drawings and documents as per Annexure-I shall be supplied unless otherwise specified.
- 12.2 All drawings and documents shall have the following description written boldly:
  - Name of client
  - Name of consultant
  - Enquiry / Order Number with plant / project name
  - Code No. and Description

#### 13.0 SPARES

- 13.1 Commissioning Spares: Commissioning spares, as required, shall be supplied with the main equipment. Item-wise list of recommended commissioning spares shall be furnished for information.
- 13.2 Spares for 2 Years Operation (Mandatory), as specified shall be supplied.
- 13.3 List of Recommend Spares (other than Mandatory Spares) alongwith recommended quantity and item-wise price shall be furnished.
- 13.4 All spare parts shall be identical to the parts used in the equipment.



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#### **ANNEXURE - I**

#### **DOCUMENTENTATION FOR ELECTRICALS FOR OVERHEAD CRANES & HOISTS**

OL NI-	Description	Documents Required (Y / N)		
SI. No.	Description	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 N	Y	Y
	c) Control station	N	Ý	Ý
	d) Limit switches etc.			
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 - ELECTRICAL ERECTION, TESTING & COMMISSIONING



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#### 1.0 SCOPE

- 1.1 This standard covers the technical requirements of erection, testing and commissioning of all Electrical equipments at site.
- 1.2 This standard shall be read in conjunction with the relevant technical specifications and other references specified therein.

#### 1.3 **Scope of Work**

- 1.3.1 The scope of work shall generally include supply (wherever specified), handling, transportation, unpacking, checking, reporting of damages/defects, storage, assembling, erection, installation, including fabrication, alignment, levelling, grouting, welding, bolting, painting, etc., testing and commissioning of various electrical equipments and machineries, illumination system, earthing system, lightning protection and fabrication & installation of steel structural etc. required for the complete electrical system as per drawings & documents, specifications, standards & codes, prevalent rules & regulations and best engineering practices.
- 1.3.2 Detailed Scope of Work (Supply and Erection) shall be as indicated in project specific Technical Specifications.
- 1.3.3 The entire electrical installation work shall be carried out in accordance with the following:
  - a) Indian Electricity Rules & all applicable Statutory Acts & Regulations
  - b) This specification
  - c) The latest issue of approved drawings of vendors / consultant
  - d) The recommendation of the manufacturers
  - e) Latest issue of Relevant IS
  - f) The direction of the site engineers

Any additional revision made to the drawings at a later stage, which in the opinion of the consultant / owner is necessary, will be binding on the contractor and shall have to be carried out.

- 1.3.4 The contractor shall be responsible for:
  - a) Obtaining approval from the Electrical Inspector / Factory inspector or any other Statutory Authority for equipment, plant design / drawings and complete installation work.
  - b) Carrying out modifications in the equipment & installation as required to comply with the above.
  - c) Submitting installation certificates on completion of installation to Electrical Inspector & obtaining certificates of approval of the installation.

These jobs shall be carried at the contractor's own cost and the work shall be deemed to have not completed unless the approved certificates mentioned under (c) are submitted to the owner.

1.3.5 No erection material shall be supplied by the owner. All materials like clamps and tags for cable/ conduit and earthing including hardware material, all tools and tackles required for erection, testing and commissioning such as, but not limited to jacks, welding sets, oxygen/ acetylene gas, cutting set, drilling machines, grinders, pipe bending machine, dies for pipe threading, scaffolding materials, cables, switches for erection power supply and workshops, temporary lightning protection, cable jointing tools, megger, earth tester,



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primary and secondary injection test sets, substandard meters for calibration of ammeters & voltmeters etc. and any other tools required shall have to be arranged by the contractor.

- 1.3.6 Consumable materials required for the erection jobs such as, but not limited to kerosene, cotton waste, jute, duster shims for alignment & levelling, cement, concrete, bricks, welding electrodes, paints, carbon tetrachloride, unleaded petrol, solder, flux, raul-plug, phill-plug, nylon-plug, anti corrosive grease for copper, aluminium contacts etc. shall also have to be arranged by the contactor.
- 1.3.7 Cleaning of site after completion of erection as well as regular clearance of unwanted material from site, returning of all packing materials, & excess of other material supplied by owner back to owner's stores shall also be covered under the scope of work.
- 1.3.8 All equipments and instruments shall be inscribed with proper number, nomenclature, cautionary signals & other instructions as may be necessary.
- 1.3.9 The contractor shall supply and touch-up any surface of switchgear and other electrical equipments which are scratched and / or damaged during transportation and erection. The paint used shall match exactly the surface being touched up.
- 1.3.10 Major civil engineering works pertaining to electrical equipment like foundation and plate inserts etc., if excluded from the scope of work, the contractor shall check their correctness as per latest manufacturer's drawing and carry out minor civil jobs such as, but not to limited to, grouting of base plates, channels, supports and foundation bolts, cutting holes in wall and ceiling, chipping of floor and ceiling, sealing of cable entries and making good the same after installation of the equipment, levelling and any other minor similar civil works advised by site engineer has to be carried out by the contractor with out any extra charges.
- 1.3.11 The contractor shall furnish all supervision, labour, tools, rigging material and incidental material such as bolts, welding electrodes, anchors etc. required to install, test and adjust the equipment.
- 1.3.12 The contractor shall employ all skilled, semi-skilled and non-skilled labourers for erection, installation & testing as required. All Electricians, cable jointers, wiremen, welder and other employed shall be suitably qualified possessing valid certificates/ licenses recognized by the complement authorities. The owner at its own discretion, put any electrician, wireman, cable jointer to test about competency of technician concerned and the contractor shall have to replace any such staff found incompetent in the opinion of the owner, to execute the job as per the requirement.
- 1.3.13 The contractor shall also furnish a list of Engineers / Supervisors and staff employed by him for erection and installation jobs giving in brief qualification and experience of such staff and indicating whether they hold such competency certificates / licences to supervise the electrical installation jobs as required under Indian Electricity Rules & State Electrical Inspectorate Rules.
- 1.3.14 The contractor shall set up his own work-shop and other facilities at site allocated place to undertake fabrication jobs, pipe bending, threading etc.
- 1.3.15 The contractor shall be responsible for recording of all readings and observations during erection, testing and commissioning in registers or on prescribed Performa. These shall be carried out in the presence of owner's representative. All such test data and records shall be duly singed by the contractor's Engineer / Owner's representative and shall be submitted to owner in triplicate.



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- The contractor shall hand over completed job. Minor details not specifically mentioned in the scope or schedule of quantities but required for completeness of the job shall have to be carried out by the contractor with out any extra cost.
- 1.3.17 The contractor shall commission all Electrical equipments and carry out all tests inclusive of load test as per the performance quarantee and will be responsible for final adjustment of relays, instruments, meters, breakers etc.
- 1.3.18 The specifications given under Cl. Nos. 5 & 7 are only guidelines and doesn't give the details entirely. It shall be the responsibility of the contractor to execute the work without any extra cost to owner, in accordance with the standard code of practices, the relevant manufacturer's drawings, owner's drawings, consultant's drawings and as per Site engineer's directions. Further, the stipulations of general conditions of the contract shall prevail over all other conditions stipulated in this specification.

#### 2.0 **CODES AND STANDARDS**

- 2.1 The erection, testing & commissioning of the equipment shall comply with the latest issues of all relevant Indian Standards and Codes of practices. Design, manufacture, testing & installation of supply items shall also comply with the relevant standards. Equipments complying with equivalent IEC standards shall also be acceptable.
- Some of the relevant Indian Standards are as follows: 2.2

IS: 10118(Part-3)	Code of practice for selection, installation and maintenance of Switchgear and control gear			
IS: 11039	Requirements for mounting on rails in switchgear and control gear installations.			
IS: 2551	Danger notice plates			
IS: 3043	Code of practice for Earthing			
IS: 5216	Recommendations on safety procedures and practices in electrical work			
IS: 8437	Guide on effects of current passing through human body			
IS: 900	Code of practice for installation and maintenance of induction motors			

2.3 The contractor shall observe safety rules and take all necessary safety precautions to carry out the work in the plant.

#### 3.0 **EQUIPMENT SPECIFICATION**

- 3.1 All equipments shall conform to the relevant specifications indicated in project specific Technical Specifications. They shall be suitable for specified site & climatic conditions.
- 3.2 Make of equipments shall be as per project specific requirements. Make of equipment not specified shall be as indicated and shall be subject to Owner / Consultant's approval.
- 3.3 Drawings and documents for various equipments shall be submitted as per Documentation Schedule indicated in relevant specifications.



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3.4 Spares as specified / recommended spares for 2 years operation and commissioning shall be supplied for all equipments as mentioned in relevant specifications.

#### 4.0 GENERAL PROCEDURE FOR ERECTION

The general procedure governing "Transfer of equipment and materials to Contractor", erection and Final acceptance of Owner/ Consultant are given below:

#### 4.1 Drawl of Equipment from Owner's stores

All equipment and materials, excepting, equipment / erection materials included in Contractor's scope of supply, shall be issued from Owner's store. Contractor shall arrange to draw the necessary equipment / material in the sequence required for erection and transports the same to contractor's store or directly to erection point.

#### 4.2 Contractor's inspection at Owner's stores / Site

On receipt of any material (supplied by the owner) at site, before removing any issued item, contractor shall fully unpack and inspect all equipment received for completeness, signs of damages, defect etc. in the presence of owner's representative and shall get all discrepancies (damage / short supply) duly recorded by owner's/ consultant's authorised representative on the issue note, failing which, no claim by the contractor shall be entertained at a later date and he shall be required to make good/replace/repair the defective/ damaged items at no extra cost.

#### 4.3 Handling and cleaning

- 4.3.1 Contractor shall be responsible for proper handling and cleaning of all materials / equipment drawn / supplied by him until Owner / Consultant finally accepts the erected equipment.
- 4.3.2 Equipment shall be handled with care by experienced riggers under guidance of competent supervisors and as per rigging marks given on cases. Dragging on floor shall be avoided and crane/suitable rollers shall be used for moving the equipment at any times.
- 4.3.3 The contractor shall be fully responsible for the safe keeping of equipment issued to him till these are erected, tested, commissioned by him and accepted by owner/ consultant.

#### 4.4 Transportation

This involves transportation of various electrical equipments / materials from owner's stores / store siding to erection site / Contractor's stores & Contractor's Stores to erection site. When transporting the equipment, it shall be loaded on suitable trailer / trucks as per capacity and size of equipment, and shall be properly supported on the trailers / trucks by means of ropes / stoppers to avoid damage or tilting due to heavy jerks and vibration. Precautions, if any, displayed on equipment shall be strictly observed.

#### 4.5 **Storage**

Whenever materials are required to be stored by the Contractor in his own stores at site, the contractor shall strictly observe the following requirements: -



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4.5.1 The contractor shall keep a proper record of the materials handed over to him by owner / consultant at the initial start of the work and the materials drawn by him and kept in his stores.

- 4.5.2 All equipment and materials shall be properly stored by the contractor at site in the designated storage area provided by the owner.
- 4.5.3 The contractor shall ensure that all the materials drawn / supplied by him are stored indoor / under shade. However, if a package is temporarily stocked outdoor due to unavoidable reasons, this shall be ensured that the storage area is dry, hard and well-drained area.
- 4.5.4 Goods must not be placed directly on the floor / ground but shall be kept on blocks, 60 mm to 120 mm above the floor level such that the bottom is well ventilated.
- 4.5.5 In case of outdoor storage, the contractor at his own cost shall provide waterproof PVC sheets / tarpaulin to cover all goods so as to protect them from rain etc. These sheets / tarpaulin shall be removed for inspection once in a week and if found moist or mouldy, shall be dried in direct sunlight.
- 4.5.6 In addition to the above, the equipment manufacturer's storage instructions, if any, shall be strictly followed.

#### 4.6 **Erection Requirements**

- 4.6.1 All work shall be carried out as per drawings supplied. Placing of equipment on foundation, aligning, grouting, connecting, fixing danger notice plate / board on equipment shall be done as specified. Meggering, labelling and painting shall form part of erection requirements.
- 4.6.2 Fixing of supporting frames / pedestals, grouting, cutting and dressing holes in walls / ceiling and any other minor civil work necessary for installation and levelling of electrical equipment are included in electrical erection scope.
- 4.6.3 The scope of erection also includes cable dressing/ clamping/ minor rerouting, minor relocation of fittings, internal cleaning of equipment, overhauling and minor repairs.
- 4.6.4 Fabrication of clamps from the materials specified and clamping of cables on racks, trays etc. fixing of single core cables in tri-foil formation in aluminium clamps, earthing of cable armour and lead sheath, wherever necessary (and as per the details given by Consultant) fall under erection scope of work.
- 4.6.5 Marking of cables by fixing / grouting the cable marks / number tags for every 25 meters along entire route of cables is included in the scope of work. The tags shall be made of Aluminium Strips.
- 4.6.6 The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged / scratched during handling, erection or repair. The paint used shall match exactly the painted surface of the equipment on which touch-up is done, and shall be epoxy based.
- 4.6.7 The descriptions given above are only to give a preliminary idea about the scope of work and they do not limit the entire scope to these descriptions only. Hence all other parts of the tender document shall be read in conjunction with the referred standards, associated



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drawings, specification sheets and schedule of materials & services to assess actual scope of work.

- 4.6.8 The contractor shall undertake erection of all equipment specified herein in accordance with good engineering practices in conformity with statutory regulations and Code of Practice and to the entire satisfaction of the purchaser/ owner.
- 4.6.9 The contractor shall arrange all the necessary erection tools, tackles, testing and measuring instruments and shall supply all erection materials as required.

#### 4.7 Installation Certificate

On completion of work the contractor shall submit installation certificates in prescribed Performa as required under prevailing Electricity Act/ Rules to Electrical Inspector or other competent statutory body and obtain certificates of acceptance/ approval of Electrical Installation carried out by him.

#### 5.0 SPECIFICATION FOR ELECTRICAL ERECTION

#### 5.1 General

- 5.1.1 These specifications lay down the erection procedures to be followed for each type of equipment, over and above the general "Erection Requirements".
- 5.1.2 The contractor shall also follow manufacturer's instructions and any other instructions of consultant / owner / Statutory bodies during erection.
- 5.1.3 Suggestive Erection Drawings shall be supplied to the successful bidder for Lighting, Earthing, Cable Tray Routing, etc. These drawings may be suitably modified, if required, to suit site requirement with the approval of owner / consultant.
- 5.1.4 As-Built Drawings shall be prepared by the Erection Contractor and supplied to owner / consultant.

#### 5.2 Switch Boards

#### 5.2.1 Handling

- a) As far as possible lifting of switchboards is to be done by making use of eyebolts provided. Ensure that before lifting, all eyebolts are fully tightened and that panel supports, nuts and bolts are in tact and tight.
- b) If lifting arrangement is not provided / not feasible and final positioning by sliding is unavoidable, retain packing base as long as possible and rolled on suitable pipes. Avoid sliding / dragging panel directly on floor by crowbars.
- c) Maximum care shall be taken to avoid any damage to insulator, bushings, meters and protective equipment.

#### 5.2.2 Erection

a) Check the foundation according to the drawings. Ensure that all pockets have been rightly made. Fix the datum level, and level the foundation by chipping in such a way that the prescribed point of cubicle base plate is flush with finished floor.



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b) Check the individual cubicle for any deformity and ensure that all faces are straight. Any dent on sheet steel frame is rectified before placing on foundation.

c) Wherever separate base frames are supplied level and the foundation in both directions (lateral and transverse) and ensure that these have been correctly levelled throughout. In case of runner rails, check the rails for level in both the directions and ensure that they are parallel to each other.

Wherever base frame is fixed to cubicle, place the cubicle on foundation ensuring that holding down bolts are directly over the foundation pockets.

d) Obtain correct level of panel with respect to floor / existing bus-bar by putting shims below base frame (as per drawing). Shims are to be supplied by the contractor. Measure the level of each frame with reference to datum and ensure that level difference between the two ends of the switchboard base frame is within ± 2 mm.

Owner shall provide a level benchmark in each sub-station. All levels shall be checked with this mark by Theodolite and the Contractor shall keep a record.

- e) Cubicle shall be so adjusted that front face of all the panels are in one plane, all sides are plumb and corresponding horizontals on all panel faces (e.g. minimum lines, door edges, inter cubicle joints) line up in the same horizontal line(s). Match the cubicles and adjust properly. Provide gasket between edges, if required, so that no inter-panel gaps are seen.
- f) Bolt adjacent cubicles and base frame together. (Drill new holes where corresponding holes of cubicles do not match after levelling, if found necessary).
- g) Grout the foundation bolts with mortar. Also run grouting mixture under base of the cubicle frame and ram to ensure solidity. After grout has set properly, tighten the foundation bolts.
- h) Fix bushing/ insulators of bus-bars as per drawing if these have been despatched loose.

In case of extension panels for existing boards, this must be done before step (d).

#### 5.2.3 Bus Connections and Installation of Loose items

- a) Fix bus bar links and inter panel bus-bar connections with coupling bolts/ supporting insulators. Clean the contact surface of bus bars and links and smear with contact grease before bolting.
- b) Wherever recommended, fix shroud on the joints and fill compound, or compound may be put on joint to form smooth homogenous & spherical shaped mass and then wrapped with tape. Simple taping of joints may also be done. Recommendation of manufacturer/ consultant/ owner shall be followed in this respect.
- c) In case of misalignment of bus bars, adjustments may be necessary. The connecting pieces may have to be re-drilled or re-fabricated.
- d) Check tightness of bus bars bolts connections with torque wrench. Follow vendor's recommendations in this regard.
- e) Install all loose relays, instruments, cable boxes, metering and protective CTs, PTs etc. Before fixing the relays, make sure that they are cleaned and all packing materials have been removed from them and proper operation. Clean the contacts.
- f) Connect all inter-panel bus wiring. Connections of relays and instruments shall be done as per drawings. Check the wiring according to wiring diagram.



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g) Connect all earthing bus bar between the cubicles and it shall be connected at two points by Al/ Gl strip or cable to the main earthing ring. Fix all glands for incoming and outgoing and control cable connections on the holes provided for the purpose, as per drawings.

h) Drill holes for fixing cable glands/ cable boxes as per drawings, if such holes are not provided. All spare holes, gaps etc. shall be blanked as per instructions of Owner/ Consultant.

#### 5.2.4 Cleaning

After erection is complete all cubicles, switches, starters, CTs, PT Chambers, Bus Bar Chambers etc. shall be cleaned by blowing air (preferably hot air). Surface of the insulation shall be cleaned with cloth soaked in CTC/ Benzene.

#### 5.2.5 Circuit Breaker installation

#### 5.2.5.1 Air Circuit Breaker

- a) Clean the contacts properly with both soaked in CTC/ Benzene etc. Clean and lubricate the operating mechanism, check and rectify the main insulating contacts and bushings and also secondary contact for any damage/ misalignment. Check the locking mechanism.
- b) Manually close and trip the breaker several times and check contact alignment and pressure. Adjustment, if required, shall be done according to the manufacturer's instruction. The arc chute if despatched separately shall be fixed properly, only after checking of contact alignment etc. After fixing the Arc Chute, operate manually the breaker and check the contacts make properly. Measure contact resistance with ductor. Check the operation of OFF-ON indicator.

#### 5.2.5.2 Vacuum Circuit Breaker / SF6 Circuit Breaker

- a) Check the breaker frame for any damage. In case of vertical isolation type, raise and lower the breaker several times and ensure that breaker moves freely on guide, lubricate the mechanism.
- b) Check the operation of locking mechanism. Check the secondary isolating contacts for any deformity. Check HT bushings for any damage and repair if it is minor.
- c) Manually close and trip the breaker several times. Adjust the mechanism as per manufacturer's instruction. Measure the contact resistance with ductor. Check the oil level in the chamber. If level is low, due to leakages, rectify and fill up as per manufacturer's instruction. Check the operation of ON-OFF Indicator.
- d) Check that safety shutter open and close smoothly. Remove the lock if provided before racking in the circuit breakers. Put the circuit breaker inside the cubicles. If cubicle is aligned properly, the circuit breaker shall go smoothly inside the cubicle.
- e) In case of horizontal isolation type circuit breaker, engage the racking mechanism and put the interlock mechanism operates smoothly and adjustment if required shall be done. Slowly rack in the breaker to service position. While racking in, ensure that safety shutters open smoothly. Check the mechanical interlock mechanism. Also check that the main and secondary isolating contacts mesh properly. Conduct this operation a few times to ensure proper functioning and alignment of all mechanism.



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f) For vertical isolation type circuit breaker, put it first at the test position and check interlock mechanism and also the secondary isolating contacts engaged properly. Put it at service position, and slowly raise it to fully raised position. Ensure that main isolating contact bushings enter bush bars spouts smoothly and contacts mesh properly. Conduct the raising/ lowering operation several times to ensure a smooth functioning of all mechanism. Any other allied work thought necessary for completion of the erection will have to be done by the Contractor.

#### 5.2.5.3 General Checks

- a) Ensure that all gaskets are in position, replace the same if found damaged.
- b) All opening covers and rear doors shall be bolted with required number of bolts. Take care that no bolt/ nut/ washer gets lost during handling and erection.
- c) Check inter-changeability of breakers of same rating.

#### 5.3 Motor Control Centre / Power & Motor Control Centre (MCC / PMCC)

Erection of MCC / PMCC, if required, is to be carried in accordance with Cl. No. 5.4 above. In addition, the following points are to be observed:

- a) Cable glands shall be fixed in cable gland plates/ cable alloys (Drilling of holes in gland plates are to be done at site as required).
- b) Cable entries are to be made vermin proof.

#### 5.4 Panelled Equipment

These include AC/ DC Distribution Boards, Thyristor Control Panels, Inverters etc. In addition to the procedure laid down in Clause Nos. 4.0 & 5.0 along with its sub clauses, any other instruction given by the manufacturer shall also be followed.

#### 5.5 Cable Joining & Termination

#### 5.5.1 General

The scope of work includes:

- a) Soldering / crimping of sockets / ferrules and connections at all joints / terminations as per specifications. Sockets shall be provided at all terminations except where pressure clamp type terminals are provided.
- b) Glanding of cable and fixing of cable boxes.

#### 5.5.2 Specifications

- a) All PVC cables shall be terminated in conventional type cable boxes, fitted with wiping gland / compression type gland / clamps with rubber bush. For outdoor terminations double compression type gland and for indoor terminations single compression cable gland shall be used. Boxes may be filled with bituminous compound, epoxy M-seal, as and where specified.
- b) For XLPE cables, special termination kits (heat shrink type) shall be used.
- c) All paper-insulated cables shall be terminated in compound filled type cable boxes using conventional compound filling methods or in special cases resin oil filled or epoxy M-seal cable boxes. Wiping gland / clamp with rubber bush are fitted to the cable box.

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- d) All LT and control cables shall be terminated through compression type gland.
- e) In explosion proof equipment sealing accessories, where provided in cable box, are to be used for sealing the cable entry to the box and termination.
- f) All lighting and control cables shall be provided with crimped Al / Cu Sockets before termination in junction boxes.
- g) In case of LT cables, armours shall be suitably earthed in compression type glands. For HT cables, this shall be done either in glands or by any other suitable means like bonding the armour with suitable wire and connecting same to the earth terminals inside cable box.

#### 5.5.3 Crimping

All cable lugs for Cu conductor's sizes up to 400 sq. mm shall be of crimped type solder less Cu lugs, which shall be crimped by special hand / hydraulic crimping tools. Cable lugs for conductor sizes exceeding above shall be conventional soldering type, heavy duty. All the control cables, which shall be of copper conductor, shall be terminated without any additional lugs in screwed type terminals provided in various equipments. Before crimping the socket inhibiting grease shall be smeared over the conductor. Conductor shall be shaped properly before sliding the socket over it. Crimping shall be done in an approved manner.

#### 5.5.4 Jointing

- a) The jointing shall be done in an approved manner with proper jointing kits. Care shall be taken not to damage the insulation when opening the cable for jointing. Taped / temporary joints shall be avoided.
- b) In case of LT PVCA cables, armours shall be suitably earthed in compression type glands. For HT cables, this may be done either in glands or by any other suitable means, like bounding the armour with suitable wire and connecting same to the earth terminals inside cable box.
- c) Before commencing soldering of the socket, conductor shall be thoroughly cleaned and insulation protected. The ferrules shall be thoroughly cleaned. Ferrule and each strand of the cable shall be thoroughly sweated with solder to completely tin them and fill the conductor gaps and to remove all air pockets. Soldering materials of approved quality as per IES practice shall be used. Taping of the conductors shall be done in an approved manner after crimping / soldering.
- d) Filling up compounds and sealing the cable box, shall never be done in one operation. After the first pouring of compound, it shall be topped up again with compound and then sealed.
- e) Straight through Joints
  - Jointing of XLPE & PVC / HRPVC cables shall be done with extreme care and manufacturer's instructions shall be strictly followed. Soldering of ferrules shall be done with extreme care as stated earlier.
  - Earth continuity wire shall be plumbed and or clamped. Compound shall be filled according to the instruction of manufacturer of terminating kit / cable. Joints made inside trench or racks shall be properly supported. Wherever, joints are made inside the ground, brick masonry work shall be done around the joint box and filled with sand and thereafter covered with earth at no extra cost.
- f) A tent shall be used in all circumstances where jointing work is being done outdoor for protection against rain and to prevent dust from being blown into exposed joint and jointing materials. Extreme care shall be taken to maintain proper phase sequence while terminating at equipment ends. Record of connection details shall



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be maintained. Conductor shall be shaped properly while terminating and no sharp bend shall be given. Where numbers of cables are connected in parallel, proper tests shall be done before connecting so that no cross connection is made. No phase crossing shall be allowed for making the connection.

- g) Cables shall be supported adequately at the entry to cable box / equipment so that load of cable does not come on cable gland.
- h) All cables shall be meggered (checked for insulation resistance) before and after jointing and insulation resistance values recorded.
- i) While terminating at equipment end, each core shall be properly tagged with numbering ferrules as per nomenclature given in the drawings. Wires shall be dressed and clamped neatly. Bolting shall be done properly.

#### 6.0 GENERAL PROCEDURE FOR TESTING & COMMISSIONING

Before proceeding with the work, contractor shall fully inspect all installed Electrical Equipment for completeness, signs of damages, defects etc. and shall get all discrepancies duly recorded by Owner / Consultant, failing which no claims by the contractor shall be entertained at a later date and shall be required to make good / repair / replace the damaged components at no extra cost.

#### 6.2 Cleaning and Regular Maintenance

Till the commissioned equipment is finally accepted by Owner / Consultant / Engineer-in-Charge, Contractor shall be responsible for regular cleaning and maintenance of all electrical equipment. The maintenance job is to be done in consultation with or on advice from the Owner / Consultant.

#### 6.3 Testing & Commissioning Requirements

- 6.3.1 All works shall be carried out in accordance with the drawings, suppliers' instructions / manuals for equipment and as per relevant standards and codes of practices.
- 6.3.2 Before conducting test on any equipment, the contractor shall obtain permission from Owner / Consultant / engineer-in-charge and all tests shall be conducted in their presence.
- 6.3.3 Records / results of each test shall be recorded by the contractor immediately after the test on approved Performa and counter signed by both the contractor and the owner's authorised representative.
- 6.3.4 Copies of the record shall be handed over to Owner / Consultant / engineer-in-charge.
- 6.3.5 The contractor shall commission all electrical equipment and carry out all precommissioning / commissioning tests inclusive of no-load and on-load tests on motors and shall be responsible for final adjustments of relays, motors, instruments, starters, breakers etc. as per operational data supplied and as per directions of Engineer-in-Charge.

#### 6.3.6 **Painting**

The contractor shall without any extra cost, touch up with paint all electrical equipment which are damaged/ scratched during testing and commissioning work. The paint used shall match exactly painted surface of the equipment on which touch up is done.



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6.3.7 All terminations, cable joints, which are opened for testing purposes shall be reterminated and re-insulated to restore their original state.

#### 6.4 Motors

#### 6.4.1 General Checks

- a) Check the alignment of motors with the driven equipment/prime mover.
- b) Check and calibrate motors, safety switches, bearings/ air temperature indicators, winding temperature indicators, water flow/ air flow pressure meters, lubricating oil pump motors.
- c) Check operation of space heaters.
- d) For motor standing idle for a long time, carry out overhauling, re greasing and drying.
- 6.4.2 Check the condition of grease in bearings and if required replace completely with fresh grease after proper cleaning of bearings. This work shall preferably be taken up before final alignment of motor with driven equipment.
- 6.4.3 In case of oil lubricated bearings, the bearing housing shall be flushed with oil and then filled up to the specified level. Check that oil ring rotates freely along with motor. In case of pedestal type journal bearing, it may be necessary to open the top cover, and check the bearings.
- 6.4.4 Fix up all accessories like techno-generators, water pressure relay, temperature detectors and any other safety switches after calibration.
- 6.4.5 Check that the shaft rotates freely. This shall be done after decoupling the motor from driven equipment.
- 6.4.6 Check air gap between rotor and stator (wherever possible) at three places at 120o apart on both sides of drive and verify with the figures furnished by the manufacturers. The variation shall not exceed 10% of average value.
- 6.4.7 Check the tightness of foundation bolts. Ensure pins are fitted before commissioning of motor.
- 6.4.8 Check that power and control cables are properly connected and tightened. All earth connections of the machine shall be checked.
- 6.4.9 In case of forced ventilated motor, clean the ventilation duct. Ensure that recommended flow and pressure of air is available to produce the required cooling effect. If the motor is provided with air to water heat exchanger, check for the adequate flow of water. If necessary, clean the exchanger to remove any obstruction to water flow. Check that there is no leakage from water cooler, pipe connections.
- 6.4.10 Check the space heater circuit. Space heaters shall be provided on all HT and special type LT motors. Switch on spare heater supply at least one week before the commissioning of motor. Wherever drain plugs are provided in motor body, open and check for water accumulation inside motor.

#### 6.4.11 Testing

a) Insulation Resistance Test

The insulation resistance of LT motors shall be measured between the winding of the machine and its frame by means of 500 / 1000V megger. A minimum value of 1  $M\Omega$  for 400 V motors shall be considered a safe value.

3.3KV, 6.6KV and 11KV motors shall be tested for insulation by 1000 5000 V



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megger and its value shall not be less than 1  $M\Omega$  for each KV. However, it is desirable that before commissioning the motors, the insulation resistance shall be improved substantially above the lower limits. The contractor shall carry out heating of winding as per the advice of the consultant/Owner. The following methods may be adopted.

#### b) Drying

- i) Blowing hot air
- ii) Placing heater or lamps around and inside, in case of small motors after making suitable guarding and covering arrangement so as to conserve that heat.
- iii) Heating by injecting low voltage in the winding low voltage output of welding set shall be used. The winding shall be inter-connected so that current flows through each phase, and particular care shall be exercised to prevent local over heating. The voltage applied shall be suitably adjusted. The maximum temperature of winding, while drying, shall be 70° to 80°C by thermometer or 90o to 95°C by resistance method. Heating shall be done slowly first till steady temperature of winding is reached (may be within 4 to 8 hours depending upon size of motor) once the steady temperature is reached, maintain it for some time.
- iv) Check the insulation resistance which will drop first and then become steady. Hourly reading of IR shall be taken and temperature shall be recorded 1/2 hourly. If IR is reasonably steady, supply can be switched off. Measure IR under cold condition. Never keep the motor unattended during drying process.
- v) For checking polarisation index of HT motor, use electric driven megger. Note IR value after 1 minute and 10 minutes. The ratio shall be compared with data supplied by manufacturer (but shall be not less than 2.5).

#### 6.4.12 Operational Test

- a) Check control gear and set the protective relays as per settings supplied by Consultant. It is preferable that before first no-load run, the settings may be kept lower than 100%. However, during load running, settings shall be restored to Normal. Simulation test shall be conducted on motor starter, circuit breaker (main fuses removed on CB at test position). All interlock shall be incorporated in the control system. Testing shall be done from local and remove control station and shall be ensured that the control system works satisfactorily. In case of any defect in the integrated control wiring the contractor shall locate and rectify such defects.
- b) Any other tests recommended by the manufacturer for special type equipment like variable speed motors etc. shall be done.

#### 6.4.13 No-load Test

Finally the motor shall be started on no load after decoupling. Check the direction of rotation and change if required. The motor shall be run for 8 to 10 hours. Voltage, starting current, and starting time shall be noted. Hourly reading of current, winding and bearing temperature, (for small motors body temperature to be measured by thermometer) shall be noted. Note vibration, excessive noise if any.

In case of variable speed motor, variation of speed shall be checked and regulation of speed noted.

6.4.14 After switching off the motor, the insulation resistance shall be measured under hot and cold condition.



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6.4.15 If the no-load trial run is found satisfactory, the motor shall be run on load after adjusting the protective relay setting to 100% value. Note the starting time, load current, winding temperature etc. The temperature rise shall not be more than the specified value. Check for any excessive vibration or noise.

#### 7.0 DOCUMENTATION

- 7.1 For the purpose of completion certificate, the following documents will be deemed to form completion document:
  - i) The technical documents according to which the work was carried out.
  - ii) Final check-list and completion report.
- 7.2 Three sets of construction drawings showing therein the modifications and correction made during the course of execution signed by Owner/ Consultant/ Engineer-in-charge.
- 7.3 Test certificates for the materials purchased by Contractor.
- 7.4 Material appropriation statement for the materials issued by Owner for the works and list of surplus materials returned to Owner's stores duly supported by necessary documents.
- 7.5 No claim certificate by the Contractor certifying that the entire work done by him under the contract has been measured and accepted for the final bill to his satisfaction and that he will have no claim(s) concerning any work(s) or part thereof performed by him under the Contract, to Owner except otherwise indicated in the final bill.
- 7.6 The completion certification shall be issued by Owner within 30 days of the Contractor furnishing documents listed in this clause jointly certified by Owner/ Consultant and Contractor's Site Engineer.

#### 8.0 HANDING OVER TO OWNER

- 8.1 The contractor shall hand over the complete installation as a whole. Minor details not specified or mentioned in the scope or schedule of rates but required to complete the job as a whole will have to be done by the contractor without extra cost. Any equipment/ installation shall not be deemed as handed over to Owner until the same is complete in all respect and is accepted in writing by the Owner/Consultant.
- 8.2 The final acceptance of the work shall be after the demonstration of guarantees by the Contractor and Owner shall issue the final acceptance/ taking over certificate upon fulfilment of the guarantees.

#### 9.0 OBLIGATIONS & RESPONSIBILITIES OF CONTRACTOR

The contractor's obligations and responsibilities shall include but not limited to the following:

- 9.1 To deploy skilled, semi skilled and unskilled personnel in requisite numbers and as per scheduled programme so as to complete the WORK as per overall project schedule.
- 9.2 To deploy suitably qualified supervisors and engineers in requisite numbers to assure execution of good quality job as per best engineering practices and to the full satisfaction of Owner / Consultants / Engineer-in-charge.



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9.3 To prepare detailed planning and execution schedule considering the availability of fronts and materials. This shall be reviewed by Owner & consultant and Contractor shall be required to keep updating the same (as per the instructions of Owner / Consultant / Engineer-in-charge) to take care of any changes in the availability of fronts and materials and to complete all jobs as per the overall project schedule. Owner / Consultant / Engineer-in-charge shall in no way be held responsible for such changes because such changes are deemed quite a common feature in any project of this size.

- 9.4 To check for quantity compliance between bill of materials and drawings for cable, structural, earthing materials etc. and intimate Owner / Consultant / Engineer-in-charge sufficiently in advance regarding discrepancies, if any.
- 9.5 Construction power shall be made available at one point. Arrangement for distributing the same to various areas for construction shall be the contractor's responsibility.
- 9.6 To arrange and supply all tools and tackles, consumables, instruments, erection materials & machineries etc. for handling erection, testing & commissioning of complete electrical installation. List of major tools and tackles required are as listed below:
  - i. Cranes, winches, chain pulley blocks etc. in required quantity and of suitable capacity.
  - ii. Trailers with prime mover/Tractor trailers.
  - iii. D-Shackles, slings, wire ropes etc.
  - iv. Transformer welding sets
  - v. Water level, spirit level etc. for levelling and alignment.
  - vi. Gas cutting sets
  - vii. Drilling/Grinding machines
  - viii. Jacks with spindles (for cable drums)
  - ix. Pipe bending machine
  - x. Hydraulic crimping tools set
  - xi. Hand crimping tools set
  - xii. Air blower/vacuum cleaner
  - xiii. Transformer oil dielectric strength testing machine, portable type.
  - xiv. High voltage testing set.
  - xv. Secondary injection testing set
  - xvi. 5 KV motorised Megger Insulation tester
  - xvii. 500 V to 2.5 KV each rating hand operated 'Megger' Insulation tester
  - xviii. Earth resistance tester with leads and spikes
  - xix. Clip on ammeters/tong testers
  - xx. Tachometers/ Tacho-generators (for RPM checking)
  - xxi. Phase sequence meter
  - xxii. Primary injection set up to 2000 amps., if required
  - xxiii. Grease gun for greasing of motors
  - xxiv. Wooden sleepers of proper size and in adequate numbers.



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xxv. Scaffolding materials as required.

xxvi. Any other tools and tackles and facilities required completing all the jobs as per ITB to the best engineering practices.

xxvii. Drilling M/C for drilling hole in RCC Roof/ Column for grouting expansion bolts.

xxviii. DG set for construction power

9.7 To arrange and supply all consumables (required for executing the under question) such as but not limited to the following in sufficient quantity, of required quality and in time to meet the schedules:

Electrodes, filler wires, industrial gases, such as oxygen, acetylene, diesel, petrol, kerosene, CTC, standard grease/ lubricant for motor bearings, insulating tapes, compounds, solders, fluxes, rawl plugs, phil plugs, saddles & bars, ferrules, bricks, sand, cement, stone chips, clamps, tags, shims, hard wares, paints, thinners (as required), salt and charcoal (for each electrode pits), copper lugs for GI earth wires, cotton waste, marking cloth, sand papers, emery papers, thread, nylon ropes.

- 9.8 To arrange and supply storage tanks for drinking water so as to avoid any inconvenience that may be caused due to interruption in water supply at times.
- 9.9 To provide proper storage and security arrangements for Contractor's tools, tackles, equipments, materials etc. as well as equipment and materials issued by Owner/Consultant to Contractor. Owner/Consultant shall not be responsible for any loss or damage to items in the custody of Contractor at site for any reason whatsoever.
- 9.10 Completion of all repairs arising out of defective work done by Contractor Owner/ Consultant / Engineer-in-charge may at his discretion require the Contractor to rectify certain defects in materials caused due to bad workmanship of supplier and/or during transportation. For such work of course, the payment modalities shall be settled by mutual agreement before starting such rectification jobs.
- 9.11 To maintain all the records for men, materials and execution of job as required by law as well as Owner / Consultant / Engineer-in-charge.
- 9.12 To get his work inspected by Owner / Engineer-in-charge and approved from statutory agencies such as but not limited to Electrical Inspector, Factory Inspector etc.

All co-ordination with Statutory Authorities shall be contractor's responsibility. Only statutory fee required for approval shall be paid by the owner.

- 9.13 To make arrangements for services such as transport, medical, lighting, canteen etc. for working round the clock.
- 9.14 In addition to safety regulations indicated in this enquiry Owner / Consultant / Engineer-incharge may issue certain safety directives, which shall have to be followed meticulously without any reservation.
- 9.15 To undertake and execute work and supply as per scope of work, scope of supply, to follow Technical Conditions including specification for electrical erection, specification for electrical testing and commissioning and as per schedule of rates. In honour all other obligations listed in other sections and sub-sections of this enquiry.
- 9.16 Reconciliation of materials issued to Contractor as directed by Owner / Consultant / Engineer-in-charge.



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- 9.17 Handing over of the completed works to Owner / Consultant / Engineer-in-charge as per procedure laid down by Consultant.
- 9.18 To submit documentation forming part of request for issue of completion certificate.
- 9.19 Clearing the site after cleaning the areas where the Contractor executed the job, stored the materials and built his office, fabrication shop etc.

#### 10.0 TERMS AND CONDITIONS

All the work shall be carried out in accordance with drawings supplied to the contractor and the entire installation shall conform to the Indian Electricity Rules/ Regulations/ Acts and with latest issue of relevant IS, Specifications, drawings & documents supplied by Consultant/ Supplier/ Owner and as per the directions of Owner / Consultant / Engineer-in-charge.

#### 10.2 **Contractor's Staff**

The contractor shall employ all skilled, semi-skilled, non-skilled labourers necessary for erection, installation testing and commissioning. All electricians, cable jointer, wire man and others employed by the contractor shall be suitably qualified and must possess valid certificates / licences recognised by the competent authorities.

Engineer-in-charge at his own discretion may put any electrician / wireman / wire cable jointer to test for ascertaining the competence of the technician concerned and the contractor shall have to replace any staff found incompetent to execute the jobs as per requirements, in the opinion of the Owner / Consultant / Engineer-in-charge. The contractor shall also furnish a list of such staff and indicating whether he holds such competence certificate to supervise electrical installation jobs as required under Indian Electricity Rules and Regulations, and State Inspectorate Rules.

#### 10.3 **Contractor's Workshop**

The Contractor shall set up his own workshop having facilities to undertake all jobs connected with, Erection, Testing and Commissioning. He shall provide all facilities at site to undertake steel fabrication work e.g. fabrication of cable racks/ trays, cable supports/brackets/ frameworks/ base frames for electrical equipment etc.

The contractor will be required to provide workshop and other facilities to undertake minor fabrication work, including conduit bending and threading, fixing rawl plugs, welding supports, making brackets, small foundation bolts, protective guards, and such other miscellaneous items as may be necessary for completing the erection, testing and commissioning jobs. The contractor shall also, on his own, set up adequate office, stores, godowns etc. for his work in the area / space provided by the Owner / Consultant / Engineer-in-charge.

#### 10.4 Tools and Tackles

The contractor shall have to arrange all tools, tackles including various erection machineries and instruments for measuring, testing, calibrating etc. required for erection as well as for Testing and commissioning on his own, such as compressors, cranes, winches, jacks, chain pulley blocks, welding sets, oxygen, acetylene gas cutting set, drilling machines, grinders, pipe bending machines, dies for pipe threading, scaffolding materials, cable jointing/ crimping tools, megger, ductor, filtering machines, earth tester, secondary injection sets, sub-standard meters for calibration of ammeters, voltmeter, oil



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testing-sets, Multi meters, phase sequence meters, HT test set, primary injection (if required), clip on ammeters (tong testers), techo-generators etc.

#### 10.5 Materials

- Owner. The contractor shall have to arrange at his own expenses all consumables required by him for erection as well as for testing and commissioning like Kerosene oil, petrol, CTC, grease, petroleum jelly, rawl plug, phil plug, screws/nails, wires for portable tools, lights, plugs, cotton waste, jute dusters, shims for alignment / levelling, cement, sand, stone chips, bricks, reinforcement rods, welding electrodes paint, insulating taps, compounds, solders fluxes, ferrules, nut bolts, washers, cable clamps, cable tags and such other materials contractor might need to execute the complete job. The contractor might need to execute the complete job. The contractor shall also provide foundation bolts, for all floor/ wall mounting equipment as per requirement at site. All hard wares supplied by the contractor shall be of GI. All GI materials shall have a minimum zinc coating of 800 g/m² at any point on the surface.
- 10.5.2 All equipment and materials including Instruments / meters required for measuring, checking, testing and commissioning are included in the scope of the contractor and shall be arranged and supplied by the contractor himself

#### 10.6 **Inspection**

- 10.6.1 Electrical Installation work shall be subject to inspection by Owner's/ Consultant's engineers, statutory bodies like Electrical Inspector, Factory Inspector, and wherever applicable by equipment supplier's engineer. The contractor shall carry our without extra cost all damages/rectification/modification desired by the above engineers/inspectors or to make the installation conform to relevant Electricity Rules etc.
- 10.6.2 Further the Owner/ Consultant may reject any portion of the work considered defective or of poor workmanship and contractor shall make good these defects without extra cost.
- Owner/ Consultant reserves the right to get such repairs/replacements done from any other agencies in case the contractor fails to do the job within a period of 7 days after the request has been made to him in writing and the cost of such alteration/ repair/ testing shall be recovered from the contractor and will be adjusted against any bill due to the contractor.

#### 10.7 **Completion of work**

Work shall be deemed to be incomplete until such certificates as required under statutory regulations are obtained and delivered to Owner / Consultant / Engineer-incharge.

#### 10.8 Clearing of Site

The contractor will be responsible for the final clearing of site after completion of erection works as well as after completion of jobs connected with testing and commissioning. He will return all excess materials such as cables, earthing materials etc. to the Stores under instructions from Owner / Consultant / Engineer-in-charge. All empty cable drums, packing materials, cut-pieces of cables, steel scraps, and other materials, supplied by Owner for the job shall be shifted to a suitable place by contractor as per instruction of



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Owner / Consultant / Engineer-in-charge. Contractor will also be responsible for demolition and clearance of temporary sheds and structures put up by him. All clearance of unwanted materials shall regularly be done as per advice of the Owner / Consultant / Engineer-in-charge.

#### 10.9 Materials utilisation statement and permissible wastage

After completion of the erection, the contractor shall submit to the Owner / Consultant a statement giving details of materials drawn from stores and quantity used in erection, balance quantity returned to stores and quantity of scraps for his checking & approval.

The scraps of steel shall not be more than 2% of total quantity used for erection. For cables, the quantity of scrap allowable is as follows:

a) 11 KV and 6.6 KV cables : 1% of actual quantity laid b) 1000 volts & below grade : 2% of actual quantity laid

power and control cables

c) Lighting cables only : 3% of actual quantity laid

Any cable cut piece less than 5 mtrs. and structural steel less than 1 mtr. shall be considered as scrap.

#### 10.10 **Civil Foundation**

Owner / Consultant will give necessary civil foundations ready complete with location of foundation bolts, sleeves etc. before the contractor is expected to commence his work. Minor rectifications and chipping etc. may, however, have to be carried out by the contractor, if found necessary while grouting the foundation bolts. Contractor shall check the foundations cleared by other agency; Owner / Consultant shall not be responsible for any delay. But all concrete cutting and chipping work necessary for fixing and grouting of base channels for switchgear and control panels will have to be done by the contractor.

#### 11.0 PRIOR APPROVAL OF THE MATERIAL TO BE SUPPLIED BY CONTRACTOR

All items to be supplied by the contractor shall be of superior quality and shall be of approved make. These shall be as per specifications and conforming to relevant Standards.

#### 12.0 RECOVERY AGAINST OWNER'S UN-RECONCILED MATERIALS

The contractor shall be responsible for material utilisation statement. Any equipments or materials not reconciled shall be charged back to the contractor.

#### 13.0 STATUTORY APPROVALS

All co-ordination at site with statutory authorities (including inspection of completed WORKS from statutory authorities) shall be in the scope of CONTRACTOR. Only statutory fees deposited by CONTRACTOR for approval of installations and works shall be reimbursed to the CONTRACTOR on production of documentary evidence.

#### 14.0 GUIDELINES FOR SAFETY MEASURES

Requirement of electrical power for any construction activity is of prime importance. The utilization of power in any construction site shall be done with utmost care to avoid

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accidents due to electrical shocks, fire due to electrical short circuits. Electrical installation increase the risk of such accidents, if it is exposed to adverse environmental conditions i.e. presence of hazardous gases. Hence, it is absolutely essential to take extra precaution for such installation to ensure safety of personnel and equipments.

This standard gives details of required safety measures to be adopted for the electrical installations by all contractors during construction activities. Following are some general guidelines & check points that should be followed:

14.1 All electrical connections for electrical installations shall be carried out as per provisions of the followings latest codes and standards in addition to the requirements of statutory authorities and IE rules:

OISD - STD - 173 : Fire prevention and protection system for electrical installations 1S - 30: National electric code

- 14.2 All electrical connections shall be done by a competent electrician having valid license and to the satisfaction of Engineer-in-charge and one competent licensed electrician shall be made available by contractor at site round the clock to attend the normal / emergency jobs.
- 14.3 All necessary personal protective equipment (PPE), Safety equipment shall be made available to use for persons employed by the contractors on the site and shall be maintained in condition suitable for immediate use. Protective equipment for head protection, body protection, eye protection, hand protection, hearing protection & respiratory protection shall be made available by the contractor. No loose clothing shall be allowed.
- 14.4 When workers are employed on electrical installations, adequate safety items / charts viz. fire extinguishers, insulating mats, hand gloves, multilingual (English, Hindi & local languages) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name and telephone number of contact person in emergency shall be provided in substation and near all distribution boards / local panels. The workers shall not wear any rings, watches & carry keys or other materials, which are good conductors of electricity.
- 14.5 When work has to be done on elevated places, towers, roofs, pipe racks & other lofty positions where plat-forms & other fall guards are not there, use of SAFETY BELT is compulsory. Safety Nets will prove very helpful in case somebody slipped from height.
- 14.6 All welding machines and switchboards shall be kept in well-ventilated and covered shed. The shed shall be elevated to avoid water logging. Use of flammable material shall be prohibited for construction shed; also flammable material shall not be stored in and around electrical equipments. Adequate clearance and operational space shall be provided around the equipment.
- 14.7 No work, however, small should be undertaken / started without obtaining valid work permit from the concerned department. Confined space entry should be done only by valid entry permit from the Engineer-in-charge. Safety permit shall be obtained before taking the temporary electrical equipment inside the hazardous area.
- 14.8 No work must be carried out on any live equipment. Electrical equipment should be considered live unless it is ensured that they are isolated & made dead / safe. A 'permitto-work' shall be issued before any work is carried out. Don't tamper with any type of electric switches / equipments or any other appliances or moving machinery installed in factory area without permission.



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14.9 Before the contractor connects any electrical appliance to any plug / socket belonging to the other contractor / owner, he shall:

- i) Indicate to the Engineer-in-charge that the appliance is in good working condition.
- ii) Inform the Engineer-in-charge of the maximum current rating, voltage and phase of appliance.
- iii) Obtain the permission of the owner dealing the sockets to which the appliance may be conducted.
- 14.10 The Engineer-in-charge shall not grant permission to plug-in until he is satisfied that:
  - i) The appliance is in good working condition and is fitted with a suitable plug.
  - ii) The appliance is fitted with a suitable cable having earth conductors.
- 14.11 All temporary installation shall be tested before energizing to ensure proper earthing, bonding and suitability of protection system and adequacy of feeders / cables.
- 14.12 Voltage for all portable equipment viz. drilling machine, temporary lighting etc. will not exceed 240 volts.
- 14.13 Earth leakage device shall be checked for operation regularly by temporarily connecting the series lamps. The operating current of earth leakage device shall not exceed 30mA.
- 14.14 All the electrical equipments should be properly earthed as per Indian Electricity Rules.
- 14.15 Use of hoisting machines & tackle including their attachments, anchorage & supports shall be good of mechanical construction, sound materials & adequate strength & free from patent defect & shall be kept in good condition & in good working order.
- 14.16 No welding / grinding / cutting / soldering or open flare / fire etc. should be done without valid safety permit issued by the Engineer-In-charge. While welding / grinding / cutting make sure that sparks & molten slag etc. don't fly or come into contact with combustible materials surrounding equipments, valves etc. i.e. make provision for collection of sparks by using 'Fire Blankets'.
- 14.17 Use of SAFETY APPLIANCES like safety goggles, canvas hand gloves, welding helmet, chrome-leather hand gloves, safety shoes, etc. during welding/ chipping/ grinding should be enforced.
- 14.18 The following design features shall be ensured for all electrical installation during construction phase:
  - i) Each installation shall have a main switch with a protective device, installed in enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5M. The main switch shall be connected to the point of supply by means of armoured cables.
  - ii) The out going feeders shall be double or triple pole switch with fuses / MCB. Loads connected to three phase circuit shall be balanced as far as possible and load on neutral shall not exceed 20% of load in the phase.
  - iii) The installation shall be provided adequate protection against overload, short circuit and earth leakage by using suitable protective devices. Fuses wherever required, shall be of HRC type only. Use of rewireable fuses shall be strictly prohibited.
  - iv) Connections to the welding receptacles / hand tools shall be taken through proper switches, sockets and plugs.



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- v) It shall be ensured that all single phase sockets shall be 3-pin type only and all unused sockets shall be provided with socket caps.
- vi) Contractor shall use 3 core (P+N+E) overall sheath flexible cables with minimum conductor size of 1.5 sq. mm. copper for all hand tools.
- Metallic distribution boxes with double earthing shall be used only at site. No vii) wooden boxes shall be used.
- It shall be ensured that cables to be used for installation purpose shall be free from insulation damage.
- ix) An independent earthing facility should preferably be provided within the temporary premises.
- X) For local earthing, separate earth electrodes shall be installed near the supply point and earth continuity wire shall be connected to local earth plate for further distribution to various appliances. All insulated wires for earthing shall have insulation of green colour.
- It shall be ensured that structures shall not be used as a neutral. Separate core xi) shall be provided for neutral earth.
- ON / OFF position of all switches shall be clearly marked / painted for easy isolation in emergency.
- 14.19 Don't check gas leaks with lighter, matches or other flame. Always keep gas cylinders away from direct rays of sun, hot place, welding, grinding & cutting sparks. Valves on cylinders should not be lubricated. Gas cylinders should be kept away from work place & Acetylene cylinders should be kept vertical. Cylinder should not be rolled on roads for transportation from stores or one place to another place, use suitable handcart for the purpose. It is prohibited to carry gas cylinder up-stair in the plant or in-side the vessel or confined spaces for cutting / welding job.
- 14.20 Permission of a supervisor before any excavation is a must. Also the presence of underground electric cables or any pipelines must be taken care of during excavation. Excavated earth must not be dumped within five feet. The further the better.
- 14.21 All the sewers or openings / cut-outs should be kept covered to avoid pit falls. Red illuminated signal should be displayed so that nobody goes near the pit / opening during dark hours. Proper approaches / scaffoldings / ladders etc. must be provided to avoid falls.
- 14.22 Be careful to keep all aisles, passageways and stairways clean & unobstructed. All discarded metal & other scrap should be collected. Storage area for keeping equipments, machines & other raw materials should be isolated & properly protected. Combustible materials like wooden pieces, cotton waste, bags etc. should be immediately removed to safe places.
- 14.23 Sitting or walking on rail tracks, crossing between wagons, taking rest under stabled wagons, crossing the rail through the openings underneath the stationary wagons shall be strictly prohibited. Standing under a suspended load is very dangerous. It may slip & fall on you thereby causing serious injury & even death.
- 14.24 Hands should be thoroughly washed before touching anything that goes in your mouth. All concerned personnel at site should maintain a high standard of 'Cleanliness'. Smoking & carrying matchbox, cigarettes, lighter, bidis etc. shall be prohibited.



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14.25 Unauthorized entry into any battery limit of plant shall be strictly prohibited. Reckless driving or other non-observance of traffic safety rules shall result into withdrawal of permission to carry vehicles in side factory.



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### SECTION - VI- 3.4

### **CONTRACTOR SCOPE OF WORK - INSTRUMENTATION**

PLANT: INSTRUMENT AIR/PLANT AIR SYSTEM

PROJECT: INTEGRATED COAL BASED FERTILIZER

ODISHA, INDIA

COMPLEX AT TALCHER, ANGUL, DISTRICT-

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#### 1.0 INSTRUMENT AND CONTROL PHILOSOPHY



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#### SCOPE

The description and requirements contained in this specification are concise by necessity and cannot include all details. However, it is the responsibility of the contractor to execute the job on a turnkey basis in accordance with the specifications and internationally recognized good engineering practices for smooth and successful operation of various units of the plant. Any activity specifically not listed in this document, does not absolve the contractor of their responsibility to include such activities in their scope of work and supply, which otherwise is necessary, to complete instrumentation work for the Instrument air/Plant air plant. All such activities shall be carried out by the contractor without any implication.

This section outlines the general requirements and specifications for Instrumentation and Control System for Design, engineering, procurement, fabrications, supply, inspection, testing, painting, transportation, calibration, supervision of erection and commissioning supervision of Instrument Air/plant Air system with associated facilities at TFL.

This section outlines the general requirements and specifications for Instrumentation and Control System for Design, Engineering, Manufacture, Shop test, third party Inspection, Supply, erection and commissioning of Instrument Air/plant Air system along with associated facilities. The Instrumentation and Control System shall consist of but not limited to the following

- Instrument Air/plant Air shall be provide as per below mentioned <u>Control</u> <u>System</u>:
- Instrument Air package plant shall be provided with DCS/PLC based control system. This control system will accommodate all control/trip and monitoring signal/functions for the unit
- Common DCS/PLC has been considered for Instrument package and bidder to ensure segregation of individual plant level signals at Al/AO/DI/DO card level so as to ensure the reliability of the system. The same control system shall be applicable for Drying Unit also.
- 1 no. OS with dual LED monitors and 1 no. OS cum Engineering having the feature of SOE also (placed in console area of engineering room), shall be provided by the bidder.
- One no. Aux. Console with Ann. window, push buttons, switches for critical trip and alarm shall also be provided.
- RIO shall not be considered anywhere in the package.
- All the required protections & interlocks shall be carried out in DCS/PLC. All the
  features such as graphics, alarms, and process parameters display diagnosis for
  plant equipment shall be displayed in package's operator station installed in the
  CCR.



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- Network securities shall be provided by Vendor in control room as per IEC 62443
  for protection of the system from both internal and external threat. The requirement
  includes all USB port blocking (including all monitors / CPU), provision of sufficient
  firewalls, and antivirus update for one year, patch update; unauthorized logging
  recording with events etc. must be addressed by Vendor.
- Bidder to note that all the Operator /Engineering Console & printer table etc. supplied by Bidder shall preferably match with the Client's installed consoles in the Main Plant CCR. Details regarding existing consoles shall be provided to the bidder at later stage.
- Beside this, Bidder to arrange power distribution to additional 4 operator station.
   Supply of 4 OS not in bidder scope, power supply distribution from PDB to OS is in Bidder scope. Bidder to consider PDB panel to achieve the same.
- The Instrument Air/plant Air system package shall be provided with complete instrumentation & control system that performs the safety and protection of the packages.
- Package vendor shall be responsible for supply of instruments, controls, local panels, trays, cable, termination to junction boxes and multipair cable termination from junction boxes to Central control room etc.
- All the instruments on skid (if applicable) shall be supplied as installed items, no
  lose supply of instruments shall be acceptable for any type of skid.
- For important operating data and indications required for surveillance and monitoring, a provision shall be made to repeat the signals in Client's DCS/ ESD from Instrument air/plant air unit Control system, wherever applicable. For this bidder to provide communication redundant port (MODBUS TCP/IP) / OPC server for communication to Client's DCS. Bidder to provide necessary interfacing cards to achieve the purpose. It is preferable to offer Control system of the same make as the existing DCS/ESD in central control room. Existing DCS/ESD make shall be discussed during detail engg. Any Hardware / software required for seamless integration for interfacing from Package Control system to CCR, shall be in the scope of bidder.
- Bidder shall supply, install & commission all field instruments, local cables, junction boxes, cable trays, Air Distribution Pots. All local cabling shall be terminated in Field Junction Boxes/Local Panels by the bidder and the same from JB/Local panel shall be taken to Central Control Room through Multi-core cables by the Bidder. Supervision for erection/commissioning shall also be provided by the bidder at site.
- Bidders shall provide necessary support for interfacing till the control room.

	Supply	Installation/	Assistance	
		Erection/Commissioning	Erection/Commissioning	



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1.	Field Instruments	By Bidder	By Bidder	By Bidder
2.	Control system	By Bidder	By Bidder	By Bidder
3.	Package Battery Limit to Central Control Room through multi- pair cables & cable trays	By Bidder	By Bidder	By Bidder
4.	Interface Control system (Hardware/Software)	By Bidder	By Bidder	By Bidder
5.	Earthing/Earthing cables & Earth Pits	By Bidder	By Bidder	By Bidder

- All the required, control function, logic function, protections & interlocks shall be carried out in the control system. All the features such as process Cause and Effect graphics, Logic functions, alarms, and process parameters display diagnosis for plant equipment shall be displayed in package's operator station installed in the Central Control room with local interruption facility.
- All operating conditions including necessary data logging, alarms etc. process Cause and Effect graphics etc. shall be communicated to control system. Changes in 'Operating Modes' (for generating either liquid or gaseous Nitrogen) shall be carried out by control system.
- Planned shut-down and 'Emergency shut-down' caused by plant trips, shall be managed through control system.
- Sequence of Cyclical mode operation of the Absorber Vessels (if applicable), along
  with temperature, pressure and flow indications, and ON/OFF indication and their
  push buttons for Compressor and other vessel shall be implemented in control
  system with their repeat signal in local panel wherever applicable.
- The plant shall be capable of fully automatic operation once started. The control and monitoring of parameters along with over-ride features shall be incorporated for part and full manual operation.
- The system shall be capable of operating on a continuous or intermittent basis and shall be completely automatic, requiring no operator attention, with all cycle control valves actuated by a control system.
- The operation shall be from control system only, however the complete plant could be started manually from local control panel.
- Emergency stopping shall be possible from control system. & local control panel.



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- Analyzers shall be designed for continuous monitoring
- The Instruments in general shall be Electronic Micro processor based type with latest revision of software. The field instrumentation i.e. Flowmeters, Transmitters, Smart Positioner, etc. shall have latest HART protocol as minimum.
- All equipments/instruments/system oriented items (with all its sub-systems) shall be of field proven quality both with respect to design and materials. Prototype instruments or instruments of an experimental nature shall not be offered or supplied. In general, all the supplied items by supplier shall have a well proven performance record of operating satisfactorily in an Acid /Pharmaceuticals /Oil and Gas sector/Power/Chemical/Fertilizer Plants for minimum of one year. No instrument requiring special maintenance or operating facilities shall be offered or supplied as far as possible. PTR for field instruments shall be considered min for 2 years.
- Bidder to carry out :
- Preparation of engineering and construction documents like functional schematics, I/O list, logic diagrams for interlocks as per ISA 5.2 with functional descriptions, configuration diagram, electrical load list, cable schedule, cable tray/trench layout, instrument air requirement, nameplate schedule, JB schedule, instrument location layout, electrical instrument signal interface, instrument index, layout drawings, loop diagrams, primary and secondary sketches and bill of materials.
- Preparation of all engineering documents for control system like graphic schemes, instrument loop data base, log formats and any other documents necessary to carry out the system engineering of control system.
- Co-ordination with Control system vendor for system engineering, implementation, software testing, supply and final commissioning supervision and site acceptance tests.
- Co-ordination with all instrumentation vendors for obtaining sufficient information in the form of documents, drawings for engineering and approval from OWNER.
- Preparation of specification for erection materials like cables (Signal, power, control, Optical fiber etc), cable trays, pipe & pipe fittings, air tubing, junction boxes, air distribution pots etc.
- Bidder to provide all sufficient information in the form of documents, drawings for engineering and approval from OWNER.
- Bidder to supply complete instrumentation system with all necessary erection material like valves, fittings, tubes/pipes, cables, cable glands and cable trays Junction box and any other erection material for the completeness of the job.



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- All system cables/fiber optic cables in the field (including communication between CCR and CR) shall be routed in HDPE Hard pipe. Fillings shall be used for joining the HDPE pipe. HDPE pipes shall be ORANGE in colour with BLACK fillings. All system cables/fiber optic cables shall be routed in the middle 150mm portion of the tray. Wherever it is absolutely necessary to route these cables underground, it should be routed in the RCC Trenches only. Separate route should be followed for redundant system cables. Supply of Cable trays and laying of cables through trenches upto CCR are in bidder scope.
- No copper or copper alloy shall be used for the parts coming either in contact with process fluid or outside atmosphere.
- All instruments and equipments shall be suitable for use for specified site climatic
  conditions and industrial environment in which corrosive gases and/or chemicals
  may be present. As a minimum, all instruments and enclosures in field shall be
  dust proof and weatherproof to IP-67 as per IEC-60529 or equivalent NEMA 4X
  enclosure rating or better and secure against the ingress of fumes, dampness,
  insects and vermin. All external surfaces shall be suitably treated to provide
  protection against corrosive plant atmosphere.
- Junction box shall be of die-cast aluminium alloy (LM-6) anti corrosive painted. All
  junction box shall be weatherproof to IP-65 as well as flameproof. Junction box
  shall have screwed covers. All cable entries to junction boxes shall be side or
  bottom.
- The design of electronic instruments shall be in compliance with the electromagnetic compatibility requirements as per IEC 61000-4 "Electromagnetic compatibility for Industrial Process measurement and Control equipment".
- Process switches, shall be realized through field transmitters only. If for some packages, process switches are unavoidable same shall be provided with sealed micro switch contacts rated for the specified application. Contacts shall be 1 no. DPDT preferably. Otherwise 2 nos. SPDT can be considered. All switch contacts except those used in intrinsically safe circuits shall be silver plated. Contacts used in intrinsically safe circuits shall be suitable for the applications. Switches shall be hermetically sealed type. Switches shall be connected through interposing relays.
- All Field transmitter supports should be properly clamped with SS304 accessories
  to the pipe for pre-fabricated wherever required and closed couple installation. No
  air gap shall be kept between support clamp and pipe.
- All Solenoid valves shall be Intrinsically Safe type (24 V DC), SIL3 certified with details inside the design basis. Solenoid valve body material shall be SS316. All critical loops must have redundant SOV's.
- Other specification like panel earthing, instrument earthing, MCT material, temp monitoring inside panels, inside CR the scope of vendor shall still be as per



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contract, UPS monitoring alarms in Control system, H2 detector in battery room etc. shall be as specified elsewhere in this tender.

### **Dew point/Moisture Analyzer**

For dew point analysis, analyser based on aluminium oxide sensor along with OEM specified sampling probes and sampling system and its accessories shall be considered subject to compatibility with the process sample. The dew point analyser shall be supplied complete with proper calibration apparatus, local indication, any sample conditioning requirement etc. The aluminium oxide cell and sample conditioning unit shall be located as close as possible to the sample point. Twisted pair armoured cable shall be used to connect to the transmitter. Auto calibration facility need to be provided for the analyser, if applicable. The analyser shall be stand alone panel mounted and protection class shall be IP65 or better. Suitable canopy shall be provided for the enclosure. Analyser shall have 4-20 mA transmission output for indication in Central Control Room. Local display shall be digital LED type.

Where the analyser is required to monitor extremely low levels of moisture the quartz-crystal oscillator technique shall be considered.

Connection between the sample point and the conditioning unit / analyser element shall utilise a pre-insulated / electrically heated stainless tube (SS316-in inches only) bundle.

For extremely low moisture concentrations the use of internally polished (Electropolished and passivated), pre-insulated /electrically traced tube bundles shall be considered.

- ➤ Accuracy shall be ±3 Deg C or better and repeatability must be ±0.5 C' or better.
- In the event of any conflict between this specification, related standards and codes, any other attachment to this package or process packages, the contractor shall follow the following documents in the order of their priority:
  - ✓ Design Philosophy-Instrumentation
  - ✓ General Standard specification attached
  - ✓ Licensor's recommendation
  - ✓ Statutory requirements and codes & standards

Instrument Air Plant shall be provide as per below mentioned Control System



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### **OPTION 1**

DCS based control system for Control & ESD function also with applicable redundancy as specified in this tender. This control system will accommodate all control/trip and monitoring signal/ functions. One redundant controller with I/O cards (redundant cards to be considered only for closed loops signals) for control & monitoring application and one separate redundant controller with redundant I/O cards for trip/shutdown functions. Scan time of the controllers shall not be more than 250 msec.

Control system for Instrument Air plant shall be placed in CCR (Central Control Room).

(Detail specification of DCS shall be share with the bidder on later stage.

### **OPTION 2**

PLC based control system (DMR)

Scan time of the controllers shall not be more than 250 msec. (Other requirements for PLC system shall be per NIT)

- 1 nos. OS, 1 no. ES cum OS with SOE, with dual LED monitors will be used for controlling Instrument Air package out of which 1 nos. OS will be placed on the consoles of CCR, 1 no. ES cum OS and 1 no. SOE station will be placed on the consoles of Engineering room of CCR.
- o One no. Aux. Console with Ann. window, push buttons, switches for critical trip and alarm shall also be provided.

Dedicated SOE work station is not required. Engineering station shall have feature of SOE.

### 2.00 DOCUMENTATION

SL No	Document Description	Docu	ıment to be subm	itted
140		With Bid	After order for approval	Final
1	List of Instruments (tag wise) indicating type of Instrument, make, model no., quantity etc.		Yes	Yes
2	Instrument mounting and connection details		Yes	Yes
3	Instrument layout drawings		Yes	Yes
4	Catalogue of Instruments & System		Yes	Yes
5	List of spares (item wise and quantity) for Commissioning and 2 years of operation		Yes	Yes
6	Specification of Instruments		Yes	Yes



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7	Detail wiring/ interconnection diagram		Yes	Yes
8	P and I Diagram		Yes	Yes
9	I/O list		Yes	Yes
10	Loop Diagram		Yes	Yes
11	Logic Diagram for interlock & safety (if any)		Yes	Yes
12	J.B. termination drawings		Yes	Yes
13	Instrumentation, operating, maintenance manuals		Yes	Yes
14	Instrument Test Certificate			Yes
15	Vendor to indicate power requirement (if any) for the control system		Yes	Yes
16	Other documents necessary to have a clear understanding of the system		Yes	Yes
17	List of alarms		Yes	Yes
18	Schematic drawings for controls		Yes	Yes
19	Control room layout/System Architecture		Yes	Yes
20	Field Operator Room layout		Yes	Yes
21	System Architecture	Yes	Yes	Yes
22	Control Philosophy	Yes		
23	Instrument Air Consumption Requirement		Yes	Yes
24	UPS power & Heat Load Requirement		Yes	Yes
25	Bill of Material		Yes	Yes

### 3.0 CONTROL PHILOSOPHY (GENERAL)

- 3.1 Design and installation of instrumentation shall comply with codes and recommendations listed in item 4.0.
- 3.2 The instrumentation shall be designed to provide stable and accurate plant control ensure safe plant operation and to facilitate plant maintenance, Control and Monitoring. The operating interface to the process shall be colour dual screen 22" LED TFT Color (Minimum) display units with touch facility, presenting overview, group and point displays as well as process graphics with live data. The operator will manipulate all facilities through dedicated operator's keyboard and using the touch panel. All operating consoles for control system shall be located inside the Central control room.
- 3.3 I/O units, marshalling cabinets, power distribution cabinets shall be housed in Rack room in the Central control room.
- 3.4 ES cum OS (Dual Stacked) with SOE feature, shall be placed on the console of engineering room.
- 3.5 Package Unit Control System:



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Bidder to provide Control System with redundancy at all levels and with latest model. It shall have provision to communicate with main plant control system placed in CCR (Central Control room) through Modbus protocol and connected by Serial cable in redundant mode. Control System for the package including marshalling cabinets, relay cabinets, MCC Interface cabinets, power supply distribution cabinets, instrument isolator, alarm cards, terminals, relays with accessories duly mounted, wired & tested to meet specified requirements.

- 3.6 DIs/DOs from MCC to Control System or from Control System to MCC shall be with relays only. Separate panels for DI/DO and AI/AO. The details will be discussed during detailed engineering.
- 3.7 Alarm and Annunciation System (LED type only):

Annunciation system is used to indicate and sound alarm for any process abnormality, trip/status change of Electric drive. Annunciation system shall be of modular design & programmable type. Electrical circuit is designed to read the change of state of discrete signal and generate the output to illuminate the window and give the alarm. The alarm can be silenced by acknowledge switch. Window light can be reset after acknowledgement and, when the state of signal returns to the prior alarm state. Annunciation system can be configured for any of sequences of ISA standard. There shall be a provision in circuit design to change the state of signal required to generate alarm (from Open to Close or vice versa) simply by changing the jumper position on circuit board. Lamps in window shall be replaceable from the front.

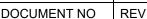
Hooter in general, shall be solid state type with audibility of the order of 100 dB at the distance of 3 meters. An interruption of power supply up to 20 msec shall not affect the functioning of unit.

- 3.8 The minimum instrument accuracy shall be as defined in Annexure-1.
- 3.9 Universal HART Protocol with Latest Revision shall be used in all cases.
- 3.10 SIL certification rating for all the instruments shall be minimum as per following list:-
  - All Smart Positioners SIL 2
  - All Transmitters SIL2
  - All Solenoids SIL 3
  - All Gas Detectors SIL 2
  - All switches SIL-3 or maximum SIL rating available



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- 3.11 Card mounted Relays are acceptable but cards must have redundant power facility, with it power healthiness indication in diagnostic graphics.
- 3.12 Cable entry to control room, analyser shelter, substations shall be through MCT blocks with SS MOC only.
- 3.13 Entry into the Marshalling Panels in the control room shall be through bottom mounted MCT blocks or SS316, DC, ET glands.
- 3.14 General Earthing & Instrument Earthing shall be provided separately (Panel and power earthing, Control System earth and Instrument signal earth is minimum envisaged).
- 3.15 All wetted part materials for all instruments (sensing elements) shall be min SS316L.
- 3.16 The instrument item like control valve, pressure relief valve, orifice flanges, level instrument, thermowell etc., coming on pipe and vessel under IBR services shall be certified by IBR or IBR authorised representative, even for SS metallurgy.
- 3.17 Turbine flowmeter shall not be used.
- 3.18 All Contacts shall be 2 SPDT or 1DPDT.
- 3.19 No Direct Process Switches (Pressure / Level/ Flow / Temp.) shall be used.
- 3.20 All field transmitters for pressure, d/p, level and flow shall be microprocessor based (dual compartment) SMART transmitters with "UNIVERSAL HART" protocol with latest revision. The transmitter selection shall be such that the operating maximum upper limit shall be around 70% of the total measurement range of the transmitter. All Field transmitters for pressure, d/p, level and flow shall be provided with 10 years stability with accuracy (0.1%).
- 3.21 The control system and its software must be of latest version and supplied with latest antivirus software.
- 3.22 All equipment/materials supply shall include spares required for 2 years operation and separate consumable for commissioning.
- 3.23 Motor / electrical equipment control philosophy
  - a. Field:
    - Ready to START (Lamp)



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- START
- STOP
- L/R Switch
- b. For Package PLC
  - STOP Command
  - Discrepancy Alarm
  - Running Indication
  - Motor Fault Alarm
  - Current Indication ( All motor > 5KW)
  - L/R Switch Indication
  - Ready to START F/B
- c. For start / stop of all electrical equipments, local/remote selector switch shall be located in field, A/M (Auto/ Manual) and stop push buttons on consoles in Central control room. Local stop push button on LCS (local control station) shall be always effective.
- d. In remote mode, motor can be stopped from control system.
- e. In LOCAL mode, both START and STOP shall be possible only from LOCAL. Only in REMOTE, stopping is possible from control system.
- f. Auto / manual selection shall be in Control System /local.
- 3.24 For all motors current indication shall be provided in control system for rating more than 5 KW.
- 3.25 For Auto start/stop signal to pump, 1002 philosophy shall be considered.
- 3.26 All Instruments including volume bottle must be painted with Corrosive resistant epoxy paint.
- 3.27 Local indicators, start /stop switches, emergency stop switches shall also be provided near package units/rotating machines where local start up of the equipment is advisable.
- 3.28 For instrumentation electrical interface, input and output contacts shall be in separate multicables (should be signal cables).



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3.29 All trip solenoids shall be dual redundant, and configured and hooked up properly in such a way that failure of one solenoid doesn't initiate a false trip. Trip solenoids shall be normally in energised condition and shall be de-energised to initiate trip.

- 3.30 All trip interlocks must be designed on 2003 philosophy.
- 3.31 Emergency stop and critical stops must have transparent protective cover.
- 3.32 PB's, Annunciator, EPB must be available on console placed in Central Control Room.
- 3.33 Air fails to open, Close or Hold of any control valve shall be as per process requirement, to take care of process, plant and human safety. For Piston actuators necessary air volume chambers and lock up relay shall be provided to achieve the fail-safe condition.
- 3.34 All Analysers shall be Ex.proof (Minimum IP65 or better) irrespective of area of installation.
- 3.35 All control valves / On Off Valves / MOVs shall be flanged type.
- 3.36 Control valve / on-off valve, pneumatic valve shall be designed for minimum 4 Kg/cm2 air pressure.
- 3.37 Actuator design shall be of 1.5 times of shut off pressure with guidelines as below:-

Vendor shall ensure that the actuator torque produced at maximum air supply pressure (MAWP) does not exceed the shear torque of the valve stem/shaft. As a guideline, actuator torque values shall be in accordance with the following:

Minimum actuator torque of 1.5 x required highest starting torque to commence movement of the ball in the case of maximum differential across the valve.

Shear torque of stem/shaft greater than 1.5 x maximum torque produced by actuator at maximum air supply pressure

- 3.38 Valve body MOC in steam service shall be of WCC or better irrespective of pipe class.
- 3.39 Air distribution pots shall be of stainless steel (SS304). Inst. Impulse pipes for process parameters shall be in accordance with piping specifications.
- 3.40 Hart Compatible gas-detectors to be provided. Electrochemical type gas detectors shall not be considered. Bidder to submit suitable gas detectors as per OEM recommendation/ as per ITB as specified elsewhere. Bidder to submit gas detectors quantity calculation



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along with layout. Bidder to provided hooters (electric type) & beacon (rotating type with light flash).

- 3.41 All line mounted instruments like in-line SOVs, Magnetic flow meter, Rotameter, Mass flow meters etc shall be provided with block & bypass arrangement, with their indications in system as per requirement, which will be discussed in detailed engineering.
- 3.42 Separate Sample handing system shall be used for each analyzer. Multi Channel with stream selector can be used, provided the total system including sample handling system shall be imported. Necessary sequence shall be inbuilt in the analyzer for draining the condensate.
- 3.43 For double acting valve, air accumulator (with MOC as SS304) shall be used for achieving fail safe operation.
- 3.44 FRP Canopies (UV stabilized 3 mm thick), 2" Pipe mountable, are required for Transmitter, JBs, LCPs, Control Valve positioner, Temp Elements, Proximity level switch, remote mounted electronics, mass flowmeter, ultrasonic flowmeter etc. FRP Canopy shall be Prefabricated type. Canopy for transmitters shall cover top and 3 sides. SS canopy instead of FRP, if offered by package vendor, shall also be acceptable. No separate canopy shall be required for instruments located under shed like compressor shed etc.
- 3.45 System / Marshalling/ Packages cabinet size shall be 2100 (H) X 1200 / 800 (W) X 800 (D) Rittal make.
- 3.46 Separate Tapping shall be used for each instrument coming for trip, control & monitoring, local display. No More than 3 set of taps allowed.
- 3.47 Smart positioner shall be considered for all Control Valves. For high temperature services (Above 200 Deg C) remote feedback shall be used for the smart positioned (i.e positioned shall be installed remotely).
- 3.48 Positioner shall be of valve OEM or as per approved vendor list.
- 3.49 For all Local panels rain cover to be provided. The gasket of local panels must be acid resistant preferably Silicone/EPDM or better which will be discussed during detailed engineering.
- 3.50 For Analysers separate feeders to be directly taken from UPS. No sub-branching is allowed at any place.



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3.51 No Switches to be used. If in pump seal plan, if level measurement is requirement, GWR to be used. 3.52 Fibre optic cables shall be armoured, multicore type. All fibre optics cable must be laid through HDPE conduit. The make of fibre optic cables shall be Belden / Leoni. 3.53 All cables inside package battery limit shall be supplied and laid by Package vendor through instrument cable trays supplied by Package vendor. All cables inside skids/modules shall be supplied in pre-wired & pre-tested condition. 3.54 All Instrument Hookups shall be approved by owner/PMC. 3.55 All fittings shall be SS316 and in inch only. 3.56 All tubing shall be SS316 and must be made from hot extrusion process only. 3.57 The manifolds (3 valve/5-valve/2 valve) material shall be SS316L. 3.58 All the soft parts of Local panels/JB/SOVs etc shall be of acid resistance, preferably silicone, EPDM or better which will be discussed during detailed engineering. 3.59 Level measurement in the acids tanks shall be of ultrasonic type. 3.60 LO auto start (if applicable) should be designed on 1002 principle and if Run feedback is taken as one process input in trip logic then it must be designed on 2003 logic using two inputs as other process parameters. 3.61 One emergency push button be placed near the compressor and it must be directly connected to MCC for stopping the compressor i.e. without routing through Control System logic. However, its spare contact must be connected to Control System as DI signal so as to get its actuation feedback in Control System as a SOE event. 3.62 Load and Unload SOV must be of SIL3 and redundant. 3.63 Suitable vibration measurement system shall be considered by the bidder for vibration measurement in the machines. (Detail shall be discussed during DE stage). In case of any trip action is required because of machine high vibration; interlocks must be design on 2003 philosophy or 2004 philosophy. Key phasor for speed measurement shall be provided in compressors.



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- 3.64 All absorber swing valves (if applicable) must be rugged and proven for high frequency cycle operation. They must have both position and limit switch feedback. Logic designing on position feedback will be preferred instead of limit switch feedback.
   3.65 All drier change over valves must operate in auto mode and must have both position and
- 3.65 All drier change over valves must operate in auto mode and must have both position and limit switch feedback. Logic to be designed on position feedback instead of limit switch feedback.
- 3.66 The drier operation should be automatic without any manual interventions.
- 3.67 For all Diaphragm Seal Type DP Transmitters/Gauges on Vessels, min size and rating shall be 3" 300# RF.
- 3.68 The vessel having two LT's shall be based on two different principles.
- 3.69 Flushing ring for remote diaphragm seal shall be provided where extended diaphragm seal cannot be provided for pad type nozzles.
- 3.70 For LT,PT, DPT, PG proper vent /drain facility using manifold/drip ring shall be provided.

  For vent, drain ,1/2" gate isolation valve shall be provided
- 3.71 For ON/off Valve, open/close indication, SOV(either redundant or 2003),PST, feedback of SOV if 2003 ,if any signal from switch is going to ESD ,2003 shall be provided.
- 3.72 For control Valve, open/close indication, SOV(either redundant or 2003), feedback of SOV if 2003 shall be provided.
- For MOV, open signal, close signal,open/close command, position feedback, fault, if any signal is going to ESD ,position feedback 2003 shall be provided.

### 4.0 INSTRUMENTATION CODE AND PRACTICES

IEC 13	Diagrams, Charts and Tables, Preparation of Logic Diagrams
IEC 534	Industrial - Process Control Valves
IEC 584	Thermocouples
IEC 605	Equipment Reliability Testing elements
IEC 611-12	Part 12 Graphical Symbols for Diagrams. Binary Logic



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IEC 654	Measurement and Control equipment
IEC 751	Industrial Platinum Resistance Thermometer Sensor
IEC 801	Electromagnetic Compatibility for Industrial Process measurement and Control Eqpt.
IEC 848	Preparation of Function Charts for Control Systems
IEC 902	Industrial Measurement and Control Terms and Definitions
ISA S-5 .1	Instrumentation Symbols and Identification
ISA S-5.2	Binary Logic Diagrams for Process Operation
ISA S-5 3	Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Symbols
ISA-S20	Instrumentation specification formats
ANSI/ISA S 5.1	Process Instrumentation Terminology
ANSI/ ISA S71.04	Environmental conditions
ANSI/ ISA S75.01	Control Valve Equations
ANSI/ ISA S75.02	Control Valve Procedure Capacity Test
ANSI/ ISA S75.03	Face-to-Face Dimensions for Flanged Globe Style Control Valve Bodies
ANSI/	Quality Control Standard for Control Valve Seat
FCI 70.02	Leakage
BS 6020	Instruments for the Detection of Combustible Gases
DIN 43760	Measurement Standard for RTD.
DIN 19243	Measurement and Control Electrical Sensors, Electrical Position Sensors and Signal Converters used for Intrinsically safe two-wire DC System.
EN-50-014/020	Electrical Apparatus for Potentially Explosive Atmospheres
EN 54 Part I	Components of Automatic Fire Detection System Introduction.
EN 54 Part 5	Heat sensitive Detectors - Point Detectors containing a Static Element.
ISO 3511.1	Process Measurement Control Functions and Instrumentation Representation Part I: Basic requirements.



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ISO 3511.2	Process Measurement Control Functions and Instrumentation Representation Part 2: Extension of Basic Requirements.
ISO 3511.4	Process Measurement Control Functions and Instrumentation Representation Part 4: BasicSymbol for Process Computer, Interface and shared Display/Control Systems.
ISO 4200	Plain End Steel Tubes, Welded and Seamless - General Table of Dimensions and Masses per Unit Length.
ISO 5167	Measurement of Fluid by Means of Orifice Plates, Nozzles and Venturi Tubes Inserted in Circular cross-section Conduits Running Full.
API RP 520	Sizing, selection and Installation of Pressure relieving devices in Refineries
API RP 521	Guide for Pressure Relieving and Depressuring System
API RP 2000	Venting Atmospheric and low-pressure storage tanks
API-RP-550	Manual on Installation of refinery Instruments Part I and Control System
ANSI - B 16.104	Control Valve seat leakage
ISA-S 75.01	Control Valve sizing
ISA S 18.1	Specifications and guides for the use of general Annunciators.
IEC 529	Environmental Protection of equipment
ANSI B 2.1	Pipe threads
ANSI B 16.5	Steel pipe flanges, flanged valves and fittings
IEC 79.11/	Intrinsic safety code and practice
IEC-79.14	International Boiler Regulation
IS 2148	Flameproof enclosure of electrical apparatus

### 5.0 HAZARDOUUS AREA CLASSIFICATION & ELECTRICAL EXECUTION

5.1 Irrespective of area classification, the execution of instrumentation shall be as per area Zone 2, group IIC, T6, Exia and Protection.

Electrical / Electronic instruments	IP 67
Sensors; RTD, T/C, etc.	IP 65
Local Gauges; PG, etc.	IP 55
Pneumatic instruments	IP 54
Solenoid valves	IP 67

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EMC compatibility and electrical safety as per latest IEC standard.

5.2 Electrical instrument equipment shall be designed for and supplied as intrinsic safe certified.

Analysers, solenoid valves and other equipment that cannot be classified intrinsic safe shall be ex-proof in accordance with the above mentioned electrical specification.

IP 55

Certification for installation in hazardous areas in accordance with IEC 60079 series is shown below:

Transmitters, Positioners, Limit Switches, etc. Ex ia IIA/IIB T6

Field Switches: Ex de IIA/B T6

Analysers and Panels: Ex p IIA/B T6

Solenoid Valves: Ex ia IIA/B T6 (Ex md not allowed)

Junction Boxes and Cable Glands: Ex e/Ex d

### 6.0 ELECTRICAL SUPPLY

The electrical supply will be as follows:

S.No	Description	110 V AC 50Hz UPS	110 V DC	24V DC	110 V AC Non UPS	240V AC 50Hz (Non UPS)	415 V AC-3 phase	Remarks
1	Control System	YES						
2	Package Units	YES				YES		Non UPS for Lighting
3	Alarm Annunciator	YES						
5	Solenoid Valves			YES				
6	Smart Positioners, I/P, Transmitters			YE S				
7	I/P Interrogation Voltage			YE S				
8	Gas Detectors			YE S				



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9	Analyzers and Analyzer System	YES				
11	Level Gauge Illumination			YE	S	
12	Cabinets Fan			YE	S	
13	Cabinets Lighting			YE	S	
14	Control Room			YE	S	
15	Local Panel	YES	YES	YE	S	Non UPS for Lighting
16	Analyzer Cabinet Air Conditioning	YES				
17	Analyzer Shelter HVAC				YE	S

Where 24V DC is needed, it will be generated by local rectifier units (bulk power supply), which are part of the instrumentation supply. The power supply to these units shall be taken from the UPS.

Where 24V DC are used for Safety Circuits, the rectifier units shall be duplicated and with high reliability and form a part of Control System vendor. The bulk power supply shall be with MOSFET O-ring.

There shall be minimum 4 (two no. Of each type; total 8 nos.) separate earth pits for signal (IS), Non IS, Panel and chassis (system) grounding for DCS/PLC Earthing system at Central Control Room with different cable colour codes. All earth shall be less than 2 Ohm or OEM specific, if better. The size of Earthing Cable shall be 50 sq.mm minimum and should be routed in proper HDPE conduit, outside the control room building. All above instrument earth pits shall be separate from Electrical earth pits and must have separate colour identification from electrical earths. Minimum 2 nos. Of earth pits of each type (total 8 nos) shall be constructed by the bidder.

Supply of earth electrodes, grounding cables (separate for signal grounding and instrument grounding) and other related accessories required for barrier earth, system earth and installation shall also be in the scope of work Contractor. Copper conductor shall be of 1Cx10 Sqmmas minimum. For surge protection devices separate earthing shall be used.



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UPS supplies shall not be used for utilities supplies cooling fans, panel/cabinet lighting etc. A separate non-UPS supply shall be used for the same.

A summary of all critical UPS alarms, 24V DC supply, Panel supplies, diode o rings healthiness shall necessarily provided in Control System and hardwired annunciation in control room or any manned location

Only copper cables & tin-plated copper lugs shall be considered for instrumentation power distribution system.

Supply of UPS and its battery is not in the scope of Bidder. Owner shall provide UPS power at OSBL substation or Utility substation, further distribution shall be done by Bidder. Kindly refer area plot plan elsewhere attached with the Tender. Bidder to furnish requirement of UPS load as well as no. of feeders. The power distribution from UPS to UPS load (like PLC Panels, PDB, lights, Field Instruments etc.) to be catered by Bidder. Bidder to note that distance between UPS room to main central control room (where Panels are placed including IRP,IFC panels) is approximately around 500 meter( Bidder to confirm the distance from area plot plan). Necessary PDB in the control room shall be provided by the bidder to distribute power supply.

Protection coordination with respect to fuse/MCB ratings from the supply source ACDB/DCDB to downstream distribution panels shall be thoroughly studied by the system designers/OEM and documented as a part of the system documentation and be implemented accordingly.

MCB's must have DI contact's which must be wired to Control System and available in diagnostic graphics.

### 7.0 FIELD INSTRUMENTS

### 7.1 Flow Instruments

### 7.1.1 Flow Transmitters

D/P cells shall have measuring method on the floating capacitance technology. The signal transmitter shall normally be a 2-wire system and shall be capable of delivering rated current into external load of at least 600 ohms when powered with 24 V d.c. Protection against short circuit and reverse voltage shall be provided. Bodies shall normally be in stainless steel with SS316L internals. Integral 3- valve manifold similar to AGCO make model 4A shall be used for mounting transmitters on manifold for ease of maintenance.



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Material of manifold in general shall be SS316L but may vary depending upon service. Digital output indication shall be preferable on the integral output meter with the transmitter. All flow transmitters shall have sq.root extraction function.

Pressure elements in austenitic stainless steel is a requirement. The transmitter shall be furnished with an output meter or gauge with a sqrt scale. Smart type transmitters will be used with Hart V protocol. Overall accuracy for SMART transmitters shall be +/- 0.050% or better. Process connection size shall be 1/2" NPT.

All field transmitters shall be 2 wire type, 24 Volt DC, SMART with HART protocol, and shall be equipped with Local LCD type digital indicator. 2" pipe mounting, SS304 MOC brackets and other accessories, as applicable, Accuracy 0.050% of Span , Rangebility 1:100, Local Display configurable, SS MOC, Double Compression SS 316 cable glands, Exia IIA/B/T6, IP67, Wetted MOC SS316L, SS316L MOC Manifold, Housing Die-Cast Aluminium Epoxy Painted, Universal Hart Protocol with Latest Revision is required.

### 7.1.2 Rota meter with Transmitters

Rotameters or variable area meters may be used in pipe sizes from 1 1/2" and smaller. The meter shall be selected for normal flow at 50 to 60% of the span. In applications with toxic or inflammable fluids, glass tubes must not be used except for low pressure analyser sample flows. They may be used for severe corrosive services and of fluid of high viscosity. The metal tube meters shall be of stainless steel, PTFE lined or any other suitable lining for the service. The Indicator assembly shall be magnetically coupled and mounted with rotameter body. Transmitters or Indicators on float extension are not recommended except for cryogenic services. The switch assembly shall be of proximity type. All Rotameters shall be metal tube type with transmitter. The rotameter transmitters shall have 4-20 mA output at 24V d.c. power on two wire system, which must wired to control system.

### 7.1.3 PRIMARY DIFFERENTIAL PRODUCERS

### 7.1.3.1 Orifice Plates

Orifice plates of the square edged concentric type shall be specified except where unsatisfactory for the application. Materials of orifice plate shall normally be AISI 316 unless special materials are required for the service. The maximum ratio of orifice to inside pipe diameter of 0.70 and minimum ratio of 0.30.

Orifice plates dimensions and calculations shall be in accordance with ISO 5167-1980.



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The flow range shall be selected such that normal flow rates are between 50% and 70% of the flow upper range value.

Material of construction of orifice plate shall be 316L SS except where this material is unsuitable for the service because of corrosion or erosion considerations, in which case an alloy shall be chosen whose corrosion allowance is equal to or better than line material. Orifice plates dimensions, finishing, flatness, tolerances for dimensions and identification information shall be in accordance with ISO standard. Orifice plate shall be provided with tab handle, which is welded on the orifice plate and engraved with following information on the upstream of the tab handle:

- UPSTREAM or UP
- Instrument tag number
  - Orifice diameter
  - NPS (Nominal Pipe Size) and ANSI flange class
  - Material of the orifice plate
  - DP range & Meter (Flow) range

The tab shall also be in line with the Drain or Vent hole and shall indicate the direction of flow.

BIDDER shall submit the sizing calculations for orifice plates for review.

Pressure drop for orifice sizing shall generally be selected among the following values: 125, 250, 500, 625, 1250, 2500, 5000 and 10000 mm H2O with standard selection at 2500 mmH2O.

Orifice plates shall be installed on horizontal lines when practical. Vertical meter runs may be used for down flow of vapour and up flow of liquids.

Differential ranges for all liquid flow meters shall not exceed 5000 mm water. Typical ranges for gas, steam or vapour meters are as follows:

Static Pressure Diff. Range

(in Kg/Cm2g) (in mmwc)



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0.35 to 2.5 500-1200

2.6 to 6 1250-2500

Above 6 2500-5000

Orifice bore with diameter less than 0.125" shall be avoided.

a) Flange taps orifice shall generally be used for line sizes 2" to and including 18". Above 18"line size, D and D/2 taps shall be used. Integral Orifice assembly with transmitter shall be used for line size 1 1/2 "or below (as per standard BS-1042)

Orifice assembly shall be provided with two sets of "Flange Taps" located in accordance with latest AGA standards. The orifice assembly shall be provided with jack screw for removal of orifice plate. In case of 2 out of 3 logic requirement, three different transmitters shall be used and no two transmitters shall share the common tapping. In such case six set of taps (independent tapping) shall be provided in orifice assembly. Instrument tapping connections shall be 1/2"NPT (F).

b) Orifice flanges shall be in accordance with the ANSI B16.36, ANSI B16.36a and applicable piping specification and shall generally be of weld-neck type only. The minimum pressure rating of flanges shall be ANSI 300 lbs.

Flanges larger than 3" shall have a pair of jack-screws. The mating flanged shall be aligned in such a way that jack-screws will be diametrically opposite.

Orifice flanges used at pressure ratings up to 600 lb. shall be tapped  $\frac{1}{2}$ " NPT(F) tap for 900 # above  $\frac{3}{4}$ " NPT(F). Orifice connections for Vena contracta taps or pipe taps  $\frac{1}{2}$ " socket with schedule/MOC as per piping specs

- c) For line size below 2" Integral orifice with corner taps shall be supplied as an integral assembly consisting of upstream and downstream straight pipes, integral orifice of 316L SS (as a minimum) installed along with H type manifold and SMART, 2 wire 24 V DC, DP transmitters with latest HART protocol (refer 7.2.1 for tx details). End flanges shall be as per piping specifications. Upstream and downstream pipes shall be honed from inside to achieve smooth surface. Integral orifice meters, when used, shall be installed with block and bypass valves.
- d) Upstream and downstream straight length shall be provided based on maximum d/D ratio of 0.70, in general. Where it is difficult to meet this requirement, the actual d/D can be



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considered for reducing the straight length as permitted by ' recommended practice shall be as per API-MPMS Recommended Practices and AGA Report No.3. The piping layout, where possible, shall be arranged such that straightening vanes are not required.

- e) Orifice plates with RTJ flange connections above 2" shall be supplied with Carrier rings.
- f) Meter taps shall be horizontal for liquids, condensable vapors and steam. The tap shall be on top for gas, non-condensable vapor, or liquids, which boils at maximum design ambient temperature at operating pressure.
- g) The Meter Range flow shall be equal to the 1.5 times of normal flow or 1.3 times of the maximum flow and it shall be nearest higher multiple of 50/100/1000s of units of measure (in Engg. Unit) in round figures. This meter max range criteria specified is applicable to all other type of flow transmitters also.

### **7.1.3.2** Nozzles

ISA 1932 Nozzles may be used in high and medium pressure steam and BFW piping. Materials for nozzle element shall normally be AISI 316L steel unless special materials are required for the service. Dimensions and calculations shall be in accordance with ISO 5167-1980. Generally, branch pipe is required with the nozzle the same shall be machined from higher schedule pipe than the one used for the service or forged branch pipe shall be used if higher schedule pipe is not available. The branch pipe bore shall be same as that of nozzle ID and shall have mirror finish.

### 7.1.3.3 Venturi Tubes

Venturi Tubes or nozzles as per ISO 5167-1980 or similar type elements may be used to measure the flow of low pressure gases or liquids where loss of pressure is an important consideration.

### 7.1.3.4 Averaging pitot tube/Annubar (Not to be used) The vendor may supply thermal mass flowmeter instead.

### 7.1.3.5 Local Flow Indicator

Motion balance (Barton cell type) type differential pressure indicator shall be used for local flow indication. Body and internals shall be of 316L SS. Process connection shall be 1/2" NPT(F) . SS316L 5-valve manifold with 1/2" NPT connection shall be used with the meter.



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### 7.1.4 OTHER FLOW METERS

### 7.1.4.1 Mass Flowmeter

Coriolis type mass flow meter with local digital display of flow shall be used to measure the process flow where high accuracy is required. Normal accuracy for mass flowmeters shall be 0.15% of span. The sensing element shall be straight/U-tube, matl. 316L in general.

### 7.1.4.2 Vortex Meter

Vortex shedding meters may be used for wide range of flows for gases and liquids. The measured flow shall be temperature compensated.

Insertion type vortex meter may be used in utility services for line size more than 6" inplace of Pitot /Annubar/Pitot venturi tubes.

### 7.1.4.3 Ultrasonic Flowmeter

Ultrasonic flow meters (non- insertion probes preferred) based on the "time-of-flight" method shall be used. Meters based on the "Doppler" principle are less accurate and shall not be used. Ultrasonic flow meters shall be considered for large turn downs and where pressure drop is not permitted. Upstream and downstream straight lengths shall be as per standard.

### 7.1.4.4 Electro-Magnetic Flowmeter

Electromagnetic flowmeter with ceramic lining shall be used for the measurement of flow with high accuracy for highly viscous and corrosive services. Instrument shall be suitable for Acid and alkaline measurement.

### 7.2 LEVEL INSTRUMENTS

Level Instrument shall be suitable for Acid and alkaline measurement. Guided wave radar type instruments (SMART) shall normally be used for level measurement up to 2400 mm, wherever guided wave radar cannot be used then only external displacer type transmitter to be used. Differential pressure transmitter (Capillary type) shall be used for level measurement above 2400 mm and for services requiring purge or where liquid might boil in external portion. Capillary type DPTs shall not be used in vacuum services. Internal displacer type of level transmitters shall be not be used. Remote Seal PT/DPT shall be with min 5 mtr Capillary with SS armoured in PVC sheath of Protection with DRIP RING



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and with Ball type Isolation Valve. For Vessel/Equipment requiring more than 5 m capillary electronic remote seal shall be provided. Process connections shall normally be 3" flanged. Wherever Differential pressure transmitter is considered for level measurement, the element shall be preferably remote seal type with drip ring provision & with welded joint for vent & drain. Remote diaphragm seal type DP shall be taken for level measurement with min size and rating of 3" 300#RF.

Where ever possible C-C Distance shall be same for ESD and DCS level transmitter. If there is any deviation, same shall be discussed during DE on case to case basis.

### 7.2.1 External Displacement

Displacer type level instrument shall be avoided and guided wave radar type or remote diaphragm seal DP shall be used in their place if suitable to process condition.

If unavoidable External displacement type instruments shall generally be used (with owner/PMC approval) for small spans only (The standard ranges shall be: 350 mm, 810 mm., 1200 mm). The cage material shall normally be forged material conforming to the service requirements. Where the vessels are of alloy steel construction, the body material shall be equivalent or of a better material. The displacer shall be in stainless steel (SS316L) and the torque tube in inconel. If LVDT type transmitter in place of torque tube is selected then the range spring of such transmitters shall be Inconel and cannot be used for temp. more than 330 degree C. Process connections shall normally be 2" flanged with side-side connections.

For high temperature as well as low temperature and cryogenic services, torque tube heat insulation extension or torque tube extensions shall be applied. Radiation fins or extensions shall be used for temperature above 200 degree C or below 0 degree C.

### 7.2.2 LEVEL GAUGE GLASS

### **Gauge Glasses**

Glass gauges shall be avoided and magnetic type level gauges shall be used if suitable to process condition. If unavoidable Gauge Glasses shall normally be reflex type for all process services, except for boiler drums bicolour types shall be used, and in corrosive services. Where transparent gauges with glass protection and illuminators shall be used, Illuminators shall be explosion-proof in hazardous areas. Gauge glass columns will not exceed 1500 mm. Multiple level gauges shall be used for visible lengths more than 1500



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mm.

Transparent type gauge glasses (double glass) will be used for services in which a level may not be distinguishable, such as interface services, between different liquids, where mica shields are required and fluids of high viscosity or high solid content.

For corrosive services, such as strong acids or alkalies, special devices such as magnetic followers or plastic ("KelF") coated glasses shall be used.

Level gauges shall be supplied with a pair of off-set shut off valves with ball check with SS304, or material suitable to process, as its MOC.

For cold services where temperature is below 0 deg C a non-frosting gauge will be used. Glass tube level gauges shall be avoided.

Gauge glass columns will not exceed 1500 mm. Multiple level gauges shall be used for visible lengths more than 1500 mm.

### 7.2.3 Non Contact Radar/Guided Wave Radar

Displacer type level instrument shall be avoided and guided wave radar type shall be used in their place if suitable to process condition.

Ultrasonic / Radar type Instrument shall be used for large liquid storage tanks. Guided Wave Radar type level instruments, where used, shall be external type with side / side connections and rotatable transmitter head. Vent and drain valves shall be provided. Non-Contact Radar type level shall be used on corrosive, congealing, slurry services where diaphragm seal type transmitter cannot be used. Dip tube can be used in above services where radar cannot be used. In case of heavy congealing service (sticky liquid) rigid single lead type GWR shall be used. All guided wave radar will be coaxial type, where high accuracy or interface level measurement is required. However single rod design to be avoided to extent possible).

Guided Wave Radar Level transmitter shall be applicable for liquids or slurries, hydrocarbons too water- based media. In absence of dielectric constant for the process fluid, Bidder shall confirm the suitability of Guided Wave radar Level Transmitter for such applications and Bidder shall suggest the suitable model for the same. Bidder shall suggest the suitable model for Interface applications like oil on water, Hydrocarbon on water, etc. Electronics shall be capable of measuring upper liquid and interface level simultaneously. Selection shall be available for analog output signal from level transmitter



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corresponding to upper liquid or Interface. Process connections shall normally be 2" flanged with side-side connections.

For sump levels, Guided wave radar for DCS and non- contact type radar level instrument for interlock shall be used within accuracy ±3mm. For servo gauges where used, calibration chamber with access for removing the displacer for maintenance purpose shall be provided.

SS (or other material as per piping spec) Still Well shall be provided for Non Contact/Guided Wave Radar .

### 7.2.4 Magnetic Level Gauges

Magnetic type level gauges shall be considered for:

- Cryogenic services
- Fluids that attack glass (e.g., strong acids, alkalies, boiler feed water)
- Light ends services
- Toxic services
- Pressures above 500 psig (3450 kPa) special consideration must be given to the design of float for high pressure

Magnetic- type level gauges shall consist of a liquid chamber enclosing a float which is magnetically coupled to a rotary wafer-type indicator. It shall be top or side mounted type. The liquid chamber shall be one- piece construction with a minimum internal diameter of 50 mm, provided with a bottom flange for removal of the float, vent and drain connections. Indicator shall be adjustable around the chamber with provisions to indicate float failure.

The indication shall consist of bi-colour (red/white, silver/black) magnetic rollers mounted on outside the magnet chamber. As the float rises or falls with the liquid level each roller rotates 180 Deg and so presents a contrasting colour.

Floats shall be designed and manufactured for suitable to the process parameters. It shall be designed to be adequate for hydrostatic test conditions. Floats shall be hermetically sealed, no vented or pressure equalized construction shall be allowed.



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### 7.3 PRESSURE INSTRUMENTS

### 7.3.1 Pressure Transmitters

Pressure Transmitters and differential pressure transmitters shall be modern inherent motion-free type. Bodies shall normally be in stainless steel with pressure elements in SS316L. Two valve integral manifold of SS316L material in general shall be used with pressure transmitters.

The signal transmission should normally be a 2-wire system and shall be capable of delivering rated current into external load of atleast 600 ohms when powered with 24 V. Protection against short circuit and reverse voltage shall be provided. Pressure transmitters shall normally be electronic type and shall have digital transmitter.. Smart type transmitters will be used with Hart V protocol. Overall accuracy for SMART transmitters shall be +/- 0.050% or better. Process connection size shall be 1/2" NPT.

All field transmitters shall be 2 wire type, 24 Volt DC, SMART with HART protocol, and shall be equipped with Local LED type digital indicator. 2" pipe mounting, SS304 MOC brackets and other accessories, as applicable, Accuracy 0.050% of Span , Rangebility 1:100, Local Display configurable, SS MOC, Double Compression SS316 cable glands, Exib IIA/B/T6, IP67, Wetted MOC SS316L, SS316L MOC Manifold, Housing Die-Cast Aluminium .Epoxy Painted, Universal Hart Protocol with Latest Revision is required

### 7.3.2 **Pressure Gauges**

Gauges for process and utility services shall be industrial SS316L Bourdon gauge/diaphragm or spring bellows type as per process requirement with the case in 316L stainless steel. The gauge for 60 kg/cm2 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%,



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Pressure gauges for vibrating services and near pump, shall be glycerine filled type or with pulsating dampener device with capillary of suitable length..

### 7.3.3 Pressure Switch (Not to be used)

### 7.3.4 Diaphragm seal

Diaphragms or liquid seals shall be inserted between the instrument and the process for corrosive or highly viscous fluids. For all services element material shall be minimum SS316L.

Pulsation dampeners shall be furnished with pressure transmitters on pulsating services.

All catalyst vessel's dP measurement shall be with ERS (electronic remote seal).

Remote Seal PT/DPT shall be with min 5 mtr Capillary with SS armoured in PVC sheath of Protection with DRIP RING and with SS304 Ball type Isolation Valve. For Vessel/Equipment requiring more than 5 m capillary electronic remote seal shall be provided

DP transmitters with diaphragm seals are envisaged, where condensing leg required to be filled in normal DP transmitters or across filters, at all those locations, remote seal type DP transmitters are to be used. Also, wherever there is a control and interlock on level measurement, one transmitter shall be remote diaphragm seal type and one will be guided radar type with Material: Minimum Inconel. Guided Wave radar may be used for non-critical applications. Process connection will be 3" flanged and sealing liquid must be selected as per process requirement.

### 7.4 TEMPERATURE INSTRUMENTS

### 7.4.1 Thermocouples

Thermocouples shall normally be the sheathed type with high purity magnesium oxide insulation. The hot junction shall be isolated from ground. Sheath diameter shall normally be 6mm (1/4") Inconel 600 sheath material shall be used for design temperatures above 400 degree C, whereas ordinary SS material can be used below 400 degree C. The nominal wire diameter shall be approximately 0.19 x sheath OD. The casing material must be SS316L.

Inputs from thermocouples shall be provided with cold junction compensation and downscale burns out feature for high temperature shut downs and vice versa for low. A



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passive alarms shall warn about the burn-out.

In general type K thermocouples shall be used according to IEC 584, class-1. All temperature elements shall be duplex type, one connected and the second one shall be used as spare.

Thermocouple head must be of die cast aluminium with epoxy paint to with stand the corrosive environment.

Unless otherwise specified, thermocouples cable color coding shall be in accordance with the latest edition of ANSI-MC 96.1.

The type of thermocouple shall be selected based on the following guidelines as minimum:

Copper-Constantan (ISA-Type-T)	(-) 200 to 200°C
Chromel-Constantan (ISA-Type-E)	(-) 200 to 600°C
Iron-Constantan (ISA-Type-J)	(-) 40 to 750°C
Chromel-Alumel (ISA-Type-K)	(-) 180 to 800 °C
NiCrSil - NiSil (ISA-Type-N)	0 to 1200 °C
Platinum Rhodium-Platinum (ISA-Type-S or B)	600 to 1600°C

### 7.4.2 Resistance Temperature Probes

Resistance Temperature Probes shall be considered for applications where very narrow spans and high accuracy are required as well as low temperature service. They shall be 6mm (1.4") stainless steel sheath type similar to the thermocouples and with a Pt 100 ohms (0 degree C) element. The sensors shall be duplex type and shall be spring loaded for vibration proof. The elements shall conform to DIN 43760 or IEC 751. The casing material must be SS316L. RTD head must be of die cast aluminium with epoxy paint to with stand the corrosive environment.

Class 'A' / Class '1' tolerance as per IEC 751 / 584-2 shall be specified for all RTD and thermocouple sensors in complete temperature measurements for all open/closed loops and interlocks/Logic.



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### 7.4.3 **Temperature Transmitters**

Temperature transmitters shall be Remote mounted type (on 2" Pipe), Smart with latest HART protocol and integral digital output meter, dual compartment type.

Head mounted transmitters shall not be used.

Conventional transmitter shall have universal input for thermocouple / RTD and output 4-20 mA DC for 2 wire system.

Transmitter output signal shall be linear and directly proportional to the measured temperature with overall accuracy of +/- 0.1% FS. TT body must be of die cast aluminium with epoxy paint to with stand the corrosive environment

Thermocouple transmitters shall have cold junction compensation and thermocouple linear characterization. Resistance temperature transmitters shall have resistance element linear characterization.

Burnout protection (selectable Up Scale / Down Scale) must be provided for all temperature transmitters.

No temperature switches are to be used. The same is to be achieved through transmitters which shall be directly connected as analog input to DCS / PLC.

Temperature transmitters are to be provided for all temperature measurement (closed/open/interlock) loops. All process temperature measurements shall be done through Temp. Transmitters. No temp. Input shall be connected directly to ESD/PACKAGE UNITS. MUX is not allowed.

### 7.4.4 Thermometers

Thermometers shall normally be bi-metallic, heavy duty, weatherproof (IP 65), adjustable angle connected type with 150 mm dial as a minimum, dials of smaller size may be used for auxiliary services on machinery. Casing material shall be SS316L.

Liquid filled indicators will be used only where indication is required to be remote Case and stem shall be in stainless steel. Dials shall be of white, non-rusting metal with black figures.

For local temperature control upto a maximum scale range of 530 deg C, liquid filled sensors with capillary extension shall be used.



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Filled system instruments when used shall be fully compensated for ambient temperature variations.

Capillary shall be SS armoured and length of which will not generally exceed 3 mtrs.

Range should be selected so that normal operating temperature is approximately 70% of full scale, and the maximum expected temperature is approximately 90% of full scale.

### 7.4.5 Thermowells

Thermowells shall normally be made from bar stock material.

Flanged thermowells shall be used of 1 1/2" size, threaded thermowells shall not be used, except where accepted by piping specifications, in such case they shall be 1" NPT(M) and real welded. Flanges rating, facing and material shall be in accordance with the equipment or piping standard. Thermowell flange rating shall be 11/2" 300# minimum.

Thermowell shall be used for thermocouples, bimetallic thermometers, filled system and for temperature test points (TW).

Thermowells in vapor-liquid applications, inside columns, shall be located in the liquid phase, unless otherwise dictate by process requirements.

Test wells shall be equipped with threaded plugs and chains.

The preferred mounting position of thermowells, in horizontal pipelines, shall be in the upper half ofthe pipe.

For lines up to 2 inch size, the pipe shall be enlarged to 4 inches.

Thermowell material in general shall be of AISI 316L SS.

Immersion length of thermowells for different line sizes shall be as follows:-

Line Size	Immersion length (U)
4" to 6"	280 mm
8" and above	320 mm
Vessels	400 mm

Immersion length is based on 200 mm length between flange face and inner well of pipe



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and approx. 60% insertion in the pipeline. In vessels, where fouling with vessel internals is expected, the immersion length shall be suitably modified. Other sizes and immersion lengths may be considered based on special condition/actual requirements.

The design of the wells shall be verified by means of stress analysis, resulting from stream velocity condition. The wake frequency shall not exceed 66% of the thermowell natural frequency. Wake frequency calculation is required for all thermowells. Bidder has to submit Wake frequency calculations for all thermowells as per latest PTC 19.3. Velocity collars not to be used.

### 7.5 CONTROL VALVES

Valve types shall be selected, pneumatic diaphragm/piston operated globe, ball or butterfly shall be selected taking into account such factors as piping, operating and design conditions, fluid being handled, tangibility required, allowable leakage, noise and other special requirements. The valves shall have smart electropneumatic positioners of same OEM make as the valve. All control valves shall be provided with SMART valve positioner with valve position signal feedback connected to DCS system by 4 to 20 mA analog signal. It shall be HART compatible. Seat Leakage shall be chosen in accordance with process demands and safe operation of the plant and in accordance with AISI B16.104-1976. However, in general, the globe valves used shall be of class IV leakage minimum as per ANSI B6.104 in general. Metal seated valves shall be preferred instead of soft seated valves. Soft seat requirement shall be evaluated by PMC/Client on case to case basis. However, in general, the globe valves used shall be of class IV leakage minimum as per ANSI B6.104 in general. For vent services the leakage class shall be class V or VI depending upon process requirement.

Safety shutoff valves must not be used in throttling service during normal operation.

Noise abating devices shall be provided with valves where noise level at the outlet of valve at a distance of 1 metre all around is more than 85 DBA for valve which have operating times of 5 minutes or more in general and which are only working during start up and in upset conditions. For continuous operation the allowable sound level shall be 85 dBA. All noise abating plates, expanders, flanges, gaskets, studs & nuts shall be in the scope of valve manufacturer. The noise abating plates shall be of wafer design for easy removal for maintenance. Source treatment for noise shall be preferred over path treatment and for high noise vent applications "DRAG" type trim shall be specified.



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All valve bodies shall be cast or forged. Stainless steel bodies shall be acceptable inplace of alloy steel bodies, if not available, for low temperature application.

The valve body, positioner and actuator body material shall be suitable to corrosive environment. Suitable lining shall be provided inside wetted parts as per application.

Flanged bolted type gland packing boxes shall be used, unless other specified. Gland packing shall normally be self-lubricating type. Packing shall be PTFE type up to 200°C. For temperature above 200 °C, grafoil is to be used. Usage of asbestos is not allowed in any part.

Bellows seals shall be used wherever gland leakage is not permissible like toxic / hazardous product like carbon monoxide gas, etc.

As a minimum, trim MOC shall for all control/on-off valves shall be SS316L. By default, all Guide MOC shall be hardened stainless steel like 440 C, 17.4 PH. For erosion service, high pressure drop, cavitating service hard surfacing of plug and seat material, satellite shall be used for all cases as specified in above point 22.1. Special cases valve may require 17.4PH seat and 440C solid plugs or other material like Hastelloy, Monel, Zirconia, duplex steel, etc. for severe services like steam, urea grade, carbamate solution, acid, etc.

Mechanical stopper shall be provided as per process recommendations for min. Flow condition.

On line replaceable trims shall be considered for all high pressure valves of butt-weld or socket weld connections. Trim characteristics shall be equal percentage, unless otherwise specified. For high erosion service or in steam service where, the delta P is higher than 5 Kg/Cm2, hardened trim with stelliting shall be used. When this alone is not sufficient, in such cases, special Anti-cavitating trim or shall be selected. In general, for all trims, hardened full stelliting shall be used, as a minimum.

All on-off valves shall be ball type on-off valves only. The ball valves of up to 4", 150# size shall be floating ball design with full bore design, unless otherwise specified. Other ball valves (higher size and rating) with higher size can be trunnion supported ball type design type.

For all shutdown valves on fire safe applications, air volume tank shall be supplied for the storage of air volume for minimum 3 stroke operation.



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Oxygen service valves shall be de-greased completely and certified for oxygen service use. MOC for body shall be Monel and trim shall be Inconel 600 only.

Control / Ball valves bodies used in steam services should be A182 F22/ A217 WC9.

Split body design for ball valves acceptable where top entry ball design has not been considered for economical reasons. Mufflers shall be provided on ball valve vent air lines for noise suppression. Spring loaded seat and hard chrome plated ball shall be a standard feature for ball valves, in general. Wherever springs come into picture, vendor to ensure corrosion resistant spring steels are provided.

All control valves/ Actuators (pneumatic & Motorised) shall be painted with corrosive resistant paint. SS bug screen shall be provided for the exhaust ports.

All valve actuators shall be selected for a minimum operating air pressure of 4.0 kg/cm2g. The actuators shall be diaphragm or piston actuators in general. Diaphragm actuators with single or concentric multi-springs shall be used. volume tank with airlock relay, booster relays shall be avoided as far as possible.

Rotary rack and pinion pneumatic actuators may be used with ball and butterfly valves for on-off services.

In general, if otherwise not specified in the valve data sheet the time for full travel shall not exceed 10 seconds.

Wherever handwheel is required with a valve the same shall be side mounted type.

All split range functions for valve operations shall be carried out in control system and split range provision in valve positioners shall not be necessary.

Butterfly valve bodies shall be of wafer design. Lug type body shall be considered for size above 12". Face to face dimensions shall conform to ANSI B 16.10 and ANSI B 16.47 wherever applicable. Butterfly valves shall be used for high flow, low pressure drop below 10 kg/cm2g.

All instrumentation butterfly control valves shall be triple offset type only.

Non destructive test like radiography, ultrasonic, die penetration and magnetic particle shall be carried out for cast and forged bodies conforming to procedures laid down in ANSI B16.34. Radiography or ultrasonic test, if not specifically mentioned in the data sheet, shall be carried out for cast or forged bodied of rating 900 lb. or above.



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Valve bonnets shall be in general of bolted bonnet design as per ASME B 13.3 par 307.2 with minimum four bolts.

Smart E/P positioners with position transmitter along with valve signature software to be provided for all control valves. It shall be HART compatible, The software shall be provided for remote configuration and diagnostic analysis too.

Actuator sizing shall be done at 4 Kg/cm<sup>2</sup>.

Handwheel (Side-mounted) for All regulating control valves to be provided

By-pass valve provision shall be as per process licensor requirement.

The control valve % opening shall be at minimum flow 10-20%, for normal flow 50 to 70%, for maximum flow 75 to 85%.

All on – off application valve shall be fixed with necessary limit switches.

Valve Sizing shall be used on a maximum flow rate of approx. 1.5 time normal flow or 1.3 times the max. flow, whichever is greater, and the process conditions that exist at the increased flow (Pressure and differential pressure). Valve lift shall be approximately 70 % for equal percentage and 60 % for linear characteristic plug design at normal flow. It shall be checked that the calculated and the selected valve also covers start-up and stop conditions. In cases where over sizing shall not apply, it will be specifically mentioned in the Instrument Data Sheets.

The fluid velocity at outlet flange shall not exceed 6 m/sec for liquids whereas the velocity of gas or vapor shall not normally exceed 0.3 Mach under operating conditions. To meet this, valves shall be selected having reduced trim, labyrinth plug or cage trim as manufacturer standards.

Bidder shall submit the sizing calculations for all control valves.

Face to face dimensions of the control valves shall be as per ANSI/ISA-S75.03.

Direction of flow indication shall be engraved or embossed on the body.

Stroke time of the antisurge valves shall be 2-3 seconds and for critical services shall be as defined by process licensor or as mentioned in individual data sheet.

### 7.5.1 Control Valve Test and Inspections



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Valves shall be tested in accordance to individual specification which shall cover but not limited to:

- Visual Inspection and dimensional check
- Liquid Penetrants examination on stellite coating as per ASME B16.34 ann D.
- Radiographic, ultrasonic, magnetic particle as per ASME B16.34
- Hydrostatic Body Test Duration 3 min. (including all parts in assembled condition like body, gland, all joints)
- Impact test
- Seat leakage test as per ANSI B16.104/FCI 70.2
- Performance tests and Functional tests
- Leakage test from actuators and seals and packings
- Diaphragm head test
- Complete actuator leak test
- Helium leak test for control valve with bellow seals
- Stroke calibration
- Stroke speed test

### 7.5.2 Limit switches / Position Switches:

- 7.6.2.1 All type of limit switches shall be 2 wire, proximity type, intrinsically safe certified. Limit switches shall be provided both for close and open positions for all shutdown valves.
- 7.6.2.2 The make shall be P+F only. The sensor shall be generally cylindrical NAMUR sensor type proximity switch. The diameter and sensing range shall be selected based on application.

The MOC of sensor shall be SS316 or acid resistant body.

All limit switches sensor shall be adjustable with the threaded length and check nut arrangement.



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Flying lead type loose connections for NAMUR sensors are not acceptable. All these NAMUR sensors installed on any instruments to sense the position shall be housed in a closed box certified for weatherproof to IP65. The gland size shall be ½" NPT(F).

- 7.5.2.3 All ON-OFF type application valves taking in part in interlock/shutdown shall be provided with Open and Close type NAMUR sensor as limit switches. The sensors along with enclosure shall be installed in control valve in such a way that it can be removed with ease for maintenance.
- 7.5.2.4 Limit switches shall not be used for Control Valves.

### 7.5.3 Actuators

- 7.5.3.1 Generally, control valve actuator shall be of the spring and diaphragm, pneumatically actuated type. Standard air control signal to positioner shall be 0.2 to 1.0 kg/cm2g. For larger dP shut offs, higher spring range/higher areas shall be considered.
- 7.5.3.2 Actuators shall be single acting type for all valves.
- 7.5.3.3 All valve actuators shall be designed with 1.5 times factor of safety.
- 7.5.3.4 Piston type actuators (spring return type) with or without fail-safe capacity tanks (minimum of 2 strokes to be possible in case of air failure) shall be considered for high-pressure drop services or if actuator force requirements fall beyond the normal range of diaphragm actuators. All actuators shall be adequate to fully stroke the valve under the maximum differential pressure specified by the process requirements.
- 7.5.3.5 Air filter Regulator filter to be 5 micron. Miniature type, SS316L body & drain assembly etc as parts of air filter regulator are not acceptable.
- 7.5.3.6 Actuators must be painted with corrosion resistant paints and all its springs must be corrosion resistant spring steels. SS bug screen shall be provided for the exhaust ports.

### 7.6 PRESSURE RELIEVING DEVICES

### 7.6.1 **Pressure Relieving Devices**

All Pressure Relieving Devices shall be sized in accordance with applicable local and national code requirements. Formulas shall be in accordance with API RP 520, 1990 and ASME Codes section I and VIII.



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7.6.1.1 Percent Overpressure and Accumulation used in calculation of sizes of relieving devices shall be:

### Overpressure

- 3% Steam services where ASME Power Boiler Code applies.
- 10% Gas or Vapour service.
- For liquids and pump discharge lines with 6% system accumulation (Power Boiler Code) and with 10% system accumulation (Pressure Vessel Code)
- 21% Fire exposure on unfired pressure vessels.
- 10% Liquids for thermal relief of pipelines or vessels Accumulation
- 10% Gas, Vapour and liquid where ASME Pressure Vessel Code applies
- Gas , Vapour and liquid where ASME Pressure Vessel Code applies and the system is protected by means of multiple valves.

### 7.8.1.2 **Nomenclature**

Nomenclature used shall be in accordance with API RP 520.

### 7.6.1.3 Safety and Relief Valves

Safety and Relief Valves shall normally be direct spring loaded type. Balanced bellows valves shall normally be furnished for relief into closed flare and slowdown systems, if the developed back-pressure exceeds 10% of the set pressure. Bellows shall also be specified where leakage of gas from the seals are not permitted during normal plant operation. Steam jacketing may be considered necessary to keep some valves and lines warm at all the times to avoid the solidification of the lading fluid.

Full nozzle types of valves shall be specified for sizes 1" or above.

Test gags shall be furnished on all safety and relief valves. Test gags shall be removed and transferred to Owners possession after testing, clearly labelled with the tag number of the valve.

Lifting levers shall be furnished for exposed spring bonnets on valves on steam and hot water services, on air valves and hot water service valves with closed bonnets.



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Bonnet construction shall be plain closed bonnet for toxic and inflammable gases as well as vapour and liquids. Exposed bonnet shall be specified for steam service and in Boiler feed water service above 200°C. Bonnet extension shall be used above 400°C.

Springs shall be of carbon steel for normal process operating temperature of (-) 25°C to 200°C and tungsten alloy or high temp. alloy steel above 200°C. Stainless steel spring may be used for services below (-) 25°C. Carbon steel is permitted above 200°C for open bonnets.

Blowdown shall be between 5% to 7%. For steam services under Power Boiler Code as per ASME the blowdown shall be 3% - 4%

All connections shall be flanged in general with facing and rating in accordance with the piping specification or API 526 whichever is higher.

Centre to Centre dimensions shall be in accordance with API 526

## 7.6.2 Rupture Discs

Rupture discs may be used in lieu of or in combination with safety and relief valves, where applicable or required. For disc rupture trip or alarm disc shall be with bursting sensors.

### 7.6.3 Pressure and Vacuum Relief Valves

Pressure and Vacuum Relief valves for storage tanks shall normally be of the weight loaded or pilot operated type, and sized in accordance with API RP-2000 Tank Venting Code, or Local Codes if they govern.

## 7.6.4 Thermal Relief Valves

For thermal relief of accumulated liquids in pipelines and vessels 1" x 2" size valves shall be used in general.

## 7.6.5 **Centre-to-Face**

Centre-to-face dimensions shall be in accordance with API 526.

### 7.7 SWITCHES AND SOLENOID VALVES

## **7.9.1 Switches**



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Process switches, shall be realised through field transmitters only. If for some packages, process switches are unavoidable same shall be provided with sealed micro switch contacts rated for the specified application. Contacts shall be 1 no. DPDT preferably. Otherwise 2 nos. SPDT can be considered. All switch contacts except those used in intrinsically safe circuits shall be silver plated. Contacts used in intrinsically safe circuits shall be suitable for the applications. Switches shall be hermetically sealed type. Switches shall be connected through interposing relays.

### 7.7.2 Solenoid Valves

Solenoid valves shall normally be used to actuate other instruments/valves connected directly to the process. The SOVs shall be SIL3, direct acting type (3/2 external pilot operated, universal type, low power intrinsic safe type, with manual override and LED indication). Protective enclosure shall be IP 67 and the coil insulation H class or better suitable for continuous operation in 85 degree C ambient temperature (max. surface temperature in sun) for outdoor service. Body materials shall normally be stainless steel 316. Solenoid valves will be powered by 24V DC or through barrier, insulation class 'H' and orifice size 9 mm. The D.C. solenoids shall not have in built rectifier to operate with A.C voltage. The d.c. solenoids shall be used as an alternative to A/C solenoids only for low current intrinsic safe operations.

All solenoid valves shall be fitted with 1/2" NPT (F) SS 316 double compression cable gland connection. The cable entry should be from bottom only and solenoid coils must be hermetically sealed. SS bug screen shall be provided for the exhaust ports. The sealing medium of the SOV's will be EPDM or better (will be discussed during the detailed engineering).

## 8.0 CONTROL SYSTEM DESIGN CRITERIA

## **EXPANDABILITY**

Systems shall be designed with 20% installed pre-wired spare capacity for all I/O type cards of each category for project development. The sparing supplied shall be for "complete loop"; i.e. corresponding marshalling, power supply, terminals/barriers, interposing relays, pre-fab cables other accessories, etc. and its space, and panel cut outs where appropriate, etc.

To allow for future expansion 20% spare capacity shall be allowed & terminated in multi core cables, junction boxes, marshalling racks, etc,



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Communication networks and cables shall have a spare load capacity of 50% as a minimum.

Plant wide networks shall have a node connection spare allowance of 50 % as a minimum.

Local networks shall have a node connection spare allowance of 30% as a minimum.

## Operators' Keyboard

This shall be used by plant operators along with each Operator station display unit for operation of the plant. It will have multiple assignable keys to directly open preprogrammed display as well as few other system typical templates for selected tags including controller group display, trend, configuration display, alarm summary pages, etc. There shall be both numeric and alphabet keys and dedicated function keys on membrane type operator keyboard each of which must be freely programmable. There shall be one no. of operator keyboard with each of the operator stations.

This shall be membrane type fully dust proof and spill proof & corrosion proof.

Key lock switch / password switch shall be provided for operator/supervisor/engineer security levels.

Dummy Consoles/Filler Panels shall be provided to maintain aesthetic and mounting instruments like indicators, annunciators etc. as well as for push buttons, lamps, key switches, paging system hardware.

Entry into the Marshalling Panels shall be through SS316 ET double compression cable glands only.

### PLC CONTROL SYSTEM

### 8.1 General

The operation and control of Plant shall be through Process PLC based Control system. The system shall be microprocessor based programmable logic control (PLC) with fault tolerant redundant processors based on DMR technology.

The PLC will be used to provide protection and controls for the entire plant.

Following minimum functions are provided on the OS (Operator station).



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- 1. Area wise display of the plant.
- 2. Operation of the plant from the OS.
- 3. The schematics will be having dynamic parameters like valve open / close and motor running/ fault indications

The Control system shall perform any of the following functions for safety of the plant from control room.

- Total Shut Down
- Unit Shut Down

It will perform following functions also:

**Data Display** 

**Process Control** 

Process and system alarms

Logging

Real Time trends & Historical trend

**Dynamic Graphics** 

Report Generation (shift, daily, weekly, monthly and on demand)

System diagnostics

The following shall be adhered to while selecting the DMR system

- a) DMR CPU's shall be applied.
- b) If a CPU fails, the other(s) shall continue to operate. Single CPU operation system to be certified to operate without any time limitation of faulty CPU repair.
- c) DMR buses shall be applied.
- d) DMR analogue inputs and outputs shall be applied.
- e) DMR digital inputs shall be applied.
- f) DMR digital outputs shall be applied.
- e) Redundant communication interfaces shall be supplied.
- f) Redundant Power supplies (at least three in parallel) shall be supplied.



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- g) In the event of a failure of a fault tolerant component, power supply or other function, of the system shall change over to "single mode" operation without causing nuisance trips and also generate alarm on Operator and Engineering console.
- h) In case of failure of complete processor system, i.e., system outputs shall take fail safe state automatically unless otherwise specified.

Operator interface for critical trips shall be mosaic display with illuminated push button for trip, reset, inactivation etc. and LED indication for each element of trip & actions.

The operator will be informed about a trip situation by a warning sound (to be different from the audible signal from the alarm system), and a LED display will clearly inform about the alarms in trip position. The first up alarm will flash.

Scan time shall be maximum 250 msec. CPU loading shall not exceed 50%, Bus Communication modules, Power Supply and I/O cards shall have 100% redundancy and fail safe certification.

### **System Redundancy**

Following system redundancy shall be available as a minimum.

1.	Controller (CPU for control, I/O communication, network communication)	1:1
2.	Communication Bus	1:1
-	I/O communication modules with CPU (I/O bus between CPU and I/O with all necessary hardware)	1:1
4.	Main data highway	1:1
5.	Communication Cards	1:1
6.	System Device	1:1
8.	Power supply (Power supply for all CPUs, I/O power supply modules)	1:1
	History	1:1
11.	Modbus/Serial interface	1:1
10	ODC conver ODC conver If applicable about	hava

12. OPC server: OPC server, If applicable shall have RAID-5 configuration with firewall.

13. System server (for server based PLC): Redundant (1:1 redundancy)

However, lamp drive cards, supporting mosaic need not be redundant also. Active isolator/barriers need not be certified for fail safe operation.



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The operator can bypass trip alarm inputs, which may be necessary in abnormal situations. A lamp shall indicate that the trip alarm is inactivated. The operator will be warned by sound and fast flash if the inactivated circuit goes in alarm status.

The system shall include an event recording system, and it shall be considered to store about 500 events. The system should have SOE backup facility for 30 days. Sequence event recorder (SOE) of 1 msec, resolution to be envisaged.

Display colours shall be in accordance with the following:

Alarm and Trip (safety operations) : Red
Pre-alarm for trip (safety operations) : Orange
Indication for by pass of trip (safety operations) : Red
Equipment in operation (alarms and pilot lights) : White
Ready (standby of equipment) : Green

The critical trip shall be displayed on a separate graphics available in control system.

All Emergency stop and manual start/stop push buttons shall drive an interposing relay located at IRC. For all critical electrical drives (list will be discussed separately during detailed engineering), the spare contact of final DO command from PLC going to MCC, must be connected as DI into PLC and configured in SOE for confirmation of command to MCC from PLC.

Consumables like printer paper, cartridges, fuses etc shall be supplied along with the PLC control system for a minimum period of one year duration.

## 8.1.1 **PLC requirements**

- a) All systems' all cards shall be supplied with ISA G3 level or equivalent coating for environmental protections.
- b) ISOLATIONS

Analog I/Os to Field : Galvanic Isolation through safety barriers

Analog I/Os Module: Channel to Channel Galvanic Isolation

If individual channel to channel isolation is not available with system vendor, then only Isolation shall be provided in a group of 4 channels as per system vendor design.

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Digital Input to Field: barriers + optical isolators on cards

Digital Output to Field: Interposing relays + smart barriers for monitoring purpose

## c) PANELS:

All panels shall be either 1200 mm (wide) x 800 mm ( depth) x 2100 mm ( height) or as a special case 600 mm( wide) x 800 mm ( depth) x 2100 mm ( height), RITTAL make, with 100 mm black powder coated metal base frame and with colour shedding of RAL7032 ( Siemens Grey) and removable gland plates at bottom only. This applies to all types of instrument panels to be used in the whole project like various PDB, Electrical / Instrument panels, Third party device panels, etc.

- d) All A/D converters of system I/O cards shall have resolution of min. 13 bits and all D/A converters of system I/O cards shall have resolution of min. 10 bits
- e) There shall be 20% installed spares minimum 1, installed and wired capacity for I/O cards of each category in DCS, including all peripheral termination modules, prefab cables, Relays, Safety barriers, etc
- f) All marshalling and system panels shall have minimum 20 % wired spare capacity for future expansion (should be possible with the same wiring philosophy.)
- g) I/O cards' Channel density shall not exceed the following limits:

Analog Input 16 Channels

Analog Output 16 Channels

Digital Input 32 Channels

Digital Output 16 Channels

- h) Process override switches (POS) shall be soft type.
- i) All interlock and control transmitters shall be separate right from field junction box to marshalling panels
- j) Those parameters, which are directly or indirectly tripping the plant or may cause production loss, shall be wired with 2 out of 3 transmitter trip voting interlock in PLC. There shall be three separate analog input channels in three different cards. Al cards shall be used for this purpose in system. Same thing is applicable to Digital inputs also including emergency stop and compressor stop DI's.



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### 8.2 DCS CONTROL SYSTEM

The control system shall be a modern Digital Distributed Control System (DCS) located in the Central Control Room. The system shall be reliable, fault tolerant and build up in modules from the suppliers' standard components and software. The system shall have facilities for plant control monitoring, alarm handling, shutdown & trip functions. It shall be self- diagnostic, self documenting and contain all the functions necessary for advanced regulatory control and trip functions.

Display colours shall be in accordance with the following:

Alarm and Trip (safety operations) : Red
Pre-alarm for trip (safety operations) : Orange
Indication for by pass of trip (safety operations) : Red
Equipment in operation (alarms and pilot lights) : White
Ready (standby of equipment) : Green

The critical trip shall be displayed on a separate graphics available in control system.

All Emergency stop and manual start/stop push buttons shall drive an interposing relay located at IRC. For all critical electrical drives (list will be discussed separately during detailed engineering), the spare contact of final DO command from control system going to MCC, must be connected as DI into control system and configured in SOE for confirmation of command to MCC from control system.

The control system shall comprise racks with I/O devices, control cards, CPU cards, hard disk, system buses, and required number of operator stations with colour video display units (VDU) with dynamic graphic generation capabilities to ensure complete access to the process during normal operation, start-up, and upset conditions. The operator shall use dedicated operator keyboards to manipulate the DCS.

The DCS shall have the following main components. Detailed specifications of each of them are given in subsequent sections. The system shall be 100% fault tolerant and dual redundant, except the redundancy at I/O cards levels. This means, all central control processors, all communication processors and all other central rack and individual node's common cards, all the communication cards, networks and cables, etc. shall be 100% fault tolerant and dual redundant, except individual IO cards of the system. All the system hardware of DCS shall have ISA G3 level corrosion protection. Since redundancy at I/O card level is not envisaged, the failure of a single card from complete system shall not



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affect more than the I/Os supported by that particular I/O card. It means all the hardware except I/O cards shall be 100% fault tolerant. All the hardware including control/communication processors, networks, cables, all type of system cards, all type of I/O cards shall be hot replaceable.

All operating consoles for control system shall be located inside the central control room but their I/O units, marshalling cabinets, power distribution cabinets and engineering station shall be housed in the adjacent room.

### **DCS Functions**

The DCS will perform, as a minimum the following functions:

Data Display
Process Control & Trip/Interlock
Process and system alarms
Logging
Real Time trends & Historical trend

**Dynamic Graphics** 

Report Generation (shift, daily, weekly, monthly and on demand)

System diagnostics

Trend: All the critical parameters (Temperature, flow, pressure, level, speed, vibration etc) as well as the Closed loops (PV,LV, MV etc) the trend shall be recorded for every 1 second with the back up of minimum 4 days. Recording shall be on FIFO basis.

## 8.2.1 Data Storage and Retrieval

Data storage and retrieval will be provided on hard disc and on DVD or DAT. The trend shall be recorded as follows:

## Analogue signals

Last 3 days

Last 7 days

Every 1 second.

Every 1 minute.

Every 1 hour

Every 1 hour

Shift averages

Last 2 years

Daily averages

Alarms Last 48 hours (Minimum)

## 8.2.2 DCS Operator Interface



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For Details of OS/ES please refer Annexure -3 System configuration

One Emergency Stop push button station directly wired to MCC, should be provided for all critical drives (if applicable). The spare contact of this emergency push button must be mapped to DCS/PLC as a DI contact for SOE punching. All emergency push buttons and stop push station must be provided with transparent safety covers.

### 8.2.3 **Process Controller Cabinets**

The process controllers will contain the microprocessor based system capable of combining continuous, sequential and discrete functions in order to the requisition of analog and discrete signals, sequential and continuous control.

The process controller cabinets shall/may have incoming and outgoing cable marshalling facility. All field cables shall be terminated in marshalling cabinets in single tier WAGO make cage clamp type terminals. Isolators shall be provided for all intrinsic safe input and outputs. All thermocouple signal wiring from terminal to respective isolator/input card shall be through extension wires corresponding to the type of thermocouple element used. The signal I/O cards may also be installed in Process Controller Cabinets. Some marshalling/I/O racks may be installed in remote safe areas by extending the system bus, especially in MCC rooms where lot of inputs from drives shall directly be terminated in the marshalling /I/O racks.

## 8.2.4 DCS Redundancy Philosophy

In order to increase the system availability and then the continuity of plant operation, redundancy shall be provided as follows:

100% fault tolerance and dual redundancy in DCS shall be for Controller cards, all communication cards and buses, all control buses, all type of common cards in the system, all power supply modules, all I/O modules for closed loops and interlock I/Os, buses, Ethernet modules. The failure of any single I/O module for open loop shall not affect more than the channels being catered by that particular I/O card. Dual redundant power supply modules for each dual redundant controller shall be dedicated.

## 8.2.5 Multiloop Controllers and Input/Output Cards

All multi loop shared controllers will be redundant with 1:1 redundancy. The control



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processors shall be of fault tolerant type and both shall be active with cyclic changeovers. All I/O cards for close loop applications shall be capable of holding the last value in case of open condition of input. Input cards for specific open loop inputs used for calculation functions must also be capable for holding the last value. As otherwise the same function shall be built up in DCS software.

## 8.2.6 **I/O Segregation:**

The I/O card segregation for DCS shall be as per physical units of the plant.

## 8.2.7 **Controller Loading**

Each Controller loading shall not exceed more than 50% (hardware and software load of each controller) in any case, after implementation of complete project and running at peak load. In case more controllers are required to meet 50% loading criteria, CONTRACTOR to include additional controllers without any cost implication.

## 8.2.8 **DCS requirements**

- a) All DCS/ESD systems' all cards shall be supplied with ISA G3 level or equivalent coating for environmental protections.
- b) All digital output from DCS and ESD shall drive interposing relays of OMRON make, 4 Change over (4 NO/NC) with socket mounted relays with LED indicators and built in surge suppressor. The contact rating shall be minimum 230 V AC/ 5 amps. Any DO Channel from DCS/ESD shall not be directly connected to any devices without interposing relays.
- c) DCS shall be a large and expandable type system available with the vendor.
- d) The system architecture shall be compliant to IEEE 802.XXX with dual redundant and 100% fault tolerant BUS/RING topology. System shall be fully open with DDE/OPC&ODBC compliant. System availability shall be better than 99.95%.
- e) DCS and ESDS I/O cards channel density shall be as per following:

I/O cards' Channel density shall not exceed the following limits

Analog Input 16 Channels

Analog Output 16 Channels

RTD/T/C Inputs 16 channels



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Digital Input 32 Channels

Digital Output DCS-32 Channels /ESDS-16 Channels

f) All I/O cards in individual category shall be of same type/model/revision only. No diff bulk I/O cards or I/O cards with degraded features shall be accepted in any of the category in a mix mode supply.

## g) ISOLATIONS

Analog I/Os to Field: Galvanic Isolation through safety barriers

Analog I/Os Module: Channel to Channel Galvanic Isolation

If individual channel to channel isolation is not available with DCS / ESDS vendor, then only Isolation shall be provided in a group of 4 channels as per DCS / ESDS vendor design.

Digital Input to Field: barriers + optical isolators on cards

Digital Output to Field: Interposing relays + smart barriers for monitoring purpose

## h) PANELS:

All panels shall be either 1200 mm (wide) x 800 mm (depth) x 2100 mm (height) or as a special case 600 mm(wide) x 800 mm (depth) x 2100 mm (height), RITTAL make, with 100 mm black powder coated metal base frame and with colour shedding of RAL7032 (Siemens Grey) and removable gland plates at bottom only. This applies to all types of instrument panels to be used in the whole project like various PDB, Electrical / Instrument panels, Third party device panels like wood word digital governors, Bentley Nevada system hardware panels, etc.

- i) All A/D converters of system I/O cards shall have resolution of min. 13 bits and all D/A converters of system I/O cards shall have resolution of min. 10 bits
- j) There shall be 20% installed spares minimum 1, installed and wired capacity for I/O cards of each category in DCS, including all peripheral termination modules, prefab cables, Relays, Safety barriers, etc
- k) All marshalling and system panels shall have minimum 20 % wired spare capacity for future expansion (should be possible with the same wiring philosophy.)

### **DCS System Redundancy**



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Following system redundancy shall be available as a minimum.

- a. Controller 1:1 (CPU for control, I/O communication, network communication)
- b. Input / output cards redundant closed loops
- c. Communication Bus 1:1
- d. I/O communication modules with CPU 1:1 (I/O bus between CPU and I/O with all necessary hardware)
- e. Main data highway 1:1
- f. Communication Cards 1:1
- g. System Device 1:1
- h. Power supply 1:1
  (Power supply for all CPUs, I/O power supply modules)
- i. Serial (RS-485) Modbus (For Interlock PLC) 1:1
- j. In case of client-server system, server shall be redundant (Raid-6 Configuration)

I/O bus and I/O interface card at controller rack shall be redundant

Connectivity from Upstream redundant device to downstream redundant device shall be through redundant device or cable.

## Loading philosophy (with 20% installed spares and 20% future expansion)

Control Processor 50%
Communication Processor 50%
Communication Bus 50%

### 8.2.9 **Scanning Time**

not more than 250 msec.

## 8.2.10 Other requirements

Operators' Keyboard

This shall be used by plant operators along with each Operator station display unit for



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operation of the plant. It will have multiple assignable keys to directly open preprogrammed display as well as few other system typical templates for selected tags including controller group display, trend, configuration display, alarm summary pages, etc. There shall be both numeric and alphabet keys and dedicated function keys on membrane type operator keyboard each of which must be freely programmable. There shall be one no. of operator keyboard with each of the operator stations.

This shall be membrane type fully dust proof and spill proof & corrosion proof.

Key lock switch / password switch shall be provided for operator/supervisor/engineer security levels

Dummy Consoles/Filler Panels shall be provided to maintain aesthetic and mounting instruments like indicators, annunciators etc. as well as for push buttons, lamps, key switches, paging system hardware.

Entry into the Marshalling Panels shall be through bottom mounted MCT blocks.

### 8.2.11 Consumables

One No. Spares like printer cartridges with each printer to be provided.

## 8.3 System Cabinets

## 8..1 Interlock Marshalling Cabinet

Marshalling cabinet(s) are foreseen for both incoming to Interlock system and outgoing from Inter ('from' and 'to' field) termination. The interlock marshalling cabinet(s) shall also accommodate the repeater power supplies for the field transmitters, galvanic isolators for all inputs, trip amplifiers, output relays etc.

The termination strips shall be arranged or grouped for inputs/outputs 24VDC, 115VAC, etc. both for inputs as well as outputs.

The terminals shall be of the Wago/weidmuller/Phoniex /Klippon make screwless, cage clamp type, single tier design (double tier design shall be avoided). Terminal stack for each unit shall be supplied with approx. 20% extra terminal points as spare/future provision in addition to the existing inputs and outputs.

Physical separation between the terminal stacks/points shall be maintained for the



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intrinsically safe and normal termination. Also the termination area shall be physically separated from the electronics area there by sealing the latter from dust ingress.

### 8.4 Sequence of event (SOE)

Bidder shall provide the Sequence of event recorder function, with a time resolution not above the machine scanning time. This information shall be available, for archiving, filtering and visualization operations to the SOE which shall be feature of ES station. (I.e this feature to be provided in Engineering station) located in the Engineering room in, to aid in diagnosis and recognise the first cause of plant or equipment shut-down.

Sizing of the system bulk memory capacity shall be done considering for SOE activities a rate of 500 events/day (or shall be discussed during detail engineering).

The SOE package of the offered system must have facility to generate a separate SOE file for critical event trips that is all important events just before and just after tripping event.

Time stamping of the SOE must be generated directly from the controller and it must be as latest ISA standard.

## 8.5 System Clock

The DCS/PLC control system clock shall have facility for synchronising with a Main plant DCS through hardwire DI signal. Bidder shall consider Ethernet port/TCIP for synchronising to Master GPS clock. Additional hardwired or communication connections / networks between DCS/PLC control system and Main plant DCS shall be consider by the bidder.

## 8.6 **Power Supply**

All instrumentation shall be fed by an Uninterruptible Power Supply (UPS) system.

An uninterrupted Supply to DCS/PLC system shall be provided to the power distribution cabinet of DCS/PLC system at 115VAC +/- 10%, 50Hz +/- 3%. UPS feeders from ACDB to DCS/PLC loads shall be redundant whereas UPS feeders for Non-Control system loads shall Non-redundant, The Contractor shall prepare a list Non-Control system UPS load requirement.

110 VAC UPS Power supply feeder failure alarm before PDB shall be provided in DCS/PLC by using double pole MCB in PDB. One contact of these MCBs shall be wired to DCS/PLC for alarm purpose



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In case rectification to DC is involved, rectifiers shall be dual redundant and both shall be 'hot' (on line) so that failure of one rectifier will not cause a system trip. Provision shall be included in the system to annunciate the rectifier/DC power supply failure.

### 24V DC power supply

- 24 VDC power supply required for interrogation voltage, solenoid valve supply, lamp, pushbutton, etc and for other packages shall be supplied by contractor using dual redundant Bulk Power Supply (BPS).
- ii) Each redundant bulk power supply shall be sized for maximum50% loading of its capacity in normal time; the maximum loading is to be 70% of its capacity of BPS.
- iii) All bulk power supply (BPS) shall be provided with surge protection capability. BPS shall also provide with cooling fans and with fan failure alarm indications in DCS/PLC system.
- iv) Each BPS shall be provided with Mosfet based redundancy with auto-current balancing and equal loading on both PS.
- v) Power supply & redundancy module shall be same make.
- vi) Current output (4 to 20 mA) shall be available from the power supply unit and the same shall be wired to DCS for Power supply health monitoring and indication from all BPS.

Philosophy of power isolation and over load protection (switch fuse units) or only over load protection shall be extended upto individual card level, while designing the system, so that, minor card failures can be localised for easy rectification. Also this will avoid major down time on the system.

Earthing /Grounding bus bars for terminating shields of the cables shall be provided on the cabinet.

Power supply (For all DCS/PLC and Vendor Packages):

All BPS Failures shall be connected to DCS/PLC as a separate DI signal.

All MOSFET O rings Failures shall be connected to DCS/PLC as a separate DI signal.

All power feed Modules shall be connected to DCS/PLC as a Separate DI signal.



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All MCB healthiness feedback shall be connected to the DCS/PLC as a Separate DI signal. Silver/Cu/humidity/temperature monitoring shall be with 2 nos. of C/R with indication in DCS/PLC.

Healthiness of BPS/MOSFET O ring must have LED indications for indicating the healthiness of the module locally. 110 V AC and 24 V DC supplies must have current and voltage transducer wired to DCS/PLC.

### 8.7 **Annunciator**

The Annunciator display stations will consists of:

- LED Lamps
- Split type architecture with lamps and electronics separate
- All connections with interlock system cabinet and interlock marshalling cabinet shall be through plug in connectors.
- About 20% spare capacity shall be there
- All switches and status lights indicated below shall be an integral part of Display Modules.
- Supply shall include mounting accessories and about 20% of unassembled extra LED lamps

## 8.8 **Precision & Accuracy**

The isolator, repeater modules/trip amplifiers for analog inputs shall have a total accuracy of less than 0.2% of full span for the measurement circuit.

The accuracy and stability for thermocouple trip amplifiers, if applicable, shall be +/- 0.5%.

## 8.9 **Control System Spare Philosophy:**

Installed Spares	I/O Level	20%
	Marshalling	20%
Spare Space	I/O Level	20%
	Processor	50%
	Marshalling	20%
	Rack	

### 9.0 LOCAL CONTROL PANELS



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All local panels under the scope of package vendor shall follow the minimum specifications listed below:

- 9.1 Panels shall be suitable for acidic environment. Sealings of the panel will be Silicone/EPDM or better, which will be freezed during detailed engineering.
- 9.2 Panel shall be free standing close cabinets, constructed in sections of min. 1000 mm wide. The panel construction shall be welded or bolted frame construction with upright and and additional framing in modular construction. The panel front sheet thickness shall be min. 3 mm. The front of panel shall be stiffened where necessary with profiles tack welded to the rear. Top, sides and doors can be made out of 1.6 mm thick plate.
- 9.3 The panels shall have environmental protection conforming to IP 55 min.
- 9.4 Instrument air shall be provided for purging of local panels.
- 9.5 Panel face, sides and doors shall be sand blasted and cleaned before primer and two coats of paints are applied. The colour of paint shall be bright grey. The final surface shall be semi mat, free from blemishes and paint runs.
- 9.6 115V A.C. +/- 10%, +/- 3% Hz power at one point to the local panel shall be provided by the client. Any other voltage level if required preferably 24 V, DC, the same shall be arranged by the vendor. Redundant rectifier units shall be provided for the generation of d.c.by the vendor.
- 9.7 Earthing lugs for both power and system earthing shall be provided by the vendor.
- 9.8 The wiring shall preferably contained in polymer ducts. Instrument safe wiring shall be laid separately from others. The colour of IS wiring shall be light blue.
- 9.9 WAGO type cage clamp type terminals shall be used for cable termination and wiring. 20% terminals shall be kept as spares in each terminal strip and box.
- 9.10 Gland plates shall be provided alongwith cable glands (ex. proof wherever required) in each panel for cable termination.
- 9.11 A miniature circuit breaker shall be provided for each power supply with DI contact wired to system.
- 9.12 All panels shall be provided with vibration dampening pads.



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- 9.13 Each panel section shall be provided with illumination level of 300 Lux min.
- 9.14 Name plate/labels shall be provided for each panel mounted instruments, equipments and accessories mounted in the front or rear of the panel.
- 9.15 Purged panels shall be provided with purge fail alarm. Purge fail trip shall be provided with a bypass switch
- 9.16 The panel must have all necessary push buttons, LED displays, field mounted displays for all relevant process parameters (may be mounted separately near panel, if required)
- 9.17 The compressor status/ Unit operation must be clearly visible from the local panel.

#### 10.0 PNEUMATIC TRANSMISSION

#### 10.1 **Output Signal**

Output signal from all pneumatic transmitters shall be 0.2-1kg/cm2g.

#### 10.2 **Pneumatic Receiver Instruments**

Pneumatic receiver instruments shall have receiver elements design for 0.2-1 kg/cm2g input signal.

#### 10.3 **Pneumatic Transmission Tubing**

Pneumatic transmission tubing for local transmission shall be ½" or ¼" OD stainless steel tubing with SS316 fittings (inch).

#### 10.4 **Instrument Air**

Instrument air required is available at 6.5 kg/cm2g and max. 70 degree C. However, the air pressure can be down to 4.5 kg/cm2g for remote consumers. Design pressure is 10 kg/cm2g. Dew point is -40 degree C at line pressure.

Air Distribution Headers shall be as SS 304.

#### 11.0 **ERECTION, INSTALLATION & COMMISSIOING**

The bidder shall be responsible for the installation, calibration & testing, commissioning of the complete instrumentation and controls as defined in this specification as minimum. All



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the instruments & systems installed by the bidder as per scope subject to inspection, checking, calibration & testing to prove their operational fitness. Testing & calibration shall be done by the bidder, if required , all the required tools, tackles, calibration instruments, qualified skilled manpower for conducting these tests shall be provided by the bidder.

Testing & calibration may be witnessed by representative Client/PMC and/or manufacturer's representative.

**LETTER WRITING**: LETTER WRITING FOR ALPHA-NUMERIC TAGGING (WITH SYNTHETIC ENAMEL). :- Letter writing of different sizes on Instrument Panels/misc. Instruments/ Equipments with synthetic enamel paints (Asian/ Jonson & Nicolson/ Berger /Nerolac Make) suitable for a temp. of 100 degree Celsius for writing of letters, figures etc. Job includes cleaning of surface on panels/instruments/misc. instruments etc. All complete with labour and materials as per drawings, specifications, Name plate schedule and directions of Engineer-in-Charge. (Supply of paints is in contractor scope)

## 11.1 INSTRUMENT LOCATION

- 11.1.1 The location of instruments, control valves. Including junction boxes shall permit easy access from grade, permanent platforms or stairways for operation, inspection and maintenance.
- 11.1.2 The use of portable ladder or mobile platform shall be limited to access root valves, thermowells and line mounted flowmeters.
- 11.1.3 Locations shall be decided to minimize the possibility of damage from passing or falling objects and the possibility of tripping hazard or obstruct on walkway.

### 11.2 INSTRUMENT CABLE

### 11.2.1 Overhead Runs

Instrument main cable tray from field junction boxes to main control building shall generally be laid in aboveground cable tray with protection cover. Tray protection cover shall be provided only for the tray on top of tray layer.



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Instrument branched cable runs from junction box or local panel to each instrument in the field shall also be routed aboveground and supported with trays, steel angles and channels.

Aluminium perforated cable trays/cable ducts shall generally be used for main cable trays. Single pair cables from instrument to junction box and branch cable tray shall be through perforated Aluminium cable trays.

The scope of supply includes Aluminium perforated type cable trays, FRP accessories such as Bends, tees, crosses, reducers & connector plates and accessories like bolts, nuts etc.

Aluminium trays shall be vinyl ester resin based and all tray shall be manufactured using the PULTRUSION process.

For Signal 900mm/ 600mm tray and for power 600mm/ 300 mm tray to be considered or shall be discussed during detail Engineering.

Cable tray segregation shall be based on the voltage level. Cable tray shall be supported at every 3M. 20% spare to be considered in the cable tray filling.

Instrumentation cables that form part of intrinsic safe (IS) circuits, if any, Shall be segregated from other instrument signal cables.

Instrument power supply (AC) cables shall not run in the same tray of instrument signal cables. Cable tray shall be dedicated for laying instrument power cables separately from the signal cable tray.

Alternatively, cable ducts of suitable size shall also be considered for main cables. When common cable ducts are used for running both power and signal cables, necessary air gap partition shall be used to segregate the cables

## 11.3 CABLES

All cables shall have PVC insulated primary insulation of 85°C PVC as per IS-583. Inner and outer jacket shall be made of extruded flame retardant 90 ac PVC to IS-5831

All cables shall be FRLS as per standard IEC 332-3 Part 3 Cat. A. Fire resistance cables whenever specified shall be as per me 331 Cat. A.



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The insulation grade shall be 600 V/11000 V as a minimum arid shall meet insulation resistance, voltage and spark test requirements as per BS-5308 Part-2

All cables shall be armoured. Armour over inner jacket shall be of galvanised steel wire/flat as per IS-1554 part I / IEC 502. All the cores of single pair or multi-pair shall be twisted and numbers of twist shall not be less than 10 per metre.

For signal and control cables, inner jacket colour shall be black. Outer jacket colour shall be light blue, for intrinsically safe application and black for others. For thermocouple extension cables the inner and outer jacket colour shall be as per IS-8784.

L/R ratio of adjacent cores shall not exceed 40 µH/ohm for cables with 1.5 mm2 conductor Electrical Properties of Cables shall be in line with EN50288-7:2005.

Contractor shall ensure a minimum of 20% of quantity of each type of cables supplied as spare including any special cable and in each multipair cables 20% pairs shall be kept as spare.

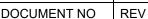
#### 11.3.1 **Instrument Signal Cable**

- a) Single pair shielded signal/alarm cables shall be used between all field instruments including switches and junction boxes/local control panels.
- b) Triad cable shall be used between GDs/RTDs to JB/Transmitter respectively.
- b) Multipair individually and overall shielded signal/alarm cables shall be used between junction boxes/local control panels and control room.
- c) The single pair/triad cables shall be 1.5 mm2 conductor size made of annealed electrolytic copper conductor of 7 strands with each strand of 0.53 mm diameter. Multipair cables with 1.5 mm2 conductor size shall have 7 strands of annealed electrolytic grade copper conductor with each strand of 0.3 mm diameter. Multi triad cable or multi pair cable with 1.5 mm2 conductor shall have 7 strand with each strand of 0.53 mm diameter. Colour of core insulation shall be black blue in pair and black, blue and brown in a triad.
- d) Shield shall be aluminium backed mylar/polyester tape bonded together with the metallic side down helically applied with either side having 25% overlap and 100% coverage. The minimum shield thickness shall be 0.05 mm in case of single pair/triad and 0.075 mm in case of multipair/triad cable.



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- e) Drain wire shall be provided for individual pair and overall shield which shall be 0.5 mm2 multi stranded bare tinned annealed copper conductor. The drain wire shall be in continuous contact with aluminium side of the shield.
- f) All multi pair cables shall have 6 pair/12 pairs only while multitriad cable shall have 6 triads/8/12 triads only. Size for multipair cable will be 1.5 mm2 with drain and overlap as above.

### 11.3.2 Cables and Multicore Cables for Solenoids etc.

Cables and multicore cables for such items as solenoid valves and flame detectors shall normally have a conductor size of 2.5 mm2. However, conductor sizes for power cables shall be co-ordinated with the Electrical Group to avoid too many different cable types.

Signals (4-20 mA or switch 'contact): 6/12 pair individually and over all shielded (screened) and armoured, twisted, 0.75 mm2 conductor.

## 11.3.3 Thermocouple Extension Wires

- a) Single pair shielded thermocouple extension cables shall be used between thermocouple head and junction boxes transmitters/ local control panel mounted instruments.
- b) Multipair individually and overall shielded thermocouple extension cables shall be used between junction boxes and main control room mounted devices.
- c) The type of thermocouple extension cables shall be compatible with thermocouple used. In addition the colour coding of the primary insulation shall be as per ANSI.
- d) The cable shall have 16 AWG and 18 AWG solid conductors for single and multipairs respectively.
- e) All thermocouple extension cable shall be matched and calibrated in accordance with MC-96.1.
- f) Shield shall be aluminium backed by mylar/polyester tape bonded together helically applied with the metallic side down with either side having 25% overlap and100 % surface. Minimum shield thickness shall be 0.05 mm for single pair and0.075 mm for multipair cable. Drain wire shall be 0.5-mm2 multi-strand bare tinned annealed copper conductor. The drain wire shall be in continuous contact with the aluminium side of the shield.



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- g) Inductance shall not exceed 4mH/Km.
- h) All multi-pair cables shall have 6 pairs/12 pairs only.

## 11.3.4 Power supply Cables

All power supply cables shall be as per IS-1554 Part I and shall have copper conductors. Minimum conductor size shall be 2.5 mm2. The cables shall be PVC insulated and armoured. The higher size conductors shall be used incase of long distance power cable where voltage drops more than 3 volts than required supply.

Any other special cable required for instruments that should also be supplied as per requirements. CONTRACTOR shall ensure that these cables are armoured type and shall meet all other requirements.

### 11.3.5 OPTICAL FIBER CABLE

The Optical Fiber Cable (OFC) used shall conform to the following specification as a minimum:

- a) The OFC shall be CSTA (corrugated steel tape armored, electrolytically chrome plated low carbon steel) armored cable.
- b) The OFC shall have FRP strength member, loose tubes for single mode optical fibers filled with moisture resistant jelly, moisture barrier of polymer coated Aluminum tape or water swellable tape, inner sheath of HDPE and outer sheath of PVC.
- c) Optical fibers shall be single mode fibers compliant to ITU-TG.652 and fibers colours shall correspond to IEC 793-2 and 304. Optical fibers shall be coated with UV cured double acrylic resin. It should not have any reaction with cladding or core material. The coating should provide maximum resistance to micro-bending & abrasion and ensure mechanical & optical strength. The coating shall be easily stripped with mechanical tools.
- d) The number of fibers in the OFC shall be decided depending upon the requirement with 8 fibers as a minimum.
- e) The cabled fiber attenuation shall be 0.37 dB/km for 1310 nm wavelength range and 0.22 dB/km for 1550 nm wavelength range.
- f) The tensile performance shall be as per . **IEC 60794-1-2 E1** and with tensile load of **9.81 x 2.5 W (Where W= mass of 1 km of cable in Kg)**Newton Or 2670 N whichever is higher.

## 11.4 JUNCTION BOX



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a) In all JBs, cable entries shall be from Bottom only. Further after commissioning, all JB's should be covered with Aluminum tapes at its periphery to prevent water ingress.

- b) In general a junction box shall contain only signal of same class. The signal class is categorized as following type:
- i) Signal Level
  - Analog
  - Digital
  - T/C
  - Solenoid Valve
  - Instrument Power
  - Gas Detectors
- ii) Type of protection
  - Non IS, Exd
  - IS, Exe
- c) All JB extra entries shall be plugged with SS316 plug. Each junction box shall be provided with 2 multi-cable entries from the bottom of the junction box with one plugged. All Cable entry shall be at the bottom only, and not from side or top.
- d) All spare cable cores shall be terminated in the Junction box, at the marshalling panel end and wired through spare barriers / isolators or relays (as the case may be) right upto the corresponding spare channel of I/O module.
- e) All spares hole of JBs, T/C head etc to be plugged with metallic plugs. The metallic plugs, Junction box hinges, Handle, DIN rail, Allen screws shall be SS 316 material of construction.
- f) For ease of identification shutdown JB's shall be colored should be marked with RED.
- g) Cable glands shall be provided with Cables shrouds. 20% spare terminals shall be supplied in each junction box.

## 11.5 CABLE GLANDS

a) Contractor shall supply all cable glands required for glanding the above mentioned cables both at field instrument and local control panel side, junction boxes side and at control room side.



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- b) All cables glands shall be of SS316 ex-proof and they shall be double compression type suitable for armoured cables. Glands shall be in line with Area classification
- c) Flame proof glands wherever required 'shall be supplied with EX'd' certification.

### 11.6 INSTRUMENT VALVES AND MANIFOLDS

- a) Contractor shall supply instrument valves (miniature type) and valve manifolds wherever required.
- b) Body rating shall be as per piping class or better. All valves and manifolds shall be forged type only.
- c) Valve body and trim material shall be SS 316L unless otherwise specified. Superior trim material shall be selected as requirement by process conditions. Packing material in general shall be of PTFE

## 11.7 INSTRUMENT IMPULSE LINES

- a) In general ½" OD annealed seamless SS 316 tubing shall be used in preference to piping.
- b) Tubing standard shall be used upto 600 # only where the same is required as per job specification. For rating above 600 # and hydrogen/lethal service, only piping standard shall be used. The tubing shall be 1/2" OD tube with all fittings suitable for the same. Valves used shall be threaded. At the first isolation / root valve end suitable pipe tag to tubing conversion fittings shall be used. For remote installation suitable unions / couplings shall be used.
- c) Piping standard shall be used for all installation where specified in job specification. For rating upto 600#, the connection to the transmitters shall be with a male connector and tubing 1/2" OD. For rating higher than 600 #, no tubing shall be used. The connection to the transmitters shall be with 1/2" piping with flanges in between piping standard, all pipes shall be 1/2" NB unless higher sizes required to meet the "requirements, with all fittings suitable for the piping. All the joints shall be welded or flanged as required. For instrument end connection i.e root valve of orifices and other items, level gauges vent and "drain connection, seal welding shall be provided. For non diaphragm seal instruments and instruments where provided with threaded connection, no welding is required at instrument end



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- d) All instruments shall be provided with isolation, drain and/ or vent valves with vent/drain end duly capped. This isolation valve shall be SS304 GATE type. It shall be in addition to the first isolation /root valve provided on the pipe or vessel at instrument take off.
- f) For diaphragm seal type instruments, spacer ring with vent and drain connection along with vent / drain valve with end capped.
- g) Contractor shall supply flareless compression type of tube fitting and of three piece construction with design similar to Swagelok/Parker Hannifen etc.
- h) Socket-weld type forged pipe fittings of suitable material and rating shall be supplied for pipe fittings. The minimum rating shall be 3000 #. Weld neck fittings shall be used where socket weld type are not allowed by piping class.
- i) All pipe fittings shall be according to piping material specification as per piping class of the pipe on which instrument is connected. In case of vessel/equipment / reactor, PMS of equivalent piping class shall be considered.

### 11.8 INSTRUMENT AIR SUPPLY DISTRIBUTION

Instrument air headers, pipes and distributors shall be of S.S 304. Instrument air manifold shall be used for supplying instrument air to control valves and other instruments. These shall be with 10 nos. of tappings and be with ½" NPT (F), SS 304 valves. From the nearby air manifold, instrument air shall be supplied to the control valves. For the purpose, all tubing shall be used shall be of SS316, ¼", 1/2" OD, seamless tubes, laid in perforated aluminium trays. All intermediate fittings shall be double compression, SS316 MOC, Swaglok or equivalent make only.

Instrument air shall be provided at one point. Package vendor has to develop air distribution scheme.

## 11.9 MCT Blocks

Cable entry to main control room shall be through MCT blocks.

Entry into the Panels in the control room shall be through bottom mounted MCT blocks.

Bidder shall provide minimum 8+8x6 MCT frame along with multi-dia blocks with peeling of arrangement and centre plug, with wedge, lubricant, stay plate. Bidder shall provide at least 20% installed spares with mult-dia blocks with peeling of arrangement and centre



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plug. ( Qty of frame shall be submitted by the bidder during bidding stage with typical cable arrangement).

### 11.10 PROTECTION AND PAINTING

All exposed carbon steel parts to be painted shall be thoroughly cleaned from inside and outside to remove scale rust, dirt and other foreign materials by wire brushing / sand blasting as applicable. Minimum acceptable standard in case of power tool cleaning shall be St. 3 and in case of blast cleaning shall be SA 2. as per Swedish standard SIS 055900-1967.

- Non ferrous materials. Austenitic stainless steels, plastic or plastic coated materials.
- Insulated surfaces of equipment and pre-painted items shall need not be painted.
- Stainless steel surfaces, both inside and outside. Shall be pickled and passivated.
- Machined and bearing surfaces shall be protected with varnish or thick coat of grease.
- Depending on the environment the following primer and finish coats shall be applied:

S. No.	Environment	Description	Minimum Requirements
1	Normal – Industrial	Primer	2 coats of Red oxide
			Zinc phosphate each 30-35 microns thick
		Finish Coat	2 coats of synthetic enamel, each 25 microns (min.) thick.
2	Corrosive – Industrial	Primer	2 coats of epoxy zinc chromate, Each 35 microns (min.) thick.
		Finish Coat	2 coats of epoxy high build paint, each 100 microns (min.) thick.
3	Coastal and Marine	Primer	2 coats of high build chlorinated rubber. Zinc phosphate, each 50 microns (min.) thick.
		Finish Coat	2 coats of chlorinated rubber coat paint. Each 35 microns (min.) thick.
			(Any values refer to dry film thickness).

Colour Band shall be provided on loading arm as per Product colour code at site.

## 11.11 PACKAGING AND IDENTIFICATION

All packaging shall be done in such a manner as to reduce the volume. The equipment shall be dismantled into major components suitable for shipment. All assemblies shall be properly match marked for site erection.



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Attachments, spare parts of the equipment and small items shall be packed separately in wooden cases. Each item shall be appropriately tagged with identification of main equipment. Item denomination and reference number of the respective assembly drawing.

Detailed packing list in waterproof envelope shall be inserted in the package together with equipment Each equipment shall have an identification plate giving salient equipment data, make, year of manufacture. Equipment number, name of manufacturer, etc.

#### 12.0 Storage Tank

Instrument design Philosophy shall be same as per section above.

2 Nos. of Level measurement of two different principle shall be provided.

#### 13.0 **Training**

Supplier shall train Clients' maintenance engineers as well as operations staff in his works at Vendors Center of Excellence. The training imparted shall be by qualified and experienced staff available. It shall be exhaustive and aimed at making clients' maintenance & operations staff self reliant for most of the day to day applications. For training, supplier shall make available as close a model of the system with all the representative nodes, as the actual system to be installed. It is envisaged that following be covered in the training:

## **Operating Staff Training**

Operating courses include all aspects involved in operating the Control System from operator interface. This shall include operation under normal and abnormal conditions as may result from minor or major system malfunctions such that the trainee can take the appropriate remedial actions. The training shall include but not be limited to the following:

- Overview of the system
- Control philosophy
- User interfaces
- Messages and alarms
- Operator commands
- Generation of reports



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Predictable events and expected operator action

## Engineering staff training

Software Design courses shall be provided which would train the Employer's Maintenance and

Design staff to be able to identify and remedy software faults, upgrade and implement data and software changes, generate/develop new software for the purpose of improving the system and production of revised or new displays. The training shall include but not be limited to the following:

- Overview of the system architecture, hardware and software
- Software design and organisation
- Database structure, generation and modification
- Generation and modification of the VDU screen
- Customization of report/chart/graph format
- Assembly, compilation, linking, editing, debugging, distributing, testing and integration of program modules

## 14.0 FAT/SAT

Bidder to consider FAT/SAT for the offered system in his scope of supply. FAT/SAT procedure.

## **FAT – Factory Acceptance Test**

FAT is inspection for verification that all equipment and devices function properly with integrity.

Prior to notification of FAT to Client/Purchaser, all the involved contractual documentation shall be completed and all the cabinets, equipment and components of Control system shall be assembled and installed in one area at one time.

Bidder shall demonstrate all the functions of the PLC working properly in FAT. Each test shall be carried out on the procedure reviewed and accepted by Client/PMC/Purchaser after submitting Manufacturing Internal Test Certificate.



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FAT certificate shall be issued by bidder at the successful end of the test activities. All the hardware and software failures and problems shall be documented. All the failures and problems shall be resolved before shipment to site, All series of actions shall be taken in accordance with the FAT procedure.

FAT will start with Visual Inspection including the following activities as minimum;

- Quantity of all the cabinets, equipment and components.
- Installation of all the cabinets, equipment and components.
- Tagging of all the cabinets, equipment and components.
- Wiring of all the cabinets, equipment and components.

Once Visual Inspection has been successfully completed, Hardware Testing shall start including the following activities as minimum;

### Power-On

- · Redundancy of Power Supply on failure
- Diagnostics of the main equipment
- Redundancy of the main equipment on failure
- · Redundancy of network on failure
- 100% I/O Accuracy Check at 5 point (0%, 50%,100%,50% and 0%) for all the hardwired points (sample check may be allowed if 100% I/O Accuracy has been checked Manufacturer Internal Test)

Once Hardware Testing has been successfully completed, Software Testing shall start including the following activities as minimum;

- I/O Database implementation
- Graphic implementation
- Control implementation
- Logic and sequence implementation
- · Historian implementation
- SER implementation
- AMS implementation

### SITE ACCEPTANCE TEST (SAT)

SAT is inspection for checking that all the conditions are good after installation at site.



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Prior to notice of SAT to Client/Purchaser, bidder shall submit all the "As-Shipped" documentation incorporating all the FAT correction.

Prior to start SAT, all the cabinets, equipment and components of PLC shall be installed in proper location as designed.

Bidder shall demonstrate all the function of PLC working properly in SAT. Each test shall be carried out on the procedure and its criteria reviewed and accepted by Client/Purchaser.

Test certificate shall be issued by bidder at the successful end of the test activities. All the hardware and software failures and problems shall be documented.

SAT shall be identical to FAT but at reduced amount to check hardware without any damage, installations completed properly and interface working properly. bidder shall provide special tools and test equipments.

## **ANNEXURE -1**

## **INSTRUMENT ACCURACIES**

The instrument reference accuracies shall be as per the table below. Accuracy of the Instruments shall be minimum as follows.

Type of Instrument	Accuracy
Belt weighers	+/- 0.5 % of range
Differential pressure & Pressure transmitter - SMART	± 0.050% of span within TD ratio of 1: 100 or better
Diaphragm seal transmitter & Pressure transmitter - SMART	± 0.050% of span within TD ratio of 1: 100 or better
Variable area type flow meter with transmitter	± 2.0% FS Note (1)
Vortex flow meter	± 0.7 % FS
Positive displacement flow meter	
- Raw material and Product	± 0.2% FS
- Others	± 0.5% FS
- Turbine meter or Mass flow meter	
- Raw material and Product	± 0.2% FS

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Otherna	. 0.5% 50
- Others	± 0.5% FS
- Magnetic type flow meter	± 0.5% FS
- Mass flow meter (Coriolis Type)	± 0.1% of reading
- Ultrasonic type flow meter	± 0.5% of reading
- Ultrasonic type flow meter( 5 – path)	± 0.1% of reading
Orifice plate : Normal Application	+/- 2% of flow rate
Orifice plate : Special Application	+/- 1.5% of flow rate
Venturi	+/- 1 % of flow rate
- Displacement type level indicator	± 1.0% FS
- Displacement type level transmitter	± 0.2% FS (Smart)
- Tank gauge (Custody Transfer)	± 1 mm with +/- 1 mm resolution
- Servo type tank gauge	± 2 mm (up to 20 m height)
- Radar type tank gauge	± 1 mm or better for custody transfer
	± 5 mm or better for normal application
	± 0.2% of span within TD ratio of 1: 100
- Pressure gauge	± 1.0% of span for Bourdon type , 1.5% for diaphragm
- Temperature Transmitter	± 0.15 % of calibrated span for RTD & T/C
- Filled system/Bimetallic	± 1.0% FS
- Small size pressure gauge	± 3.0% FS
- Draft gauge	± 3.0% FS
- Receiver gauge	± 1.5% FS
- Thermocouple & Resistance Bulb	Applicable Codes/Standards

Note: 1. Vendor's standard accuracy is applied to local indicator type.

2. Accuracy for custody transfer/mass balance instruments shall be  $\pm\%$  of reading and shall be supplied with wet calibration certification.

**Remarks:** 1. Accuracy of instrument and special articles except for the above mentioned instrument shall be in accordance with the applicable codes/standards, or Vendor's standards as approved by Purchaser.

- 2. FS: Full scale.
- 3. Overall rangeability of transmitter except for draft range shall be 1: 100. Draft range transmitter rangeability shall be 1: 30 for the accuracy indicated above.

## **ANNEXURE -2**

Field instrument connections shall be as follows.



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Instrument Type	Process / Vessel Connection	Instrumentation Connections
DP Flow Instruments	½" NPT (M)	½" NPT
External Displacer on Vessel ( Min. Rating ANSI 300#)	2" Flanged	2" Flanged
Internal Displacer ( Min. Rating ANSI 300#)	4" Flanged	4" Flanged
External Ball Float on Vessel ( Min. Rating ANSI 300#)	2" Flanged	2" Flanged
nternal Ball Float ( Min. Rating ANSI 300#)	4" Flanged	4" flanged
Magnetic Level Gauge ( Min. Rating ANSI 300#)	2" Flanged	2" Flanged
D/P Level	½" NPT (M)	½" NPT
D/P Level with Remote Seal Diaphragm ( Min. Rating ANSI 300#)	3" Flanged	3" Flanged
D/P Level Direct Vessel Mounted ( Min. Rating ANSI 300#)	3" Flanged	3" Flanged
RADAR – Direct Mount on vessel ( Min. Rating ANSI 300#)	3" flanged	3" flanged
GW RADAR – Side/Side Chamber Mounted on vessel (Min. Rating ANSI 300#)	2" flanged	2" flanged
Internal GWR on Equipment ( Min. Rating ANSI 300#)	4" Flanged	4" flanged
Special Level Instrument on Equipment (Capacitance/ Ultrasonic/R.F.Probe)	2" flanged	2" flanged
Tank Level Instruments (Servo) on Atmospheric tank/ Pressurized Equipment	6" flanged	6" flanged
Tank Level Instruments (Radar) on Atmospheric tank clean service / Pressurized Equipment	8" flanged	8" flanged
Tank Level Instruments (Radar) on Atmospheric tank viscous service / Pressurized Equipment	24" flanged	24" flanged
Tank Level Instruments (Capacitance/ Ultrasonic/R.F.Probe) on Atmospheric tank / Pressurized Equipment	2" flanged	2" flanged
Pressure Instruments	½" NPT (M)	½" NPT
Press.Gauge	½" NPT (M)	½" NPT
Pressure with diaphragm seal, (Min. Rating ANSI 300#)	3" Flanged	3" Flanged
Pressure Instruments on Vessel	1 ½" Flanged	½" NPT



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Diaphragm Seal pressure Instrument gauge on Vessel	2" Flanged	2" Flanged
Thermowell ( Min. Rating ANSI 300#)	1 ½" Flanged	1 ½" Flanged
Multipoint Temperature Element for Tanks	2" Flanged / 3" Flanged	2" Flanged / 3" Flanged
Standpipe	3" Flanged	-

### Note:-

- a. There shall be a separate tapping for each of the instruments on any pipeline/vessel. No multiple instruments from one tapping is acceptable (for example PG and PT from single pipe line tapping with single or double mechanical isolation valves are not acceptable). However, as an exception to this, three transmitters on clean gas services from one orifice (with two pairs of tapping) is acceptable, where multiple (2 out of 3, etc.) transmitters are to be installed.
- b. All type of instrument tapping flange rating shall be minimum ANSI 300#, irrespective of minimum design pressure. However for pressure rating of 600# class and above, RTJ flange shall be used. At few locations, double isolation valves shall be used as per table given below.

	PRESSURE	LEVEL	FLOW	CONTROL
INSTALLATION	TAPPINGS	TAPPINGS	ELEMENTS	VALVE
RATING				
300 #	SINGLE	SINGLE	SINGLE	SINGLE
600 #	DOUBLE	SINGLE	DOUBLE	SINGLE
900 # / 1500 # / 2500				
#	DOUBLE	DOUBLE	DOUBLE	SINGLE

## Annexure - 3

### SYSTEM CONFIGURATION

Control system package (latest model at the time of supply)

- 2 No. Operator Stations with, 22" TFT, COLOR, LED type dual monitors to be placed in control room
- 1 No. ES/OS having the feature of SOE also, dual personality, 22" TFT, COLOR, LED type
- 1 no. of Membrane Operator's Keyboard and 1 no. of QWERTY engineer's keyboards with mouse with each operator station

All USB ports must be blocked and the system must have latest anti-virus.



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Note: All OS and ES shall be of latest configuration which shall be freezed during detail engineering.

## **Printers**

1 No. A3 Heavy duty colour

HP make or equivalent Laser printer

## Annexure - 4

## **OPERATOR STATION SUB-SYSTEM**

\* Model No. By Vendor

Λ	Conoral	Requirement
А	Generai	Recuirement

1 Number of Operator Consoles ONE

2 Inter-changeability between operator consoles Required

3 On-line system diagnostics on Console Monitor Required at Module level

4 On-line configuration change Required

5 Console configuration Dual

## B. **OPERATOR CONSOLE**

1 Console's basic electronics Individual electronics for each monitor

μp Type 64 bit μp Manufacturer/ model <u>Note-1</u>



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Memory size /Cache size

16\_GB (Vendor to check\_the suitability of memory size)

2 Type of Database

**Functionally Separate** 

Database Storage Devices:

Sr.	ITEM MODEL No.	FUNCTION	REDUNDANCY	REMARK
No.			(Refer Note)	
1.	HDD	Note-1	REQUIRED	
2.	Combo drive	Note-1	REQUIRED	
3.	Vendor recommended	Note-1	REQUIRED	
4.			REQUIRED	

(Note: Full Redundancy is required if Centralized global database is provided) STORAGE DEVICES ARE APPLICABLE IN EACH OPERATOR STATION.

3 Number of Devices (per console)

S. No	TYPE OF DEVICE	Description OF DEVICES REQUIRED	NO. OF DEVICES	REMARKS
1.	MONITOR	22" TFT, COLOR, LED type dual monitors (Control system architecture)	1 per console	
2.	KEYBOARD SETS	1 no. of Membrane Operator's Keyboard and 1 no. of QWERTY engineer's keyboards with mouse.	1 per console	
3.	ALARM & EVENT, LOG A4 PRINTER	1 Nos A4 Heavy duty Colour –HP or equivalent make	1	
7.	DVD DRIVE		1 per console	

4 Inter-changeability between Monitors Required

5 Spare memory requirement Min. 40%

6. Keyboard Set

a) Keyboard Security against unauthorized access Required with Key-lock

Note: Key-lock Password shall be provided for each operator console.

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b) Maximum number of keystrokes for accessing views as per standard display hierarchy:

S.No.	TYPE OF VIEW	REQUIRED	OFFERED	REMARKS
1.	GROUP VIEW	TWO		
2.	LOOP VIEW	THREE		
3.	LOOP IN ALARM	TWO		
4.	GRAPHICS VIEW	TWO		

c) Assignable function keys for single keystroke access Required

d) Number of Assignable function keys per Monitor 64

7 a) Number of devices for cursor control Two/Monitor

b) Devices for cursor control Keyboard [X] Mouse [X]

8 Monitors and Displays

a) Size of Monitor 22" diagonal

b) Type of Monitor TFT LED

c) Surface Treatment Hard Coating anti Glare

d) Length of tag number (characters) 16 alphanumeric

e) Length of description (characters) 24 alphanumeric

f) Display update rate 2 s

g) Dynamic graphics Required

h) Multi Window Capability Required

i) Control through dynamic graphics Required

j) Screen displays and Call-up time



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S.No.	TYPE OF DISPLAY	REQUIRED	CALL-UP TIME(S)*	REMARKS
1.	OVERVIEW	YES		
2.	GROUP DISPLAY	YES		
3.	LOOP DISPLAY	YES		
4.	DYNAMIC GRAPHICS	YES		
5.	REAL-TIME TREND	YES		
6.	HISTORIC TREND	YES		
7.	ALARM SUMMARY	YES		
8.	ALARM HISTORY	YES		
9.	CONFIGURATION	YES		
10.	DIAGNOSTIC	YES		

### k) Display Hierarchy

S. No.	DESCRIPTION	REQUIREMENT	SYSTEM CAPABILITY	REMARKS
1.	NO. OF OVERVIEW PAGES	AS REQD.		
2.	NO. OF GROUPS/OVERVIEW	AS REQD.		
3.	NO. OF LOOPS / GROUP	8		
4.	NO. OF GRAPHIC PAGES	AS REQD.		
5.	NO. OF POINT IN ALARM SUMMARY	AS REQD.		
6.	NO. OF POINTS IN ALARM HISTORY	AS REQD.		
7.	NO. OF TRENDS PER DISPLAYS	AS REQD.		
8.	NO. OF MULTI-TREND DISPLAYS	AS REQD.		
9.	OTHERS	AS REQD.		

I) Multi Windowing facility

Required

Note: Opening of more than four windows on the same Monitor shall be restricted by the system .



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m) Trending functions: Each Operator Console shall be capable of trending all analog points.

Real-time trend n)

Number of parameters

Required for ALL TAGS ( Al trip signals

tends must be configured in a separate group with 0.5 sec trending)

Historical trend 0)

> Required for ALL TAGS Number of parameters

Time period 1 year

9) Logging Function

> a) Number of tags to be logged Required for ALL TAGS

b) Number of log reports:

Alarm History per shift

**Event logging** 

Hourly logs

Shiftly logs

Daily logs

Weekly logs

Shutdown report

Trip initiated log

Others (Note)

Note: Other log reports as required shall be furnished during execution stage.

User definable c) Log formats

10 System boot-up from Engineer console

11 Auto boot-up on power On Required

12 Storage disks

> a) Type of storage disk HDD Optical (DVD)

b) Number of disks and capacity



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SI. No.	TYPE OF DISC	NUMBER (MINIMUM)	MEMORY CAPACITY PER DISK	REMARKS
1	HDD	One Per Monitor	AS per latest configuration	
2.	OPTICAL	One Per Monitor	AS per latest configuration	
3.	Other			

13	Any other feature available as a standard:
	a)
	h)

14 CPU Loading 60 %15 Memory Utilization 60 %

16 Operating System Latest must have validation with the system

17 Antivirus/Network SecurityRequired as per latest IEC standard



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#### **ENGINEERING Cum OPERATOR STATION with SOE Facility SUB-SYSTEM**

• Model No. \_\_\_\_By vendor

1. Number of Engineering cum Operator Station One

2. Number of Monitors per Engg. Station One

3 Type of electronics Individual per Monitor

μP type 64 bit

Memory size NOTE-1

Model No. NOTE-1

Number of engineering keyboards
 Number of Operation keyboards
 One per Monitor

6 Functional Capability Same as operator station subsystem

- 7 Basic functions of Engineering Console
  - a) System configuration and reconfiguration
  - b) Group & multi-groups alarm inhibiting
  - c) Plant views with/ without plant operation
  - d) Graphic page compilation
  - e) Setting/ resetting real-time clock
  - f) Loop tuning on selectable basis
  - g) System maintenance and diagnostics
- 8 Monitor specification As per operator station subsystem
- 9 Keyboard specification As per operator station subsystem
- 10 Data storage Devices and capacity

Sr. No.	TYPE OF DISC	NUMBER (MINIMUM)	MEMORY CAPACITY PER DISK	REMARKS
1	HDD	One	As per Latest configuration	
2.	DVD writer	One		
3.	OPTICAL(DVD)	One	As per Latest configuration	
5.	OTHER			

11. Antivirus/Network SecurityRequired

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#### **ANNEXURE -5**

## **HARDWIRED CONSOLE**

• Model No. \_\_\_\_By vendor

1. One no. of Hardwired/Aux. console:

2. Instrument Located on Hardwired consoles: (AS REQUIRED)

INSTRUMENT TYPE	NUMBER REQUIRED ON HA	ARDWIRED CONSOLE WITH
INOTICOMENT TITE		CONSIDERED BY VENDOR
ASSIGNABLE RECORDERS	N.A.	
HARDWIRED ANNUNCIATORS	AS REQUIRED	
INDICATING LAMPS	AS REQUIRED	
SWITCHES	AS REQUIRED	
PUSHBUTTONS	AS REQUIRED	
OTHERS	AS REQUIRED	

3 Power supply Alarm/Annunciator 110 V AC, 50 Hz [X]

4 Power supply for switches, lamps, pushbuttons etc. 24 V DC **[X]** 



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# INSPECTION AND TEST REQUIREMENTS FOR INSTRUMENTATION



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## **CONTENT**

SI. No.	DESCRIPTION
1.0	Inspection and Tests
1.1	General
1.2	Visual Inspection
1.3	Dimensional Inspection
1.4	Material Inspection
1.5	Non-Destructive Examination
1.6	Pressure Test
1.7	Pneumatic Test
1.8	Seat Leakage Test
1.9	Performance Test
1.10	Steam Test
1.11	Insulation Resistance Test
1.12	High-voltage Test

## **ATTACHMENT**

SI. No.	DESCRIPTION
Table-A	Table-A- Table of Inspection and Test Items



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#### 1. INSPECTION AND TESTS

- 1.1 General
- 1.1.1 All instruments and s ystem-oriented items shall undergo factory testing and inspection by authorized Third party representatives / Owner and PMC unless specified otherwise.
- 1.1.2 Wherever inspection at manufacturer's shop is waived because of any reason, the sub vendor's own testing reports shall be verified before despatch. In no case items shall be released without proper inspection verification.
- 1.1.3 The inspection and testing shall be carried out as per related specifications, international codes and practices/standards, approved documents and/or any other documents attached along with specifically suggesting testing to be carried out at manufacturer' works.
- 1.1.4 Items, for which 'Witness Inspection' is specifically exempted, manufacturer shall forward the test certificates as desired for review. The material shall be despatched only after obtaining written despatch clearance.
- 1.1.5 No system or system oriented item shall be despatched without integrated factory testing witnessed by representatives of / Third party inspector / Owner /PMC. The testing procedures shall be detailed out, based on testing requirements indicated in individual system specifications and shall be approved by Owner/ PMC. It must certify that the system is actually ready before calling the Owner/PMC for FAT. Also all the necessary documents and literature are to be submitted before calling for FAT.
- 1.1.6 Testing and inspection for all items shall be carried out as per approved factory testing procedures.
- 1.1.7 Performance specifications must be detailed out on each time which shall be verified by third party agency / by Owner / PMC during factory testing.
- 1.1.8 Acceptable criteria for Radiography and other NDT requirements for the instruments / instrument castings shall be inline with those specified in 'Piping Specifications' have been at tached elsewhere in this package.
- 1.1.9 IBR certifications shall be provided by in the appropriate format duly signed by IBR authority or their authorised agency.
- 1.1.10 Verification of setpoint of rupture disc shall be part of witness inspection. Testing shall be carried out on the rupture disc, which are part of the actual rupture disc batch of manufacturer. This shall be in addition to the 3 numbers of spare rupture discs already indicated in the requirements. The testing, in general, shall be as per ASME section VIII.
- 1.1.11 Inspection and test items, witness inspection items for each kind of instrument at FAT (Factory acceptance test) shall be as shown in Table A.
- 1.1.12 Inspection and acceptance standards

Inspection and acceptance standards shall be as follows.

- 1.2 Visual Inspection
- 1.2.1 Conformation items

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- 1. Type and model
- 2. Tag no.
- 3. Rating
- 4. Range, Scale and symbol of unit
- 5. Set pressure and capacity of safety valves
- 6. Valve characteristics and CV value of control valves
- 7. Name of materials
- 8. Nameplate
- 9. Colour of painting
- 10. Die Marking (nominal size, material of flange and direction of flow)
- 11. Accessories
- 12. Quantity

#### 1.2.2 Harmful defects

- Defect such as cracks, deformation and flaws shall not be found in the casting, forging and machined surface of the pressure rating part.
- Defect such as inside surface weld protrusion; lack of fusion and incomplete penetration shall not be found in welded places of pressure retaining part.
- 1.2.3 The instrument shall be in rugged design and assembly of all components within the enclosure fixed firmly to avoid loosening or falling-off of any parts.
- 1.2.4 Painting of instrument's surface shall be such that there is no defect or lack of uniformity.
- 1.3 Dimensional Inspection

[X]	Main parts
[]	
[ ]	

Check and conform to the requirement of Purchaser's Spec, approved drawings or applicable code and standards.

- 1.4 Material Inspection
- 1.4.1 Mill test certificates

Manufacturer shall submit the mill test certificates for the following parts.

- 1. ANSI class 900 or above (ALL material used at the P.T. ratings)
- 2. The following parts made of steel for:
  - High temperature service (Alloy steel above C-Mo steel used at temperature of 400°C or over)
  - Low temperature service (Iron and steel material of design temperature bellow minus 11°C containing Al-killed steel)
  - Corrosion-resistant materials

I. Temperature detective parts : [X] Flange and Thermowell

II. Orifice assembly : [X] Flange

III. Venturi tube, Flow nozzle and : [X] Body Low-loss tube

IV. Positive displacement flow meter and Turbine meter : [X] Body, Strainer and Straightner



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V. Area type flow meter
VI. Displacement type liquid level meter
VII. Glass Gauge
VIII. Control valve
IX] Body and Flange
IX] Body and Flange
IX] Body and Flange
IX] Valve body, Bonnet, Plug, Seat and Vane

IX. Safety valve : [X] Valve body, Nozzle and

Disc

X. Condensate pot : [X] BodyXI. Gas eliminator : [X] Body

- 1.4.2 Material grade 316SS or 316L SS of stainless steel, Purchaser may require Vendor to carry out the qualitative analysis for molybdenum.
- 1.5 Non-Destructive Examination
  - 1. Control valve and safety valve Following Par. 1.5.2 and 1.5.3
  - 2. Other instruments

Shall be carried out in accordance with manufacture's standards approved by Purchaser

- 1.5.1 Ultrasonic Examination
  - Forging material on Orifice flange and Flow nozzle
     [X] ANSI class 900 or above
- 1.5.2 Radiography Examination

[ ] The pressure retaining casting parts

- 1. Applicable material and quantity (refer table VI)
  - Welded parts : [ ] JIS Z 3104, Z 3106

[X] ASME VIII Division 1 uw-51 "Radiographic & Radioscopic Examination of Welded Joints"

- 2. Acceptant standards and grade
  - Casting : [ ] JIS G 0581

**[X]** ASTEM E 446-9 or 186-93



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### **Table VI Radiography Examination**

	Quantity						
	class 1500 or over	C-steel					
	class 900 or over	C-Mo steel	One out of total quantity of the same				
Casting	class 600 or over	Cr-Mo steel Stainless steel	type, size and r ating for pressure retaining critical parts(a)				
	class 300 or over	Al-killed steel 2.5 Ni steel 3.5 Ni steel	Gilloai parts(a)				
	class 1500 or over	C-steel C-Mo steel	One spot on each				
Pressure retaining welded parts	class 300 or over	Cr-Mo steel Stainless steel	welded parts per same material and same				
	class 150 or over	Al-killed steel 2.5 Ni steel 3.5 Ni steel	welder. All welded crossing parts				

- a. Following parts are Critical parts.
  - Groove-welded parts of cast body
  - Flange neck and valve seat's vicinity of cast body
  - Other welded parts included in pressure retaining parts

Note: 1. In case of practical difficulty to perform Radiography Test, Manufacture shall notify Purchaser in advance, and for such case, magnetic particle or liquid penetrant examination may be used in accordance with Par. 1.5.3 with Purchaser's approval.

- 2. For the welded parts having nominal size of 1-1/2 in. or below, magnetic particle or liquid penetrant examination in Par. 1.5.3 may be used.
- 1.5.3 Magnetic Particle or Liquid Penetrant Examination
  - [X] For the pressure retaining parts



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#### Table VII Magnetic particle / Liquid penetrant examination

	Quantity						
	class 900 or over	C-steel					
Casting	class 600 or over	Cr-Mo steel Cr-Mo steel Stainless steel	20% of total quantity of the same type, size and rating for pressure retaining critical parts				
	class 150 or over	Al-killed steel 2.5 Ni steel 3.5 Ni steel	(a)				
Pressure retaining welded parts (b)	class 150 or over	All materials	20% of total welded parts				

- a. Refer to Par. 1.5.2(1).
- b. Including butt groove-welded parts at site.
- 1.6 Pressure Test
- 1.6.1 Control Valve
  - 1. Body and Bonnets
    - [X] Hydrostatic test with Applicable codes and standards
  - 2. Body of special type
    - [X] Hydrostatic test

Test pressure and Hold time

- [X] 1.5 times of max. Operating pressure / min. 2 kgcm2g
- [X] Minimum 5 minutes.
- 3. Permanent distortion or Leakage
  - [X] shall not be found
- 1.6.2 Safety Valve or Safety Relief Valve
  - 1. Pressure retaining parts
    - [X] Hydrostatic test before assembling
    - Test pressure and Hold time
      - [ ] 1.5 times of Max. Operating pressure / min. 2 kgf/cm2g.
      - [X] 2.2 times of Max. Operating pressure.



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- [X] Minimum 5 minutes.
- ii Distortion or leakage

  [X] shall not be found
- 2. The out side parts of enclosed type
  - [X] Hydrostatic test after assembling
  - i. Test pressure and Hold time
    - [X] 1.5 times. Nominal pressure of flange
    - [ ] 2.2 times. Nominal pressure of flange
    - [X] Minimum 5 minutes.
  - ii. Defects
    - [X] Shall not be found
- 3. Special type valves
  - [X] Hydrostatic test with the manufacturer's standards approved by purchaser, where Par. 1.6.2(1) and (2) are not applicable
- 1.6.3 The pressure retaining parts of instrument
  - [X] Hydrostatic test or Pneumatic test as per applicable codes and standard
  - I Test pressure and Hold time
    - [X] 1.5 time of Max. Operating pressure / Min. 2 kg/cm2g
    - [X] Min. 5 minutes
  - ii Permanent distortion or Leakage
    - [X] Shall not be found

If the above mentioned test is technically difficult, the test shall be carried out in accordance with the manufacturer's standards approved by purchaser.

- 1.7 Pneumatic Test
- 1.7.1 The pneumatic test for instrument
  - I Test pressure & Hold time
    - [X] Max. Operating Pressure. (Design press.)
    - [X] Minimum 5 minutes
  - ii Permanent distortion or Leakage
    - [X] Shall not be found
- 1.8 Seat Leakage Test
- 1.8.1 Control Valve

Allowable leakage valve / (code):

[X] ANSI B16.104 (FCI 70-2)



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Unless other wise specified, butterfly valves shall not require the seat leakage test.

#### 1.8.2 Safety valve

Seat leakage test (closing property) as follows.

- 1. Safety valve for Steam
  - i. Test pressure
    - [X] 90% of set pressure
  - ii. Leakage
    - [X] Shall not be found
- 2. Safety valve for Gas
  - i. Test pressure
    - [X] 90% of set pressure
  - ii. Allowable leakage value (Refer Table VIII)

Table VIII - Allowable leakage value of Safety valve

Туре	Orifice Area (mm)	Number of Bubbles (min)	Leakage Value (cm3/min)
General	16.0 and less	40	11.80
	20.5 and over	20	5.90
Balance bellows	16.0 and less	50	14.75
	20.5 and over	30	8.85

3. Relief safety valves, Vacuum breakers and atmospheric valve **[X]** Manufacture's standard (approved by Purchaser)

#### 1.9 Performance Test

For each instruments, the performance test shall be carried out in accordance with procedure approved by Client / PMC.

Acceptance standard shall be in accordance with applicable codes & standard, All specification, and manufacture's standard shall be approved by Client / PMC.

#### 1.10 Steam Test

Steam test shall be performed as follows:

[ ] Valves used for steam service Temperature of 450°C or more, and the body ratings of class 600 and above.



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] After attaining the steady surface temperature same as temperature of the service with the pressure of service condition.

In the case, when steam test has been performed and the report is submitted for the valve of same type, same bore size and material from the same lot, the steam test for the other valves may be omitted.

1.	Leaka	ge		
	i. Bo ii. Se		: [ ] : [ ]	Shall not be found As per specified leakage value
2.	Opera	tion		
	[ ] To	be smoot	h	

After the steam test, the test of Par. 1.6 and Par. 1.8 shall be carried out.

#### 1.11 Insulation Resistance Test

1. Power supply circuit : 10M  $\Omega$  or over (instrument panel: 3 M $\Omega$  or over/each panel)

2. Signal circuit : 5M  $\Omega$  or more (instrument panel: 3 M $\Omega$  or More per panel)

The test shall be carried out in accordance with the applicable codes & Standards. Due to any technical constraint to measure, this test can be omitted

#### 1.12 High-voltage Test

1. A-C power supply and alarm circuits

i. Voltage level less than 250 V : [X] A-C 1500 V

ii. Voltage level 250 V and above : [X] A-C 2E + 1000V

'E' is the rated voltage.

2. D-C power supply circuits : [X] A-C 500V

Test can be omitted in case of any technical constraint.



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## Table A: Table of Inspection and Test Items

						Inspection and Test Items						
Kind of Instrument	Visual insp.	Dime nsion al insp.	Materi al insp.	Non- destru ctive exam	Press ure test	Pneu matic test	Seat Leaka ge test	Perfor mance test	Insula tion resist ance test	High voltage test	Steam test	
1 Thermocouple	O <b>●</b> T	О●Т	_	_	_	_	_	□●T	□●T	□●T	_	
2 Resistance thermometer bulb	•T O	•T O	_	_	_	_	_	●T □	□●Т	□●Т	_	
3 Compensating lead wire	O●T	O●T	_	_	_	_	_	□●T	□●T	□●T	_	
4 Bimetallic thermometer	О●Т	O●T	_	_	_	_	_	□●T	_	_	_	
5 Gas or liquid-filled thermometer	ОФТ	О●Т	_	_		_		●T □		_	_	
6 Thermowell	O●T	О●Т	O □●T	O □•T	O <b>□</b> ●T	_	_	_	_	_	_	
7 Orifice plate	О●Т	O □ <b>●</b> T	О●Т	_	_	_	_	_	_	_	_	
8 Orifice flange	ОФТ	O●T	O □•T	O □●T	_	_	_	_	_	_	_	
9 Restriction orifice	ОФТ	O □ <b>●</b> T	ОФТ	_	_	_	_	_	_	_	_	
10 Flow nozzle low-loss tube	О●Т	O●T	O □•T	O □•T	O <b>□</b> ●T	_	_	_	_	_	_	
11 Venturi tube	O●T	О●Т	O □•T	O <b>□</b> ●T	O <b>□</b> ●T	_	_	_	_	_	_	
12 Positive displacement flow meter	•T	•T O	●T ○ □	●T ○ □	●T ○ □	_	_	●S ○ □	●T ○ □	●T ○ □	_	
13 Area type flow meter	O●T	О●Т	O □•T	O □•T	O □●T	_	_	O <b>□</b> ●T	O □•T	O □•T	_	
14 Thermal mass flow meter	•T	•T O	•T	_	●T ○ □	_	_	●S ○ □	●T ○ □	●T ○ □	_	
15 Turbine meter	●T ○	•T O	●T ○ □	●T ○ □	●T ○ □	_	_	●S ○ □	●T ○ □	●T ○ □	_	
16 Differential pressure flow meter	•T	•T O	_	_	●T ○ □	_	_	●T ○ □	●T ○ □	●T ○ □	_	
17 Differential pressure transmitter	•T	•T O	_	_	●T ○ □	_	_	●T ○ □	●T ○ □	●T ○ □	_	
18 Magnetic flow meter	•T O	•T O	•T O	●T ○ □	●T ○ □	_	_	●S ○ □	●T ○ □	●T ○ □	_	
19 Bourdon gauge	О●Т	O●T	_	_	O □•T	_		O □ <b>●</b> T		_	_	
20 Draft gauge	О●Т	O●T	_	_	_	_	_	○ □●T	_	_	_	
21 Differential pressure gauge	O●T	ОФТ	_	_	O □●T	_	_	O □•T	_	_	_	
22 Pressure transmitter	O●T	ОФТ	_	_	O □ <b>●</b> T	_	_	O □ <b>●</b> T	O □•T	O □•T	_	
23 Displacement type level indicator, controller	•T	•S ○ □	•T 0	•T •	•S ○ □	_	_	●S ○ □	●S ○ □	●T ○ □	_	
24 Chamber for displacement type level meter	О●Т	O □•T	O □•T	O □•T	O □•T	_	_	_	_	_	_	
25 Glass gauge	О●Т	0	0	0	0 🗆	_	_	_	_	_	_	



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	Inspection and Test Items										
Kind of Instrument	Visual insp.	Dime nsion al insp.	Materi al insp.	Non- destru ctive exam	Press ure test	Pneu matic test	Seat Leaka ge test	Perfor mance test	Insula tion resist ance test	High voltage test	Steam test
		□●T	□●T	□●T							
26 Float type level meter,	•T O	•s o	●T ○ □	●T ○ □	●S ○ □	_	_	●S ○ □	●S ○ □	●T ○ □	_
27 Differential pressure type level meter	О●Т	•T O	•T 0	_	●T ○ □	_	_	●T ○ □	●T ○ □	●T ○ □	_
28 Purge type level meter	O●T	O●T	_	_	_		_	O □●T	_	_	_
29 Capacitance type level meter	О●Т	●T ○ □	•T 0	_	_	_	_	●T ○ □	●T ○ □	●T ○ □	_
30 Conductivity type level meter	О●Т	•T O	●T ○	_	_	_	_	●T ○ □	●T ○ □	●T ○ □	_
31 Conductivity type level meter	•T O	•s o	_	_	_	_	_	●S ○ □	●S ○ □	●T ○ □	_
32 Weight sounding type level meter	•T O	•S 0	_	_	_	_	_	●S ○ □	●S ○ □	●T ○ □	_
33 Radiation type level meter	•T O	•s o	_	_	_	_	_	●S ○ □	●S ○ □	●T ○ □	_
34 Pneumatic type control valve	•T 0	•s o	●T ○ □	O □•T	•S ○ □	_	●S ○ □	●S ○ □	●T ○ □	●T ○ □	
35 Hydraulic type control valve	•T	•s o	●T ○ □	●T ○ □	•s ○ □	_	●S ○ □	●S ○ □	●T ○ □	●T ○ □	
36 Motor-operated control valve	•T O	•s o	●T ○ □	●T ○ □	●S ○ □	_	●S ○ □	•S ○ □	●S ○ □	•S ○ □	
37 Self-acting control valve	О●Т	O●T	O □•T	O □●T	O □●T	_	_	O □•T	_	_	_
38 Indicator	О●Т	O●T	_	_		_	_	O □•T	O □•T	O □ <b>●</b> T	_
39 Recorder unit	О●Т	О●Т	_	_	_	_	_	O □•T	O □•T	O □ <b>●</b> T	_
40 Controller unit	O●T	O●T	_	_	_		_	O □•T	O □•T	O □•T	_
41 Integrator unit	O●T	O●T	_	_	_		_	O □•T	O □•T	O □•T	_
42 Alarm setting unit	O●T	O●T	_	_	_	_	_	O □•T	O <b>□</b> ●T	O □ <b>●</b> T	_
43 Computing unit	O●T	O●T	_	_	_	_	_	O <b>□</b> ●T	O <b>□</b> ●T	O □•T	_
44 Converter unit	O●T	O●T	_	_	_	_	_	O □•T	O □•T	O □•T	_
45 Limiter unit	O●T	O●T	_	_	_	_	_	O □•T	O □•T	O □ <b>●</b> T	_
46 Power source unit	O●T	О●Т	_	_	_	_	_	O □•T	O □•T	O □ <b>●</b> T	_
47 Instrument panel	•T 0	•S 0	_	_	●T ○ □	•S ○ □	_	●S ○ □	●T ○ □	●T ○ □	_
48 Instrument desk	●T ○	•s o	_	_	_	_	_	•s ○ □	●T ○ □	●T ○ □	_
49 Gauge board	•T 0	•S 0	_	_	●T ○ □	•s ○ □		●S ○ □	●T ○ □	●T ○ □	_
50 Safety valve	●T	●S	●T	●T	●T	_	●S	●S	_	_	_



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	Inspection and Test Items										
Kind of Instrument	Visual insp.	Dime nsion al insp.	Materi al insp.	Non- destru ctive exam	Press ure test	Pneu matic test	Seat Leaka ge test	Perfor mance test	Insula tion resist ance test	High voltage test	Steam test
	0	0 🗆	0 🗆	0 🗆	0 🗆		0 🗆	0 🗆			
51 Pilot operated safety relief valve	•T 0	●S ○ □	●T ○ □	●T ○ □	●T ○ □	_	●S ○ □	●S ○ □	_	_	_
52 Vacuum breaker	•T 0	●S ○ □	●T ○ □	●T ○ □	●T ○ □	_	●S ○ □	●S ○ □	_	_	
53 Atmospheric valve	●T ○	●S ○ □	●T ○ □	●T ○ □	●T ○ □	_	●S ○ □	●S ○ □	_	_	
54 Gas chromato-graph	•T 0	•T 0	_	_	_	●T ○ □	_	●S ○ □	●S ○ □	●T ○ □	_
55 Mass spectro-meter	●T ○	●T ○	_	_	_	●T ○ □	_	●S ○ □	●S ○ □	●T ○ □	_
56 Infrared type gas analyzer	●T ○	●T ○	_	_	_	●T ○ □	_	●S ○ □	●S ○ □	●T ○ □	
57 Magnetic type gas analyzer	●T ○	•T 0	_	_		●T ○ □		●S ○ □	●S ○ □	●T ○ □	
58 Thermal conductivity type analyzer	●T ○	•T 0	_	_	_	●T ○ □	_	●S ○ □	●S ○ □	●T ○ □	_
59 Combustion type gas analyzer	●T ○	●T ○ □	_	_	_	●T ○ □	_	●S ○ □	●S ○ □	●T ○ □	_
60 Density type gas analyzer	●T ○	•T O	_	_	_	_	_	●S ○ □	●S ○ □	●T ○ □	_
61 Photo-electric type analyzer	•T	•T •	_	_	_	_	_	●T ○ □	●T ○ □	●T ○ □	_
62 Moisture analyzer	ОФТ	•T •	_	_	_	_	_	●T ○ □	●T ○ □	●T ○ □	_
63 pH meter	О●Т	O●T	_	_	_	_	_	O □•T	O □●T	O □ <b>●</b> T	_
64 Turbidity analyzer Water quality analyzer	•T	•T •	_	_	●T ○ □	_	_	●T ○ □	●T ○ □	●T ○ □	_
65 Density meter	О●Т	ОФТ	_	_	O <b>□</b> ●T	_	_	O □ <b>●</b> T	O □ <b>●</b> T	O □ <b>●</b> T	_
66 Electric conductivity meter	О●Т	O●T	_	_	O □ <b>●</b> T	_	_	O □ <b>●</b> T	O □ <b>●</b> T	O □●T	_
67 Flame detector	•T 0	•T •O	_	_	_	_	_	●S ○ □	●S ○ □	●T ○ □	
68. Mass Flow meter	•T	•T O	●T ○ □	●T ○ □	●T ○ □	_	_	●S ○ □	●T ○ □	●T ○ □	_
69. Vortex Flow Meter	●T ○	•T O	●T ○ □	●T ○ □	●T ○ □	_	_	●S ○ □	●T ○ □	●T ○ □	
70 Gas detector	•T 0	•T 0			_	_		●S ○ □	●S ○ □	●T ○ □	

0 : Tested by Manufacturer.

: Tested by manufacturer & witnessed by 3<sup>rd</sup> party inspector(TPI). •

: Manufacturer will submit Inspection & test records. 

: Total Inspection by TPI.
: Sample inspection by TPI.(10% of total quantity of the same type & rating. S

Notes: PMC/OWNER may witness any or all testing in stages during manufacturer or at final stage before shipment.

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**SECTION -VI: TECHNICAL** 

**PART - 4.0** 

## DRAWINGS & DOCUMENTS INSTRUMENT AIR/PLANT AIR SYSTEM

## AT TALCHER FERTILIZERS LIMITED



### **DRAWINGS & DOCUMENTS**

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## **CONTENTS**

Section Number	Description
1.0	Drawings & Documents
2.0	Category of Documents
3.0	Procedure
4.0	List of Drawings & Documents



#### **DRAWINGS & DOCUMENTS**

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#### 1.0 DRAWINGS & DOCUMENTS:

This chapter details out various drawings and documents to be generated at various stages during the course of execution of the Project by the LSTK Contractor for different project activities. Categorization of the documents/ drawings for review/ information/ records of PMC and the review/ approval requirements of the Owner/ PMC along with routing of the documents/ drawings will be conveyed separately as a philosophy.

The efficient handling of drawings and documents to be prepared by the LSTK Contractor under the contract is the key to the timely completion of the plants. The LSTK Contractor undertakes to ensure that all drawings and documents to be submitted by him to the Owner/PMC shall be of professional quality and conforming to the contractual requirements. The LSTK Contractor also undertakes to institute a formal drawing control system which will be documented and submitted to the Owner/PMC for review or approval.

Compliance of this chapter on drawings and documents is mandatory and is non-negotiable.

The drawings / documents are to be generated by the LSTK Contractor at various stages of the project covering different activities. The drawings / documents generated will be in the category of Approval/ Review/ Information. The list of drawings and documents required is enclosed; however, the categorisation for the drawings/ documents will be informed separately. However, this will in no way relieve the LSTK Contractor of responsibility to conform to drawings, standards, specification, codes and contractual requirements / obligations.

The LSTK Contractor shall prepare the drawing numbering procedure and submit to Owner/PMC for approval. Each Drawing submitted by the LSTK Contractor shall be clearly marked with the name of the Owner, PMC with revision number & date. It should contain the minimum following details:

- a. Size of Drawing.
- b. Discipline of Engineering for which the drawing is issued.
- c. Discipline wise segregation of numbering sequence for example:

100 Series for Process. 200 Series for Mechanical etc.

For drafting of Drawings, Computer aided design and drafting, AutoCAD 2015 shall be used. Further, standard, approved and well established P.C. based computer programmes/software



#### **DRAWINGS & DOCUMENTS**

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packages, available in market shall only be used by the LSTK Contractor/his subcontractors/vendors etc. Every time a computer aided design is submitted for review/ approval to Owner/PMC, it shall accompany with input/output data on Compact disc (CD) along with the name of the software package and operable on any system along with the requisite No. of Hard Copies (specified elsewhere in the Bidding document).

For drawing, data sheet and all graphic works Auto CAD 2015 and for all texts, MS Word Package 2012 shall be used. Hard Copies (4 nos.) and Soft Copies of all calculations & Drawings shall be made available by the Contractor for PMC review. Line List, Data Sheet & spread sheets shall be provided in MS Excel & all text items shall be in MS Word. All other documents like presentations etc. and other data shall be in MS Office; the required operating system for Data Exchange shall be at least Windows.

All documents before forwarding to Owner/PMC will have to be vetted in detail by the LSTK Contractor/duly approved engineering sub-contractor appointed by the LSTK Contractor. Document received without vetting will be returned.

The review by the PMC/Owner shall not be construed by the LSTK Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

Each drawing submitted by the LSTK Contractor shall be clearly marked with the name of the Owner, Unit Designation, Specifications, Title, Specification number and the name of the Project with Revision number and date. If standards, catalogue pages are to be submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawings shall be in English.

All the dimensions should be in metric units. Upon receiving comments on Drawings & Documents by the LSTK Contractor, the subsequent submission should give compliance report, separately on each of the comments, document-wise. Comments given by PMC/Owner to be discussed and finalised within agreed schedule.

The schedule of submission of the Drawings & Documents shall be in accordance with project plans only. The detailed list under different category, document-wise, shall be prepared by the LSTK Contractor for approval of Owner/PMC. This activity is to be completed within one month of LOA.

Sequence of submission of drawing is essential for proper review of documents and timely completion of the project is to be adhered. In case sequence is not maintained, the documents



### **DRAWINGS & DOCUMENTS**

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submitted will not be reviewed by Owner/ PMC and responsibility of timely execution of plant shall be to the LSTK Contractor's account.

### 2.0 CATEGORY OF DOCUMENTS:

Category	Description	Action by Owner/ PMC
1	Records/ Information	LSTK Contractor can continue to progress with the work. This drawings or documents will be retained with Owner/PMC for information only. Owner/ PMC reserves the right to advise the LSTK Contractor of any comments (deviations from the contract) at any time and the LSTK contractor is liable to respond to satisfy that the work being done is in accordance with the contract; deviations, if any will be bidder's risk and cost.
2	Review/Approval	Owner/PMC will review and advise the LSTK Contractor of any Comments on Contractor's Drawings / documents within specified schedule (ie 2 weeks), from date of receipt in PMC office of LSTK Contractor's drawings/documents. The review period is defined as date of receipt of documents by PMC, to date of issue of comments by PMC. This review period shall be valid only if submission of drawings is done by LSTK Contractor in accordance with approved drawings / documents schedule as indicated in ITB. In case of any non-conformity to the above by LSTK Contractor due to which the period of review extends beyond 2 weeks by the PMC, schedule delay, if any will have to be absorbed by the Contractor.  Review of documents / drawings shall be categorized as follows:  i) Code-3: Not accepted. New Document / Drawing to be submitted  ii) Code-2: Accepted with comments as marked  iii) Code-1: Final approval



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The documents falling under Review category will be returned with comments within specified time schedules subject to fulfilling other conditions enumerated. The information category document will be retained for information only but however Owner/PMC reserves the right to comment at any stage of the Project, but not later than two weeks of receipt.

Where clearance of Owner/ PMC is required for ordering of equipment materials, enquiry documents and one technically selected offer is to be submitted for review. The unpriced copies of purchase orders detailing both technical and commercial aspects for all items shall be submitted to PMC/ Owner within 15 days of issue of the same.

Each purchase order forwarded should contain complete technical documents. It is obligatory for the LSTK Contractor to obtain acceptance on all the technical documents and accepted copy only to be forwarded to Owner / PMC. Any inaccuracies /omissions/inconsistencies noticed and brought to the notice of the LSTK Contractor at any stage of the project will be rectified/ replaced by LSTK Contractor without any cost & time implication to the Owner/ PMC. Detailed manufacturing schedules of fabricated/ manufactured items shall be submitted within one month of ordering, Status report for all the items in detail, will be submitted once in a month.

Documents to Boiler Regulation authorities shall be submitted and getting the documents reviewed by PMC/Owner. To any other agencies, documents shall be submitted under intimation to PMC/Owner.

As built drawings and documents will be generated within one month of completion of activities on respective items of work.

#### As Built Drawings:

LSTK Contractor will furnish reproducible and electronic files of all the drawings under their scope to Owner / PMC, certified as "As-Built Issue" by Third Party Inspection Agency (TPIA) for Vendor Items coming under Third Party Inspection / LSTK Contractor for all other drawings.

Upon completion of identifiable units or components of the fabrication, construction and installation phase of the project the Contractor will complete all the related plans to the "as built' stage including all Vendor drawings and furnish Owner/PMC with the following:

- a. One complete set of all original tracings copies.
- b. One complete set of reduced size (A3-297x420 mm) copies of all drawings.
- c. One set of CD for all documents/drawings/data



#### **DRAWINGS & DOCUMENTS**

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d. All the as built drawings duly certified should be scanned and converted into electronic files made on magnetic/discs/optical long storage.

- e. All other project documents such as operating and maintenance manuals, manufacturers' Catalogues etc. shall also be scanned on magnetic/optical discs for safe storage and retrievals by the Owner when needed.
- f. 10 complete sets of full size prints of the drawings and 4 sets of reduced size prints.
- g. 10 complete bound sets of Manufacturer's specifications including design calculations.
- h. 10 complete sets in hard binders of the Manufacturers data book including certified prints and data for all items including test reports. Data Books shall be complete with index as tag numbers associated with Manufacturer's data shown. Equipment data shall include as a minimum requirement the principal and description of operation, drawings and dimensions, spare parts lists and un-priced purchase orders and bill of material.
- 10 bound copies each of the Spare Parts data books and the Lubricants inventory Schedule.
- j. 10 complete sets of field records shall be signed by both the Contractor's and Owner's Representative at the site.
- k. Original approvals and related drawings and documents from the statutory authority.
- I. Copies of correspondence with the statutory authorities.

#### 3.0 PROCEDURE:

The procedure for compilation of final as-built documents / drawings shall be informed later. However the Procedure for routing the final / as built documents/ drawings to PMC / Owner shall be informed during the execution stage.



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### 4.0 LIST OF DRAWINGS & DOCUMENTS

4.0	LIST OF DRAWINGS & DOCUMENTS	With	For	_	
SI.No	Description	bid Y/N	Review/ Approval	For Information	Final/ Approved/ As-built
A.	PROCESS				
	Basis of Design		Y		Y
	Equipment List	Υ	Y		Y
	Process Description	Y	Y		Y
	Process Flow Diagram & Material Balance	Y	Y		Y
	Material Selection diagram		Y		Y
	P&I Diagrams		Y		Y
	Design calculations for sizing of equipments		Y		Y
	Utility Requirements		Y		Y
	Data sheet of all equipment and machinery		Y		Y
	Logic diagrams		Y		Y
	Safety valve Specifications		Y		Y
	Instrumentation Control philosophy		Y		Y
	HAZOP Study and Compliance report		Y		Y
	Plot Plan (Preliminary)		Y		Y
	Operating Manuals and maintenance manuals		Υ		Y



## **DRAWINGS & DOCUMENTS**

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	Analytical Manual		Y		Y				
В	PIPING								
SI. No.	Description	With Bid (Y/N)	For Review/ Approval	For Information	Final/ Approved/ As- built				
1.0	Equipment layout drawing	Υ	Y	-	Y				
2.0	Piping Layout drawing	N	Y	Y	Y				
3.0	Design data:								
3.1	Design basis	N	Y	-	Y				
3.2	Piping material specification	N	Y	-	Y				
3.3	Valve material specification(Valve Data Sheet)	N	Y	-	Υ				
4.0	Material Take-offs (Linewise & consolidated BOQ)	N	-	Y	Y				
5.0	Material Requisitions schedule	N	-	Y	Y				
6.0	Quality control plan/Inspection test plan	N	-	Y	Y				
7.0	Vendor Drawings(Valves, Strainers, Traps etc)	N	Y	Y	Y				
8.0	Issued for construction (IFC) Drawing								
8.1	Piping GA drawings	N	-	Υ	Y				
8.2	Isometrics	N	-	Y	Y				
8.3	Piping supports, operating platforms drg.	N	-	Y	Y				
9.0	Design calculation / Documents.	N	-	Υ	Y				
10.0	Flexibility Analysis of Piping	N	Y	-	Y				



## **DRAWINGS & DOCUMENTS**

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11.0	Support and load data	N	-	Υ	Υ
12.0	All inspection, testing & NDT Records.	N	-	Y	Y
13.0	As Built Drgs/Docs/MTCs	N	-	-	Y
14.0	3D model	N	Y	Y	Υ
С	ELECTRICAL				
		\A/:41-	Documents I	Required (Y / N)	
SL. No.	Description	With bid Y/N	For approval	For Information	Final / Approved/ As built
1	Filled in Specification Sheets and Technical Particulars of all equipment.	N	Y		Y
2	Load List indicating rated and absorbed power of loads and duty type (Continuous/ Standby/ Intermittent) at different voltages including emergency loads.	Y	-	Y	Y
3	Load Data indicating normal, peak, starting and construction power requirement at various voltage levels.	Y	-	Υ	Y
4	Single line distribution diagram (Normal power, UPS supply) including protection and metering details.	N	Y		Y
5	General arrangement and foundation drawings of all equipments	Z	Y		Y
6	Equipment layout in plant area showing location of all electrical equipment	N	-	Y	Y
7	Cable schedule	N	-	Y	-
8	Schematic diagram for all control panel & switch boards	N	Υ		Y
9	Design calculations for heater	N	-	Y	Y
10	Drawings and documents asked for each equipment as per respective Technical Specifications	N	Y	-	Y



### **DRAWINGS & DOCUMENTS**

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11	Catalogues for all bought out items	N	-	Y	Y
12	Installation operation and maintenance (Manual)	N	-	-	Y
13	Spare Parts list	Z	ı	Y	Y
14	Characteristic curves for motors etc.	N	-	-	Y
15	Bill of Materials covering all electrical equipment and installation materials	N		Υ	Y
16	Test certificates	N		Y	Y
17	Guarantee Certificates	N		Y	Y
18	Quality Assurance Plan	N	Υ		Y

#### Note:

4 hard copies & 1 soft copy shall be supplied for approval/information after order within 4 weeks. 8 hard copies & soft copies in Pen drive 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



## **DRAWINGS & DOCUMENTS**

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## **D** INSTRUMENTATION

SLNo			Document to be submitted			
	Document Description	With Bid	After order for approval	Final		
1	List of Instruments (tag wise) indicating type of Instrument, make, model no., quantity etc.		Yes	Yes		
2	Instrument mounting and connection details		Yes	Yes		
3	Instrument layout drawings		Yes	Yes		
4	Catalogue of Instruments & System		Yes	Yes		
5	List of spares (item wise and quantity) for Commissioning and 2 years of operation		Yes	Yes		
6	Specification of Instruments		Yes	Yes		
7	Detail wiring/ interconnection diagram		Yes	Yes		
8	P and I Diagram		Yes	Yes		
9	I/O list		Yes	Yes		
10	Loop Diagram		Yes	Yes		
11	Logic Diagram for interlock & safety (if any)		Yes	Yes		
12	J.B. termination drawings		Yes	Yes		
13	Instrumentation, operating, maintenance manuals		Yes	Yes		
14	Instrument Test Certificate			Yes		
15	Vendor to indicate power requirement (if any) for the control system		Yes	Yes		
16	Other documents necessary to have a clear understanding of the system		Yes	Yes		
17	List of alarms		Yes	Yes		
18	Schematic drawings for controls		Yes	Yes		
19	Control room layout/System Architecture		Yes	Yes		
20	Field Operator Room layout		Yes	Yes		
21	System Architecture	Yes	Yes	Yes		
22	Control Philosophy	Yes				
23	Instrument Air Consumption Requirement		Yes	Yes		
24	UPS power & Heat Load Requirement		Yes	Yes		
25	Bill of Material		Yes	Yes		



#### **DRAWINGS & DOCUMENTS**

CALCULATIONS DULY CERTIFIED BY THIRD PARTY

MATERIALS TEST CERTIFICATES DULY STAMPED BY

WELDING PRCEDURE AND QUALIFICATION TEST

DESTRUCTIVE AND NON DESTRUCTIVE PROCEDURE

RADIOGRAPHIC EXAMINATION REPORTS & FILMS( \*\*

PROCEDURE AND

INSPECTING AUTHORITY (\*\*)

15.0

16.0

17.0

18.0

19.0

20.0

21.0

DATA FOLDER AS PER SPECIFICATION

INSPECTING AUTHORITY (\*\*)

QAP & INSPECTION AND TEST PLAN (\*\*)

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ıne	e following drawings/documents marked "Y" sha	iii de tu	rnisned by th	ne blader.	
VESSEL & COLUMN					
SI. No.	Name of Document	With Bid		Post Order	
		Y/N	For review/ Approval	For information	Final / approved/ As-built
1.0	Material Requisition	N		Y	Υ
2.0	OUTLINE SKETCHES SHOWING THICKNESS OF MAIN PARTS,MOC, DETAILS OF INTERNAL INCLUDING DEMISTER,WEIGHT (ERECTION & OPERATING) AND ANCHORAGE DETAILS	Y	-	-	-
2.1	GENERAL ARRANGEMENT DRAWINGS INDICATING DESIGN DATA, FABRICATED EQUIPMENT WEIGHT, GENERAL NOTES, NOZZLE SCHEDULE, DETAILS OF SHELL, HEADS SUPPORTING ARRANGEMENT, MAIN WELD SEAMS, NOZZLE ORIENTATION PLAN ETC	N	Y	-	Υ
3.0	DETAIL OF NOZZLES, MANHOLES, ACCESSORIES ETC.	N	-	Y	Υ
4.0	DETAIL OF INTERNALS SUCH AS TRAY,TRAY SUPPORT RING, BOLTING BARS ETC.	N	-	Y	Υ
5.0	DETAIL OF DEMISTER	N	Υ	-	Υ
6.0	MECHANICAL DESIGN CALCULATIONS COMPLYING WITH THE SPECIFICATIONS AND CODES.	N	Y	-	Υ
7.0	DETAIL OF PACKING SUPPORT, DEMISTER SUPPORT, GRATING & GRATING SUPPORT	N	Y	-	Υ
8.0	DETAIL OF INTERNAL DISTRIBUTOR	N	Υ	-	Υ
9.0	DETAIL OF EXTERNAL CLIPS SUCH AS LADDER, PLATEFORM, PIPE SUPPORT	N	-	Y	Υ
10.0	DETAIL OF INSULATION ,FIREPROOFING	N	-	Y	Y
11.0	DETAIL OF PIPE DAVIT	N	-	Y	Υ
12.0	DETAIL OF LIFTING LUG, TAILING LUG & TRUNION ETC. INCLUDING DESIGN CALCULATION	N	-	Y	Υ
13.0	SHELL DEVELOPMENT DRAWINGS INCORPORATING ALL ATTACHEMENTS AMD WELD SEAMS	N	-	Y	Y
14.0	ALL FINAL AS- BUILT SHOP DRGS. & DESIGN	N	-	Υ	Υ

Ν

Ν

Ν

Ν

Ν

Ν

Υ

REPORTS (\*\*)

& TEST REPORTS (\*\*)
HEAT TREATMENT

TEMPRATURE CHARTS (\*\*)

Υ

Υ

Υ

Υ

Υ

Υ

Υ

Υ

Υ

Υ



## **DRAWINGS & DOCUMENTS**

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	VESSEL & COLUMN					
SI. No.	Name of Document	With Bid	Post Order			
		Y/N	For Review/ approval	For information	Final / approved/ As- built	
22.0	COMPLETION CERTIFICATES (INCLUDING INSPECTION CERTIFICATE, HYDROSTATIC TEST CERTIFICATE, LOCAL CODE REQUIREMENTS)	N	-	-	Y	
23.0	PACKING AND FORWARDING INSTRUCTION (**)	N	-	-	Y	
24.0	TRANSPORTATION DRAWING SHOWING OVERALL DIMENSION, C.G. WEIGHT AND HANDLING INSTRUCTIONS DULY APPROVED BY APPROPRIATE AUTHORITY	N	-	Y	Y	
25.0	FINAL CIVIL LOAD DATA INCLUDING DETAILS OF FOUNDATION/ANCHOR BOLTS	N	-	Y	Y	
26.0	LIST OF SPARE PARTS AND DETAILS	N	Y	-	Y	



## **DRAWINGS & DOCUMENTS**

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HEAT EXCHANGERS						
SI. No.	Name of Document	With Bid	Post Order			
		Y/N	For Approval/ Review	For information	Final / approved/ As- built	
1.0	Material Requisition	N		Y	Y	
2.0	OUTLINE SKETCHES SHOWING THICKNESS OF MAIN PARTS, MOC, WEIGHT (ERECTION & OPERATING) ETC.	Y	-	-	-	
2.1	GENERAL ARRANGEMENT DRAWINGS INDICATING DESIGN DATA, FABRICATED EQUIPMENT WEIGHT, GENERAL NOTES, NOZZLE SCHEDULE, DETAILS OF SHELL, HEADS SUPPORTING ARRANGEMENT, MAIN WELD SEAMS, NOZZLE ORIENTATION PLAN ETC.	N	Y	-	Y	
3.0	DETAILS OF TUBE SHEET & TUBE LAYOUT.	N	Υ	-	Y	
4.0	DETAILS OF NOZZLES AND EXCHANGER SUPPORT	Ν	-	Υ	Y	
5.0	DETAILS OF GASKETS	N	Y	-	Y	
6.0	LIST OF SPARE PARTS AND DETAILS	N	Y	-	Y	
7.0	FINAL CIVIL LOAD DATA INCLUDING DETAILS OF FOUNDATION/ANCHOR BOLTS	N	-	Υ	Y	
6.0	MECHANICAL DESIGN CALCULATIONS COMPLYING WITH THE SPECIFICATIONS AND CODES.	N	Y	-	Y	
8.0	WELDING PRCEDURE AND QUALIFICATION TEST REPORTS (**)	N	-	Y	Y	
9.0	TRANSPORTATION DRAWING SHOWING OVERALL DIMENSION, C.G. WEIGHT AND HANDLING INSTRUCTIONS DULY APPROVED BY APPROPRIATE AUTHORITY	N	-	Y	Y	
10.0	DESTRUCTIVE AND NON DESTRUCTIVE PROCEDURE & TEST REPORTS (**)	N	-	Y	Y	
11.0	PROCEDURE FOR REPAIR OF DAMAGED TUBES (**)	N	-	Y	Y	
12.0	QAP & INSPECTION AND TEST PLAN ( ** )	N	Υ	-	Y	
13.0	RECORDS OF NDT TESTS E.G. RADIOGRAPHY, ULTRASONIC TESTING(UT), MAGNETIC PARTICAL / PENETRANT TESTING (MP/PT), HARDNESS ETC. (**)	N	-	-	Y	
14.0	MATERIALS TEST CERTIFICATES DULY STAMPED BY INSPECTING AUTHORITY (**)	N	-	Y	Y	
15.0	PWHT CHARTS (**)	N	-	Y	Y	
16.0	TEST ON PRODUCTION TEST COUPONS ( ** )	N	-	-	Y	
17.0	HYDRAULIC/PNEUMATIC TEST REPORTS (**)		-	-	Y	
18.0	MOCK-UP TEST FOR TUBE TO TUBESHEET JOINT( ** )		-	-	Y	
19.0	ALL FINAL AS- BUILT SHOP DRGS. & DESIGN CALCULATIONS DULY CERTIFIED BY THIRD PARTY INSPECTING AUTHORITY (**)	N	-	-	Y	
20.0	RADIOGRAPHIC EXAMINATION REPORTS & FILMS ( **)	N	-	-	Y	
21.0	MECHANICAL GUARANTEE CERTIFICATE ( ** )	N	-	-	Y	
22.0	INSPECTOR'S FINAL CERTIFICATE ( ** )				у	
23.0	PACKING AND FORWARDING INSTRUCTION (**)	N	-	-	Y	



#### **DRAWINGS & DOCUMENTS**

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LEGEND: Y - Yes, N - No

#### Notes:

- 1. Final documentations shall be supplied in hard copies as well as soft copes in CD Formats. Applicable. Software are MS Office 2000, Word, Access, and Excel.
- 2. Document marked as (\*\*) are to be approved by authorised Third Party Inspection Agency and Statutory Authorities as applicable.
- 3. Final documentation shall be supplied in hard copies (6 prints) and soft (two CDs/DVDs) in addition to submission through email.
- 4. All drawing & documents shall be submitted in A2/A3 or A4 paper size .Documents in higher paper size Shall be submitted in exceptional circumstances or as indicated in MR/Tender.
- 5. Bill of material (showing part no. MOC, Size, quantity, weight of each part) shall form part of the respective drawing.



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**DRAWINGS & DOCUMENTS** 

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F	ROTATING EQUIPMENTS				
SI No.	Description  With Bid For Review/ Approval Information As-but				
a.	COMPRESSORS				
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	Specification sheet complete filled in PDIL proforma enclosed with enquiry/order.	N	Y	-	Y
4.0	Equipment layout with main overall dimensions including those required for foundations and piping design for compressor and auxiliaries. (This layout shall include the driven equipment and its auxiliaries).	Y	Y	-	Y
5.0	Performance curves for Centrifugal compressor :				
	i) For turbine driven compressor, Discharge pressure, Brake horse power, Polytropic head and Efficiency Vs Inlet capacity (from surge point to 115 % of rated capacity) of the compressor at specified inlet pressure, temp. and mol. wt. of the gas and at 80, 90, 100 and 105 % speed for each stage and for overall compressor	N	Y	-	Y



**DRAWINGS & DOCUMENTS** 

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Tälcher Fertilizers

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	ii) For constant speed motor driven compressors Discharge pressure, Brake horse power, Polytropic head and Efficiency Vs Inlet capacity (from surge point to 115% of rated capacity) of the compressor at specified inlet pressure, temp. and mol. wt of the gas for each stage and for overall compressor	N	Y	-	Y
	iii) Torque Vs Speed curve for the compressors.	N	-	Υ	Υ
6.0	Performance Curve	N	Y	-	Y
7.0	<ul> <li>i) Calculation of the lateral critical speeds of the compressors.</li> <li>ii) Calculation of the torsional critical speeds. Analytical report for torsional vibration of whole set.</li> <li>iii) Thrust loading curves for each casing / barrel for various operating conditions.</li> <li>iv) Response curve of deflection Vs RPM for varying amount of imbalance.</li> <li>v) Torsional critical response curve</li> </ul>	N	-	Y	Y
8.0	Overall dimensional drawing with all main dimensions, size and location of piping connections for compressors and its auxiliaries.	N	Y	-	Y
9.0	Cross sectional drgs. Of the compressor showing details of construction including sealing details, bearing etc. With part no., description and material of construction.	N	Y	-	Y
10.0	Coupling drawings	Ν	-	Υ	Y



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4.0 0

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### **DRAWINGS & DOCUMENTS**

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11.0	Seal assembly drawings & Bill of material	N	-	Υ	Y
	Lube oil Pumps				
12.0	a) Specification sheet	N	Y		Y
12.0	b) Performance curve	N	Y		Υ
	c) Cross Sectional drawing	N	1		Υ
13.0	Certified foundation scope drawing of the compressor with driver and all accessories resting on the foundation and control panel. In the event of motor not in the scope of supply of vendor the motor frame dimensions shall be supplied by the purchaser later). Direction and magnitude of all unbalanced forces, couples and centre of gravity along with direction of rotation shall also be mentioned	N	Y	-	<b>Y</b>
14.0	a) Engineering flow diagram indicating all instruments, valves, etc. marked with battery limit of supply of:  - Process Gas lines - Cooling Water lines - Lubricating Oil lines - Condensate drain and vent lines The above drawings shall identify all components by size, pressure rating and material b) Material balance for gas, lube & seal oil.	Y	Y	-	Y
15.0	Piping layout plan and elevation drawings for gas, cooling water and utility lines, lube and seal oil lines etc.	N	Y	-	Y



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DOCUMENT NO REV



### **DRAWINGS & DOCUMENTS**

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16.0	Driver: Selection details  a) Speed - torque diagram  b) GD2 of the rotating masses of the compressor referred to the motor speed	Ν	-	Y	Y
17.0	<ul> <li>a) Piping isometrics for gas pipes</li> <li>DN&gt;20, piping manifold and all oil lines.</li> <li>b) Flexibility analysis for gas lines.</li> </ul>	N	-	-	Y
18.0	Piping support location drgs. With forces, moments and movements for gas pipes and with weights for all lines.	N	Y	-	Y
19.0	Certified allowable forces, moments, movements, stresses for compressor nozzles.	N	Y	-	Y
20.0	Bill of Material for Piping and supports.	N	Y	-	Y
21.0	Bill of Material for insulation for Pipings.	N	Y	-	Y
22.0	Bill of quantity for Painting for piping, equipments and auxiliaries.	N	Y	-	Y
23.0	Thermal calculation for heat exchangers, Mechanical calculation and fabrication drawings for heat exchangers and Pressure vessels.	N	Y	-	Y
24.0	Inspection and Test Procedure.	N	-	-	Y
25.0	Quality Assurance Plan.	N	Y	-	-



### **DRAWINGS & DOCUMENTS**

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SHEET 21 OF 23

26.0	Inspection and test reports, material test certificates, radiographic reports duly approved by specified inspecting authority, certificates for compressors, heat exchangers, pressure vessels, pipings, valves, instruments and other auxiliaries.	N	-		Y	
27.0	Lubrication schedule	N	-	-	Y	
28.0	Instruction manual for erection, installation, operation and maintenance of compressor and its accessories (important clearances to be maintained should be clearly specified.).	N	-	-	Y	
29.0	Recommended list of spares for two years trouble free operation	Y	-	-	-	
30.0	List of special tools	Y	-	Υ	Y	
31.0	Installation list of similar machines shall also include the following:  a) Client, location and year of installation  b) Drive c) Model No. and type of compressor d) Duty condition of the compressor e) Speed and KW rating	N	-	-	-	
b	EOT Crane & Hoist					
1	Data sheets – completely filled		Υ		Υ	
2	Information to be supplied by manufacturer / Vendor		Υ		Υ	
3	General arrangement Drg. showing various details & all principal dimensions of the assembled unit, horizontals and vertical clearances and approaches.		Υ		Υ	
4	List of spare parts with individual part Nos. and prices.		Υ		Υ	



### **DRAWINGS & DOCUMENTS**

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Tålcher Fertilizers

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5	Descriptive literature / catalogue	Y		Υ
6	Detailed manufacturing programme Time-Bar Chart.	Y		Υ
7	Individual structural drgs. For main girders and End-carriages.	Y		Υ
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		Υ
11	Crane rail & end stops fixing arrangement.	Y		Υ
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 defection Test duly witnessed by the Inspector	Y		Y
17	Operation & Maintenance Manual (including the lubrication schedule also.)	Y		Y
18	Drg. Showing the supporting arrangement of flexible cable with main bridge and trolley.	Y		Y
G	GENERAL			
1.0	Master Time Schedule/Network (PERT Network/ Bar chart) showing all the activities	-	Y	Y
2.0	Reference list for similar packages supplied and executed by the bidder with details.	Y	-	Y
3.0	Detailed Painting & Insulation Specifications	Y	-	Y



### **DRAWINGS & DOCUMENTS**

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4.0	Complete Spare Part List for the whole package	Υ	-	Υ
5.0	List of all construction equipments, tool-tackles & man power resources proposed to be used.	-	Y	Υ
6.0	Description and Catalogues of Auxiliary items	-	Y	Υ



### **PROJECTS & DEVELOPMENT INDIA LTD**

PC183/E/4016/SEC-VI/ PART-5.0	
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**SECTION - VI: TECHNICAL** 

**PART - 5.0** 

**SPARE PARTS** 

**INSTRUMENT AIR/PLANT AIR SYSTEM** 

AT
TALCHER FERTILIZERS LIMITED



PC183/E/4016/SEC-VI/ PART-5.0 0

DOCUMENT NO REV



SHEET 2 OF 19

### CONTENTS

SECTION NUMBER	DESCRIPTION
1.0	Spare parts for Commissioning
2.0	Mandatory spare parts
3.0	Vendor recommended spare parts



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### **General Notes:**

- Supply of mandatory spare parts (for two year operation & maintenance) by bidder shall be included in the base price of the bid document.
- Erection and commissioning spare shall be included in the base price of the bid document.
- Recommended spare parts (only list not spare parts) with unit price shall be provided by bidder with a validity of two years as per the past experience for smooth operation of package system.

### 1.0 SPARES PARTS FOR COMMISSIONING:

Contractor shall supply free of cost (Include in the scope) spare parts and Consumables (except raw materials and Utilities supplied by others) required during Pre-commissioning & Commissioning of the plants till the plant is handed over to the Owner after Performance Test.

#### 2.0 MANDATORY SPARE LIST:

### 2.1 STATIC EQUIPMENT:

S.no	Spare Items	Quantities
1.0	Heat Exchangers - Shell &	
	Tube:	
1.1	Bolts (For each nozzles with blind flanges)	10% (minimum 2 numbers)
1.2	Gaskets (for each nozzle connections with blind flange)	200 %
1.3	Gaskets (for each Girth flange)	200 %
1.4	Bolts (for each Girth Flange)	10% of (minimum 2 numbers)
1.5	Tube Plug	5 % of tube holes
2.0	Pressure Vessel ,Tanks, filter	
2.1	Gaskets (for each nozzle connections with blind flange)	200 %
2.2	Bolts (For each nozzles with blind flanges)	10% (minimum 2 numbers)
2.3	Gaskets (for each Girth flange)	200 %
2.4	Bolts (for each Girth Flange)	10% (minimum 2 numbers)
2.5	Bolting for internal flange	10 % (Minimum 2 numbers)
2.6	Gasket for internal flange	200 %
2.7	Spare for internals	
	Clamps	2 % excess, min. 5 piece
	Washer Bubble Caps / valve	20 % excess, min. 3 piece
2.8	Sight/light glass assembly	300% of each installed glass
2.0	complete with bolting and gasket	glado
2.9	Filter Cartridge/Elements	200%
3.0	Plate type Exchanger	
3.1	Plate gasket	10 %
3.2	Flow plate	10 %
3.3	Nozzle gasket	200 %
3.4	Glue (1 kg pot)	1
3.5	Special spanner tool	1 for each size/ type
Notes:		



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EV



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- 1) The quantities shown are for each equipment.
- 2) The parts listed are the principal parts only. Other parts shall be considered for recommendation in quantities consistent with the above table.
- 3) All special tools and tackles required for maintenance for critical items shall be supplied along with equipment.
- 4) Above mentioned spare philosophy is also applicable for each Integral static equipment in a package item.

#### 2.2 ROTATING EQUIPMENT

### **MANDATORY SPARE PARTS:**

Contractor shall supply spare parts as per list of spares detailed below:

- a) Centrifugal Compressor
- b) EOT Crane

### 2.1 <u>CENTRIFUGAL COMPRESSOR</u>

S. No.	DESCRIPTION	QUANTITY	
1.0	COMPRESSOR		
1.1	Completely assembled dynamically balanced spare rotor	1 set	
	including clearance check and mechanical run test		
1.2	Complete spare coupling including distance piece and set of coupling bolts & nuts	1 set	
1.3	Stator blade carrier with stator blades completely assembled (for axial compressor)	1 set	
1.4	Complete set of radial bearing ( Both suction & discharge side )	1 set	
1.5	Complete set of Pads for radial bearing with built-in temperature elements (Both suction & discharge side)	2 set	
1.6	Complete set of thrust bearings ( Both active & inactive sides )	1 set	
1.7	Complete set of shoes for thrust bearings with built-in temperature elements ( Both active & inactive sides )	2 set	
1.8	Set of process media seals for each casing including labyrinths for balance piston, oil scraper rings etc.	2 set	
1.9	Complete Set of oil seals	200%	
1.10	Complete Set of 'O' rings, gaskets, sealing rings for compressor	200%	
1.11	Sealing compound	1 charge	
1.12	Seal for each casing	1 set	
2.0	LUBE OIL SYSTEM		
2.1	Complete set of Lube Oil Pumps with drive:	1 set	
2.2	Spares for lube oil pump :	, 550	
	a) Set of bearings	1 set	
	b) Set of seal	200 %	
2.3	Lube oil filter cartridges	4 sets	



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DOCUMENT NO	REV



SHEET 5 OF 19

S. No.	DESCRIPTION	QUANTITY
2.4	Set of Couplings	2 sets
3.0	ACCESSORIES	
3.1	Set of spares for all valves (Isolation, control, safety, etc.), in lines, consisting of spindle, seat, disc, flap, packing etc.	1 set
3.2	Spare elements for permanent filters .	200%
3.3	Complete Set of inlet air Filters for Air compressor, as applicable	200 %
3.4	All type of Fasteners	200%
4.0	INSTRUMENTATION	
	As per Instrumentation specification enclosed with enquiry / order specification.	

### 2.2 <u>Reciprocating Compressor:</u>

SI. No.	DESCRIPTION	QUANTITY
1.0	Compressor	
1.1	Main bearings	1 set
1.2	Crankshaft journal bearings	1 set
1.3	Big end bearing	1 set
1.4	Cross head pin bearings	1 set
1.5	Complete Set of Connecting rod with fasteners	1 Set of each size
1.6	Complete Set Cross head body & guide assembly with fasteners	1 set of each size
1.7	Piston assembly complete with piston rod, piston, piston rings & lock nut etc. for each stage	1 set
1.8	Piston rings for each piston	2 sets
1.9	Complete stuffing box internal packing	1 set
1.10	Oil slinger ring	1 set
1.11	Liner for each stage	1 set
1.12	Complete inlet valves assembly with internals for each cylinder	1 set
1.13	Complete discharge valves assembly with internals for each cylinder	1 Set
1.14	Complete Set of all Gasket and O-Ring .	2 sets
2.0	Gas Coolers	
2.1	Tubes for gas cooler	1 set
2.2	Tubes for oil cooler (when tube are easily replaceable)	5 % for each cooler
2.3	Complete set of Gaskets for coolers & pressure Vessels	2 sets
3.0	Lube Oil System	
3.1	Spares for lube oil pump :	
	a) gears with Shaft	1 set
	b) complete set of bearings	1 set
	c) complete set of seal	2 sets
3.2	Lube oil filter cartridges	4 sets
3.3	Cylinder lubrication system :	
	a) Complete set of Lubricator bearings	1 set
	b) Pumping unit assembly	1set
	c) Check valves of each size	1 set of each size
	d) Sight glass	1 set



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4.0	Accessories	1 set
4.1	Set of spares for all valves ( Isolation, control, safety, non return etc.) in gas lines consisting of spindle, seat, disc, flap, packing, fasteners etc.	1 set
5.0	Instrumentation	
	As per Instrumentation specification enclosed with enquiry / order specification	

### 2.3 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.
- 4. Part which are not applicable in the supplied equipment, Bidder to clearly explain in the offer.



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### 2.3 ELECTRICAL ITEMS:

SI.	Item	Qı	uantity
No.			
	RICAL SPARES LIST		
1.0	HV Motor (For each rating)		
Α.	Bearings housing (complete both Driving End and Non dri		1 set
В.	Cooling fan	<u> </u>	1 No.
C.	Space heater		1 Nos.
D.	Terminal stud with bushing &	star links	2 sets
E.	RTDs for HV motors for wind	ing & bearing	1 Nos. each
F.	Grease nipple & Plug (if insta	alled)	2 Nos.
2.0	LV Motor (For each rating)		
A.	Bearings housing (complete both Driving End and Non dri		1 set
B.	Cooling fan	-	1 No.
C.	Terminal stud with bushing &	star links	1 No.
D.	Space heater, if installed		1 Nos.
E.	Grease nipple & Plug, if insta	ılled	1 Nos.
F.	Cooling fan cover		1 No.
3.0	Local Control Station of each type		
A.	Trip – neutral – close switch	20%(rounded o	off to next higher digit)
B.	Auto Manual / Local - Remote switch	20%(rounded o	ff to next higher digit)
C.	Ammeters of different ranges	20%(rounded o	ff to next higher digit)
D.	Terminal block	20%(rounded o	ff to next higher digit)
E.	Indicating Lamps of different type	20%(rounded o	ff to next higher digit)
F.	Push Buttons of different type	20%(rounded o	ff to next higher digit)
4.0	Heater		
Α.	Heater Element	20% of the total red 3 (rounded off to no	quirement in multiples of ext higher digit)
5.0	Heater Control Panel		
A.	МССВ	20% of each type (r	rounded off to next higher digit)
B.	Main & auxiliary contactor	20% of each type (ı	rounded off to next higher digit)



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SI. No.	Item	Quantity
C.	Relays	20% of each type (rounded off to next higher digit)
D.	Push Buttons	20% of each type (rounded off to next higher digit)
E.	All electronic cards for thyristor (1 no of each type)	1 set
F.	Semiconductor fuses (1 no of each type)	1 set
G.	Thyristor	1 set
H.	Thyristor stack assembly	1 no.
I.	Contactors	1 no. of each rating
6.0	SOFT STARTER	
A.	PCMU	1 Set
В.	Control cards (10% or minimum 1 set of each type & model)	1 Lot
C.	Auxiliary Contactor (20% or minimum 1 set of each type & rating)	1 Lot
D.	Dynamic Compensator Contactor	1 Set
E.	Surge Suppressor	1 Set
F.	MCB (20% or minimum 1 set of each type & rating)	1 Lot
G.	VCB coil set (closing & tripping)	1 Set
H.	Spring charging motor of VCB	1 No.
I.	Temperature Transducer	1 Set

### Note:-

- 1) The above spares do not include commissioning spares and shall be purely warehouse spares.
- 2) Set means complete replacement of particular part in one machine.
- 3) Item wise unit price against each item shall be furnished.
- 4) Wherever "Each Type" is specified, it means of the "Type/make/model/size/rating and exactly replaceable"

### 2.4 INSTRUMENTATION ITEMS



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- 1) Set means complete replacement of particular part in one machine.
- 2) Wherever "Each Type" is specified, it means "of the Type/make/model/size/rating and exactly replaceable"
- 3) Wherever "% qty." is specified, Bidder to quote in next higher rounded figure
- 4) Out of % age spares and minimum qty specified against each item higher of the two shall be supplied.

SI. No.	DESCRIPTION	QUANTITY
1.0	Field instruments	
	Pressure Gauges, Differential Pressure Gauge, Draft Gauges, Field Indicators, RTD/T/C with Thermowells, welded thermowell, Skin Thermocuple Sets, Speed Probes with Cables and Fixing Screws and Bolts, Vibration Probes, with Cables (including extension cable) and Fixing Screws and Bolts, Speed Transmitter with Cables and Fixing Screws and Bolts, Proximeters of diff. model and Fixing Screws and Bolts, Gas Sensors with Cables and Fixing Screws and Bolts	10% of each type of instruments, subject to minimum 2 nos. of each type
	Pressure Switches, DP Switches, Purge Rotameters	10% of each type of instruments, subject to minimum 2 nos of each type
	Special thermocouples ( like reactors) /multipoint thermocouples,	10% of each length subject to minimum 1 number of each type.
	Skin Type Thermocouple-	10% of total subject to minimum 1 number Complete Set of each type.
	Float and micro switch assembly for level switch	10% of each length subject to minimum 1 number of each type.
	Transmitters for Flow, Pressure, Temperature, Level, Diff. Pressure application, Remote Seal Transmitter, Transmitter for LEL/GAS Detector System including Sensors.	10% of each type of instruments, subject to minimum 2 nos of each type
	Hydra Step	1 no. Electronic unit or 10% subject to minimum. 20% or Min 3 Nos of Sensor Probes
	Mass flow meter & Mag Flow meter	A) Power fuses 6 nos per set     B) Sensor assembly-10% min 1 no     C) 10% or minimum one number complete electronic



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		head unit
		N 0
	Vortex Flow Meter	A) One sensing probe ,one set of gasket and Packing for each type and Size     B) 10% or minimum one number complete electronic head unit
	Ultrasonic Flow meter	A) 1 pair probe for each
		instrument  B) 1 number electronic card of each type  C) 2 numbers fuses of all Types.
	Glass tube Rota meters	20% or min 2 Nos of glass tubes of each size/rating /make.
	Variable Area Flow meter (Rota meters)	10% or minimum one no. float & set of Packing for each type, size, rating and material
	Averaging Pitot Tube	Set of Gasket, O-ring, Packing for Retract Mechanism and one no. Needle Valve with each Pitot Tube.
	Flame scanners and optical pyrometer  a) Electronics  b) Detectors / sensors or spares with limited life	<ul><li>a)10% subject to minimum 1 No. of each type.</li><li>b)As required for 1 year operation or Min 2 Nos Complete flame scanner</li></ul>
2.0	Displacer type Level Transmitters	A) 10% of each type of instruments head with Torque Tube Assembly and Transmitter, subject to minimum 2 nos of each type.     1 No of float of each type.     B) 10% Electronic cards and Display module – Minimum 1 no. of each type
2.1a	Ultrasonic / Guided Wave Radar Type – Level Instrument	A) 10% complete Instrument – Minimum 1 No. of each Type / Range / Material B) 10% Electronic – module / Cards /Display module – Minimum 1 no. of each type
2.2	Level gauge- Transparent / Reflex Type	20% subject to minimum 10 numbers of glass along with pair



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		I 60 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
		of Gaskets and glands sets for I/V
		valves of each type, size (Cushion
		& Wet Gaskets), whichever is
		higher.
2.2.1	Level Gauge- Magnetic Type	10% subject to minimum 1 set of
		Float, Magnet/ball follower-ring
		gaskets of each type.
3.0	Control Valve, Shut Down, On-Off, Butterfly, Ball	
	Valves, Gate Valves, Angle Valves, PCV, MOV, Safety	
	Valve Spares	
3.1	Soft part / actuator spares, including actuator diaphragm,	20% of each type of instruments,
	actuator seal kit and spring sets, for each type of actuator	subject to minimum 1 no. of each
	, , , , , , , , , , , , , , , , , , ,	type
3.2	Trim Set	Trim set consisting of seat ring /
J. <u>L</u>	550	seal ring, plug with stem, cage
		(wherever applicable), packing
		material for each make, type ,
		= -
		size, reassure rating valve to be
		provided as spare
3.3	Complete Actuator with Hand Wheel assembly	one complete Actuator for each
		type and size
3.4	Complete Spare Control Valve for Antisurge	One No
	Control Valve	
3.5	Gland packing, O rings, Packing and Bonnet gasket, seat	100 % for each valve. i.e. one set
	gasket	for each tag.
3.6	Greases and grease guns	5 sets of each type of grease and
		1 grease gun of each type
3.7	Solenoid valves	10% of each type of instruments,
		subject to minimum 2 nos of each
		type
3.8	Proximity switches including enclosure	10% of each type of instruments,
3.0		including enclosure- subject to
		minimum 2 nos of each type
3.9	SMADT Positionare	10% of each type of instruments,
ა.ყ	SMART Positioners	1
		subject to minimum 2 nos of each
		type
3.11	Other accessories: Quick Exhaust relay, Volume Boosters,	10% of each type of instruments,
	Air Filter regulators, position Transmitters, change over	subject to minimum 3 nos of each
	relay, NRV, Pilot valves.	type.
		Air filter regulator shall be
		minimum 20%.
3.12	PRDS & De-super heater unit	a )Same as those of Control
	'	Valves
		b) Gaskets for valve and
		connections per unit (if such
		Tooling hot dill (ii addit



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		gaskets, are special and supplied by PRDS/De-Super heater vendor
	For PCV Repair kit consisting of (orifice, plug, spring,	20% or minimum 1 no. in each
3.13	gasket, diaphragm, spring, O-ring for each valve.	type
	HHT loaded with latest HART configurator software	1 no. minimum
3.14	(Emerson make)	
3.15	Safety Valve:	Set of each type/ size. 1 Set comprising of 1 upper adjusting ring, 1 lower adjusting ring, 1 disk, 1 Nozzle, 1 stem & 1 Gasket set
		20% of each size and rating of Discs, Nozzles, bellows, springs etc. Additionally Minimum 2 Nos of Complete PSV for critical application (Very high pressure PSV's e.g Boiler drum application etc.)
4.0	DCS, ESD, F&G PLC, Storage PLC, Analyser PLC, Any other Control and PLC system.	
4.1	CPU	10% or minimum 1 no. each type.
4.1a	Communication cards, Processor cards (Controller) ,FTA cards	2 nos of each type of cards.
4.2	System Pre-fab cables,	10% or min. 5 sets of each type
	I/O Card cables, communication bus cables.	with all connectors, plugs,
4.3	Racks, Backplane units	2 Nos each type
4.4	Local Panel, Hardwire console & annunciator All items like Push buttons, indicators, hand switches lamps, relays selector switches, IS type indicators / Annunciators, holders etc. mounted in the local panel	10% or minimum 2 no. each type.
4.5	HDD unit	2 set of each type (normal as well as Raid-5) with all connectors, plugs.
4.6	Various Keyboards (including operator keyboard) /mouse	2 nos. of keyboard each type and 5 Nos. of mouse.
4.7	Relays	5% of each type of relays, including relevant terminal modules/sockets minimum 5 nos of each type
4.8	Pushbuttons, Lamps, Selector switches	10% of each type , including relevant terminal modules/accessories as a complete set
4.10	All type of system/PDB/Marshalling cabinet /console filters	100%
4.11	All type of system/PDB/Marshalling cabinet/console fan	2 Nos of each type including relevant terminal modules/pre-fab



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		system cables.
4.12	All type of system/PDB/Marshalling cabinet/console Tube	2 Nos of each type.
	light	
4.13	All type of various PDBs Voltmeters	2 Nos of each type.
4.14	I/O Cards	20% of each type of card,
		including relevant terminal
		modules/pre-fab system cables,
		etc., subject to minimum of 5 nos.
		each
4.15	Various System Battery, Terminators	1 no. of each type
4.16	All system Fuses and various glass fuses	100% for imported fuses
4.17	All PDB fuses, like HRC, GSA Fuses	100% of total qty. of each type
4.18	MCBs	5 Nos. of each type
4.19	Terminal Blocks	Spare Terminal Blocks along with
		DIN rail – 100 nos each type
4.20a	Cables for wiring inside Marshalling Racks of DCS of	100 mtr of each color and size
	relevant size	
4.20b	Cables for wiring inside Marshalling Racks of ESD of	100 mtr of each color and size
	relevant size	
4.21	24 V DC Bulk Power Supply modules	Min. 2 nos of each type
4.22	System DC Power supply for DCS	Min. 2 nos of each type
4.23	System DC Power supply for ESD	Min. 2 nos of each type
4.23 a	Diode-o ring modules	10% or minimum 1 no. each type.
4.24	Safety barriers, active isolators, signal convertors, trip	10% of each type of instruments,
	amplifiers, signal multipliers	subject to minimum 5 nos of each
		type
4.25	Hubs, Bus units, Switches, Routers	20% or Min 1 nos of each type
4.26	OPC / Modbus interface Cards	1 No each along with connectors /
		cables
4.27	DCS operator and engineering subsystem	
	Communication card Operator Station communication bus	1 No.
	Communication card for Engineering Station	1 No.
	communication bus	I NO.
	Motherboard for Operator Workstation	1 No.
	Motherboard for Operator Workstation	
	Motherboard for Engineering Workstation	1 No.
	SMPS	1 No.
4.28	PLC operator and engineering subsystem	
	Communication card for PLC programming Station	1 No.
	communication bus	
	Communication card for PLC SOE Station communication	1 No.
	bus	
	Communication card for PLC Operating Station	1 No.



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	communication bus		
5.0	Special control system modules a) WoodWard Digital Governor, b) WoodWard PROTECH 2003/Braun Speed Trip unit, Speed Probes c) Any other Control system module associated with Speed trip and Monitoring system. d) Voith Make E/H Converters.	<ul> <li>1 no. of each (Controller, IOs, cables, barriers Complete unit).</li> <li>Speed Probe - 2 nos of Speed Governing, 2 nos for Over speed Trip.</li> <li>1 no of each electronics &amp; sensor</li> <li>1 no I/H converter complete set.</li> </ul>	
6.0	Bentley Nevada 3500 Series Vibration Monitoring System Spares		
6.1	Central Rack cards: Power supply card, Vibration/Thrust Monitoring card, Axial displacement card, Speed monitor card, Key phasor module, Relay module, Display Unit., transducers and transmitters	20% of each type of cards, subject to minimum 2 nos of each type	
6.2	Vibration probes with leads, axial displacement probes with leads, Bearing thermo elements, speed probes with leads, I/H converter, E/H Convertor, trip solenoid valves, transducers, barriers for vibration probes/ Proximeter.	10% or minimum 1 no. of each type. Proximeter 20%	
7.0	Consumables for DCS		
7.1	Printer papers A3, A4 size	A3- 10 Rims, A4- 50 Rims	
7.2	Laser Cartridges (Black and Color)	For 6 month usage, min. 2 sets for each printer	
7.3	DATs of HP/ 3-M	25 nos. each	
7.4	CDs of HP/Samsung	200 with individual casing	
7.5	DVDs of HP/Samsung	200 with individual casing	
8.0	GC Spares		
а	Set of Filters	1 set	
b	Detector Assembly	1 set	
С	PCB assembly Power Supply	2 nos.	
d	PCB assembly Digital temp control	2 nos each type	
е	Pressure Regulator	1 no	
f	Thermocouple Assembly	1 no	
g	Sol Valve	1 no	
h	Backplane Assembly	1 no	
i	PCB Assembly	1 no	
j	Ignitor Assembly	1 no	
k	Pressure Sensor	1 no	
I	Filament Kit	2 nos	
m	Set of Fuses	1 no	
n	Set of Fittings	1 no	
0	Pressure Gauge	1 no	
р	Temperature gauge	1 no	



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_	Onwale flow makes	4
q	Sample flow meter	1 no
r	Bypass flow meter	1 no
	Gas Analyzer Spares applicable for all Gas Analyzers /	
9.0	MassSpectrometer	
а	Sample Flow Meter	1 no
b	By pass Flow meter	1 no
С	Solenoid Valve	1 no
d	Communication board	1 no of each type
е	Display Unit	1 no each type
f	CPU Board	1 no each type
g	Sensor Electronic	1 no each type
h	Modulation Unit	1 no each type
i	Sample Cell	1 no
j	Sensor	1 no each type
k	O Ring	3 sets
I	Thermal fusses	2 sets
m	Heating cartridge	1 set
n	Thermal trip	2 set
0	Analogue module	1 set each type
р	Filter membrane (pack of 25)	1 set
q	Fuse	1 set each type
10.0	pH / Conductivity Analyzer	2 (Two) Complete Analyzer
		complete with sensor, cables,
		transmitters etc of each type
11.0	Silica Analyzer/Sodium/chlorine/ moisture /Turbidity	
	/density/O2/CO/NOx/SPM Spares	
а	Sensor board	1 no.
b	Sensor and Detector	1 no each type
С	Rotameter ( if applicable)	1 no.
d	Pressure Control Valve ( if applicable)	1 no.
е	Fuses	5. sets.
f	Electronic card	1 no. each type
g	Other Aux. Cards	1 each
h	Probe	1 no. each type
i	Filters, O-rings, Gaskets	2 sets
j	Consumable Kit	2 sets
12.0	Sample Conditioning system applicable for all	
	analyzers / Mass spectrometer	
а	Complete sample kit for sample pumps	1 set
	inclusive of 'O' rings, Seal ring, Diaphragm	1 351
b	Solenoid valve for, more than one stream application	1 no
С	Flow switch	1 no
d	Vaporization system if required, which includes vaporizer,	1 set
	thermostat, electrical tracing cable and heater	



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е	Cooling system if required, which includes one cooler, flow conditioning system	1 set
f	Sample handling system fitting, valves, pressure gauges, regulators, solenoid valves, flow meters / flow switches and other components, etc	10% or minimum 1 no. of each type
g	Consumables like filters, membranes, reagents, cal. Gas, carriers	For 1 year of continuous operation
13.0	Flame Scanner	Two complete instrument of each type
14.0	Ferruling machine	1 no along with printer ribbon and sleeves size of 5.0 mm2 and 3.5 mm2 100 meter each
	Other Items	
15.0	Snubber, Syphon, Gauge Saver	10% (subject to minimum of 2) of each item used, whichever is higher
16.0	Loop powered indicators	10% (subject to minimum of 2) of Loop powered indicators used, whichever is higher
17.0	Panel mounted instruments	10% or minimum one no. whichever is higher
25.0	Tools	9
25.1	Technician's Tool Kit Set including screw drivers, slide wrench, O & D Spanners Kits	10 nos
25.2	Crimping Tool for RJ-45 Connector, Tapria	5 nos
25.3	Crimping Tool 0.5 to 4.0 mm2 wire, Tapria	5 nos
25.4	Crimping Tool BNC connector for Bentely Neveda	2 nos
25.5	Torque Wrench (Adjustable)	2 nos
25.6	Insulation Remover	5 nos
25.7	IC Puller	2 nos of each type
25.8	Logic probe	2 nos.
25.9	Screw driver kit (Taparia make)	5 set
25.10	Allen Key Set ( 1mm to 8 mm)	5 set
25.11	Lamp puller	3 nos.
25.12	Torches (LED) handheld	10 nos
25.13	Torches (Head Lamp)	10 nos
25.14	Battery charger alongwith 1 set of batteries	2 nos of each type
26.0	CCTV camera, camera station, lens with zoom, Pan & Tilt Unit, Receiver Unit, electronic unit, , power supply, etc.	10% or minimum one of each type of module.
27.0	EPABX Unit, Electronic Card each type	10% or minimum one of each type of module.
28.0	Gas Detector system  a) Transmitter assembly (including field display)  b) Sensors	10% subject to minimum 1 No. of each type.  20% subject to minimum 2 No. of
L	1	



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		each type
29.0	Smoke Detectors , MCP, Sounders, Hooters	10% or minimum one of each type
		of module.
30.0	Pressure Relief Valves/Thermal Relief Valves/ Vacuum	10% of minimum one of each type
	Relief Valves / Low Pressure Relief Valves / Pilot Operated	& size for nozzle, disc insert,
	Valves	guide whichever is higher
30.0a	Rupture Disc	2 spare disc for each Tag.
31.0	MOVs	
	Main PCB of each type	1 Nos
	Local / Remote / off Selector Switch each type	1 Nos
	Open / close / stop Selector Switch each type	1 Nos
31.0	Installation Material	
31.1	Instrument valves and	10% subject to minimum 1 no. of
		each type.
31.1.1	Valve manifolds	10% subject to minimum 3 no. of
		each type.
31.2	Tube fittings	10% subject to minimum 10 no. of
		each type.
31.3	Tubes	10% of the total length of each
		type
31.4	Cables	10% of the total length of each
		type
31.5	Junction boxes and cable glands	10% subject to minimum 1 no. of
		each type

### 2.5 Piping Items:

Following spares are to be supplied for the Piping Bulk Materials:

SI. No.	Part Description	Size Range (NB)	Quantity Required (% of as built)	Remark
1	Pipes & Fittings	≤1.5"	5%	min. qty. 6 mtr. / 1 No.
2	Pipes & Fittings	≥ 2"	2%	min. qty. 6 mtr. /1 No.
3	Flanges	≤6"	5%	min. qty. 1 No.
4	Flanges	8" to 36"	2%	min. qty. 1 No.
5	Valves	≤14"	5%	min. qty. 1 No.
6	Valves	≥16" with rating ≥900#		Note-5
7	Bolts, Nuts & Gaskets		10%	min. qty. 1 No.
8	Traps		2%	min. qty. 1 No.
9	Expansion Bellow		10%	min. qty. 1 No.



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10	Strainer element	10%	min. qty. 1 No.(Note-6)
11	Complete Gear Box for gear operated Valves	5%	min. qty. 1 No.
12	Seal ring for the Pressure seal type valves	5%	min. qty. 10 Nos.
13	Hose assembly	50%	min. qty. 10 Nos.
14	Bolt torque wrenches (Manual)	1 set	min. qty. 1 set (Note-7)
15	Bolt torque wrenches (Hydraulic)	1 set	min. qty. 1 set (Note-7)

#### **Note (Piping items):**

- 1. Percent of quantity required as mandatory spares is for each and every item/size/rating/thickness/material consumed in as built.
- 2. No substitution in size, rating and material is allowed.
- 3. Pipe length in meter and other items in No. or Set shall be supplied.
- 4. Fractional part of quantity shall be converted into nearest upward whole part.
- 5. For rating ≥900# and sizes ≥16", minimum one qty. valve spare shall be supplied for each size, rating & material.
- **6.** Percent of quantity required as mandatory spares for strainer element is for each and every Strainer/size/rating/material consumed in as built.
- 7. Quantity shall be supplied irrespective of as built/installed.

#### 3.0 VENDOR'S RECOMMENDED SPARE PARTS

Contractor shall submit list of recommended spare parts of specialised items not covered mandatory spares, along with itemised price. Owner will review and decide the recommended spares required for the project. However, these spares shall not be considered in Price evaluation.

#### Notes:

- 1. The above spares do not include installed spares / commissioning spares. The above shall be 2 years spares.
- 2. Set means complete replacement of particular part in one machine/equipment/Reformer/Fired heater etc.
- 3. Item wise price against each item shall be furnished.
- 4. Wherever "Each Type" is specified, it means "of the Type/make/model/size/rating and exactly replaceable"
- 5. Wherever "% qty." is specified, LSTK Contractor to quote in next higher rounded figure



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- 6. Out of % age spares and minimum qty specified against each item higher of the two shall be supplied.
- 7. Spares mentioned above to be offered as 2 years spares. However, if these spares are not used in the equipments being offered / supplied, the same need not be supplied. Bidder shall clearly indicate against each such spare that these spares / items are not used in their equipments.
- 8. The above is owner's recommended list of spares. The supplier may add other items as per their recommendations.
- 9. The quotation should contain sectional drawing showing location & part no. (For exact identification) & material specification.
- 10. The above nos. of spares are minimum.
- 11. The word 'TYPE' means the Make, Model no., Type, Range, Size/ Length, Rating, Material as applicable.
- 12. Wherever % age is identified, Contractor shall supply next rounded figure.
- 13. The terminology used under 'Part Description' is the commonly used name of the part and may vary from manufacturer to manufacturer.
- 14. Mandatory spares shall be applicable for Electrical / Instrumentation items of sub packages also as per above mandatory spares philosophy.
- 15. Mandatory spares shall be procured along with the main equipment. These spares include only those spares, which are critical for equipment and require longer delivery periods.
- 16. The word 'Set' means the quantity required for full replacement of that part in one machine.
- 17. The Bidder shall quote for all the mandatory spares as defined above & as applicable to the proposed design of the equipment. In case, any spare which is listed above but not applicable due to specific construction/design of the equipment, the same shall be highlighted as 'Not Applicable' against that spare supported with proper technical explanation.
- 18. Spare parts shall be identical in all respects to the parts fitted on the main equipment, including dimensions, material of construction, testing & heat treatment.
  - Mandatory spares as specified elsewhere in the engineering specifications for other items are also to be provided by the contractor before Commissioning of the plant.



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### SECTION – VI – 6.0 SITE WORKING AND SAFETY CONDITIONS

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

0	23.02.2022	Issued for Tender	JKY	DKC	RRK
REV	<b>REV ATE</b>	PURPOSE	PREPD	REVWD	APPD



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#### 1.0 **SITE LOCATION**

The proposed project will be I ocated within the premises of existing closed coal based Ammonia- urea complex of TALCHER FERTILIZERS LIMITED, Talcher, ANGUL DISTRICT, ODISHA (INDIA).

#### 2.0 **SITE ESTABLISHMENT**

- 2.1 The LSTK contractor shall provide all huts, stores, tarpaulins and other covers for the accommodation of his staff, workmen and materials. All materials likely to deteriorate in the open shall be stored under suitable cover.
- 2.2 The LSTK contractor shall advise the owner within 15 days of the placement of LOI his space requirement which shall include for office, covered storage, open storage, fabrication space, etc. Depending on availability & requirement, space shall be allotted to the contractor for the duration of this contract. He will not be permitted to make use of any other space without the sanction of the Owner. The use of this space shall strictly be made for the execution of this contract only. The sanitary conditions of the ground in or around such structures shall, at all times, be maintained by the contractor in a manner satisfactory to the owner.
- 2.3 The security of the LSTK contractor's equipment and m aterials is his own responsibility.
- 2.4 The LSTK contractor's shall clear away periodically any rubbish, scrap materials, etc. and dump the same in the area indicated by the owner/consultant. All construction material shall be neatly stacked in an orderly manner as directed by the owner and care shall be taken to allow proper access to workmen and easy movement of men, vehicles, cranes and materials.
- 2.5 The LSTK contractor shall maintain all the drawings carefully mounted on the board of appropriate size and well protected from the ravages of weather termites and other insects.
- 2.6 The LSTK contractor shall not permit the entry to the site of any person not directly connected/concerned with the work without first having obtained the written permission of owner.
- 2.7 The LSTK contractor shall submit a list of plant, equipments, tools, tackles, etc. which he will use, to perform the work. The contractor shall submit a list in duplicate of all materials, tools and tackles etc. brought inside the plant site duly signed by owner's security staff as per the rules laid by owner. These tools, etc. shall not be removed from the site till the completion of job. A gate pass must be obtained from the owner in order to remove from site any plant, machinery, tools, materials and equipment.
- 2.8 All items such as instructions and other pertinent data regarding erection/commissioning and maintenance should be typed and classified for transmittal in a manner approved by the owner.



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- 2.9 All employees of the LSTK contractor shall conform to any rules of conduct, etc. established by owner. Failure to comply with the rules of coduct will be sufficient cause for removal of such person from the site.
- 2.10 The LSTK contractor will be responsible for providing all plant, tools and tackles, consumables and scaffolding required for the execution of his work as per the best engineering practices.
- 2.11 The receipt, unloading, movement and storage at site of all the LSTK contractor plant, tools and materials is his responsibility. The receipt, movement & storage of material issued by owner also shall be the responsibility of the Construction Contractor.

### 2.12 **ELECTRICITY**

Construction power shall be arranged by LSTK contractor as per **Section Construction/Erection, Pre-Com, Com & startup.** 

### 2.13 **CONSTRUCTION WATER**

The LSTK contractor shall communicate his water requirements to the Owner within 7 days of the placement of LOI. Construction water shall be arranged by LSTK contractor as per **Section Construction/Erection, Pre-Com, Com & startup.** 

#### 2.14 FIRST AID

The LSTK contractor may have access to the Owner's qualified first aid personnel and ambulance, in case of accidents, if available. The contractor will, however provide a first aid post for minor injuries to their staff.

#### 3.0 SUPERVISION OF WORK

- 3.1 The LSTK contractor shall submit to the Owner resume of his site supervisors for approval prior to commencement of the work. Once approved, the LSTK contractor shall not remove his site supervisors without prior concurrence of the Owner.
- 3.2 The entire work is to be c ompleted as per the agreed time schedule. The programme of work in details shall be submitted by the LSTK contractor before commencement of work. The detailed programmes prepared by the LSTK contractor shall conform to the targets set forth in the time schedule and will be subject to the approval of the owner. All the work shall be carried out in such a manner that the work of other agencies at site is not hampered due to any action of the LSTK contractor.

#### 4.0 INSPECTION

The work of the LSTK contractor shall be subject to inspection by the Owner at all times.



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#### 5.0 EMPLOYMENT OF LABOUR

- 5.1 The LSTK contractor will be expected to employ on the work only his regular skilled employees with experience of this particular work. The permission of the Owner must be obtained before tradesman is recruited locally for the work. This rule does not apply to unskilled labour. No female labour shall be employed in dark hours/ i.e. hours prohibited under the applicable law. No person below the age of eighteen years shall be employed at any point of time.
- 5.2 All traveling expenses including provision of all necessary transport to and from site, lodging allowances and other payments to the LSTK contractor employees are his own responsibility.
- 5.3 The hours of work on LSTK Contractors / Owner and contractor shall adhere to the same.
- 5.4 All Construction contractors employees shall wear safety helmet and s uch identification marks as may be provided by LSTK contractor on work site and duly approved by Owner.
- 5.5 All notices displayed on the site and any instructions issued by the Owner shall be strictly adhered to by the LSTK Contractors and/or his LSTK contractor employees.
- 5.6 It shall be the responsibility of LSTK contractor to provide suitable accommodation including necessary facilities for their labour and staff.
- 5.7 LSTK contractor will arrange for Ration Cards and Permits for labour as per statutory provisions for its labour, as necessary.
- 5.8 The LSTK contractor shall be required to maintain employment records as covered in relevant Acts and produce documentary evidence to the effect that he has discharged his obligations under the Employees Provident Fund Act 1952 for the workmen working at site.
- In case the Owner becomes liable to pay any wages or dues to the labour of the LSTK Contractors or his contractor or any Govt. agency under any of the provision of the Minimum Wages Act, Workmen Compensation Act or any other law due to act of omission of the contractor, the Owner may make such payment and shall recover the sum from Contractor's bills or any other dues.

#### 6.0 COMPLETION OF WORK

Before finally leaving site, all the LSTK contractor store, huts, plant, tools and rubbish shall be removed and the site left clean and tidy. The space allocated by Owner shall be vacated and handed over to the Owner.

### 7.0 WORKING AND SAFETY REGULATIONS

7.1 The LSTK Contractor shall observe all statutory safety and I egal requirements regulations issued by Central and State Governments applicable to the work as well



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as any local regulations applicable to the site issue by the consultant or any other authority.

- 7.2 Particular attention is drawn to the following:
  - a) In case of accident, the Owner shall be informed in writing forthwith. The LSTK Contractor shall strictly follow regulations laid down by Factory Inspector, Govt. and State authorities in this regard.
  - b) LSTK contractor shall fence his plant, platforms, excavations etc.
  - c) Compliance with all electricity regulations.
  - d) Compliance with statutory requirements for inspection and t est of all lifting appliances and auxiliary lifting gear.
  - e) Safety belts proposed to be us ed, shall be g ot checked by Fire & Safety Department of LSTK Contractor / OWNER in written before use.
  - f) Before using the lifting or pulling equipment, LSTK contractor shall carryout load test which shall be witnessed by LSTK Contractor / OWNER.
- 7.3 Staircase, doors or gangways shall not be obstructed in any way that will interfere with means of access of escape.
- 7.4 No excavations will be started without the permission of the LSTK Contractor / OWNER, who will inform the LSTK contractor of the position of any pipes or cables known to be buried in the area. All excavations must be effectively railed off at all times, or completely boarded over properly marked during the hours of darkness by red warning lamps, using Flame proof warning lamps in non smoking areas. Debris or material which cannot be immediately removed must be heaped in such a way as to be immediately remove and also to leave adequate passage way. Any finds such as relics or antiques coins or fossils etc. shall be promptly handed over to the Owner.
- 7.5 The LSTK contractor will notify the Owner of his intention to bring on the site any equipment, such as, space heating or welding apparatus or any container holding liquid or gaseous fuel or other substance which might create a hazard. The Owner will have a right to prohibit the use of such equipment or to prescribe the conditions under which such equipment may be used. The LSTK Contractor will have the right to inspect any construction plant, and to forbid its use if in his opinion it is un-suitable or unsafe. No claim arising there from shall be made by the LSTK Contractor.

The LSTK contractor or any one acting on his instructions will not bring on to the site any radio active substance or any apparatus using such substances or any X ray apparatus until written permission and direction regarding the use of such equipment has been received from the Owner.

The LSTK contractor shall be responsible for the safe storage of the radio graphic sources or those of his Construction contractors.

- 7.6 The LSTK contractor will meet all requirements, and act on the instructions of the Owner where it is necessary to operate a permit to work system.
- 7.7 Where it is necessary to provide and/or store petroleum products or petroleum mixtures and explosive, the LSTK contractor shall be responsible for carrying out



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such provision and/or storage in accordance with the rules and regulation laid down in Petroleum Act 1934, Explosive Act 1948 and Petroleum and Carbide of Calcium Manual Published by the Chief Inspector of Explosive of India. All such storage shall have prior approvals of the Consultant. In case any approval or clearance from Explosive or any statutory authorities is required, the contractor shall be responsible for obtaining the same.

- 7.8 The LSTK contractor shall have his own Fire Fighting Extinguishers and Equipment.
- 7.9 The LSTK contractor shall be responsible for the provision of all safety notices safety equipments including the safety gadgets for his workmen required by both the relevant legislation and such as the Owner may deem necessary.
- 7.10 While working at heights, safety belts shall necessarily be used.
- 7.11 "LSTK contractor shall employ a safety officer for safe executing the construction activities of the project who will be responsible for implementing safety requirement contained in the documents.

The safety officer shall possess a recognised degree in engineering discipline preferably, F&S or (Any branch of engineering) and had a post qualification construction experience of minimum two years.

In addition, he/she shall also possess a recognised degree or diploma in industrial safety and preferably have adequate knowledge of the language spoken by majority of the workers at the construction sites.

Contractor shall ensure physical presence of safety personnel at each work location wherever Hot Work permit is required. No work shall be started at site until above safety personnel are physically present at site. The contractor shall submit a safety organogram clearly indicating the lines of responsibility and reporting system and elaborate the responsibilities of safety personnel in the HSE MAUAL/Program. The contractor should furnish Bio-Data/Resume of the safety personnel as above, at least 01 month before the mobilization for PDIL/owner's approval.

- 7.12 LSTK contractor shall use only steel planks and c lamps executing scaffolding. Wooden planks and rope shall not be allowed for this purpose.
- 7.13 LSTK contractor shall use asbestos cloth to ensure falling of weld spatters down below during above ground welding to ensure safety of electrical cables and personnel and avoiding any fire hazards.

### 8.0 ELECTRICAL SAFETY REGULATIONS

- 8.1 In no c ircumstances will the LSTK contractor interfere with fuse and el ectrical equipment belonging to the owner or other contractors.
- 8.2 Before the LSTK contractor connects any electrical appliances to any plug or socket belonging to the other contractor or owner, he will
  - i. Satisfy the Owner that the appliance is in good working condition.
  - ii. Uses of matching sixes plug & does not uses bare wire to insert in socket.



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- iii. Inform the Owner of the maximum current rating, voltage and phase of appliance.
- iv. Obtain permission of the Owner dealing the sockets to which the appliance may be connected.
- v. Use distribution board with ELCB for feeding power to hand held tools.
- 8.3 The Owner will not grant permission to plug in until he is satisfied that
  - i. The appliance is in good condition and is fitted with a suitable plug.
  - ii. The appliance is fitted with a suitable cable having two earth conductors, one of which shall be earthed metal sheath surrounding the cores.
- 8.4 No electric cable in use by the other LSTK contractor/owner will be distributed without prior permission. No weight of any description be imposed on any such cable and no ladder or similar equipment will rest against or be at tached to it. Cables / Wires used shall be in good condition without cuts & in insulation & joints.
- 8.5 The voltage for all portable equipment e.g. drilling machines, temporary lighting etc. will not exceed 240 volts.
- 8.6 No work must be carried out on any live equipment. The equipment must be made safe and a "permit to work" issued before any work is carried out.
- 8.7 LSTK contractor shall employ electrician to maintain his temporary electrical installation.
- 8.8 Take necessary clearance for working in hazardous area.

### 9.0 REPORTING

- a) The LSTK contractor must report the following information to the Owner in writing daily. Number of men employed, trades-wise,
  - Progress achieved;
  - Concrete pour card, if any.
- b) If during excavation any materials such as but not limited to precious materials or treasure troves etc are found, the same shall be reported to owner immediately and shall be the property of owner.

### 10.0 GENERAL SAFETY REQUIREMENTS TO BE OBSERVED DURING SITE FABRICATION AND ERECTION BY THE CONSTRUCTION CONTRACTOR

1. Before starting the work, **LSTK contractor** should get safety work permit and should strictly follow instructions written by the concerned authority in work permit. Permit is required for all types of job i.e. Hot, Cold Excavation, Chipping, Grinding etc.



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- 2. Smoking is strictly prohibited inside factory areas.
- 3. Safety appraisal and equipments shall be provided to workmen as per the nature of work. Welders shall use gloves, goggles, shields etc. during welding, gas cutting etc. All technicians shall use gloves, goggles during grinding, chipping etc. If any unsafe practice is observed Fire & Safety Sections or the authority issuing the work permit is authorized to stop the work without any prior notice.
- 4. Temporary fire extinguishers, water hose shall be available near work place and in case of fire, Owner's Fire & Safety Section should be immediately informed by LSTK contractor from nearest available telephone. Project Manager should also be immediately informed.
- 5. LSTK contractor shall secure necessary insurance of his workmen for the entire duration of works under the contract. Owner is not responsible for any accident/injury caused whatsoever, to any person employed by the Construction Contractor. However, LSTK contractor has to inform Owner's Fire & Safety Section about accident, if any, immediately.
- 6. Temporary switch boards, cables, wires and electrical equipments should be installed in accordance with standard electrical practice with proper earthing etc. and should have prior approval of LSTK Contractor / Owner electrical engineer. Switch board shall be suitably protected against rainwater. The cable used for welding machine should have flexible tough rubber sheathing.
- 7. Temporary cables and wires including welding cables should be routed as not to cluster the work areas. Also any possibility of damage to live wires by falling objects should be avoided. Temporary electrical lines for power & lighting shall run overhead or underground so that they should not hinder the movement of men, materials and vehicles.
- 8. Portable hand lamps being used by construction crew shall be preferably of 24 Volts supply bulb to be protected with safety shields.
- 9. Earthing for welding shall not be taken through existing structure or equipments due to the very explosive nature of the plant, raw materials, reaction during process and final product. There is every possibility of fire and explosion in the equipment due to electric spark caused by loose earthing connection etc.
- 10. LSTK contractor should be careful while excavating so that no underground cable or pipe line is damaged. As soon as any brick cover or under ground cables are exposed he should stop the work and inform Construction Manager immediately for necessary action.
- 11. LSTK contractor should not leave any welding machine etc. running after the work is stopped. Before leaving the work place, Contractor should ensure that welding sets are disconnected from welding socket outlet.



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- 12. All work areas shall be kept reasonably clear and clean for easy movement of men & material. Also all approach roads shall be free from obstacles for easy movement of cranes, vehicles, fork-lifts, trollies etc. and all debris shall be periodically removed.
- 13. All temporary structure and s upports for erection purpose such as scaffolding, ladders, walkways, platform, shuttering etc. shall be sufficiently strong for safe use and to prevent collapse & accidental fall of workman. Same shall be removed immediately after the work is completed.
- 14. All workmen working at unsafe elevation during the construction activity such as concreting, plastering, welding, erection work, painting, insulation etc. shall be safe and sufficient passage and should be properly instructed to take necessary safety precautions and observe safe practice to prevent accidental fall. Safety belts and helmets shall be used wherever necessary.
- 15. All supervisors, welders, electricians, technicians, riggers, engaged in the work shall be adequately skilled, experienced and acquainted with standard rules, regulation & practices of the work.
- 16. All open trenches, pits and other excavation carried shall be barricaded out by Construction Contractor, to avoid accident.
- 17. All lifting tools, tackles & accessories shall be in good working condition and of suitable capacity for the purpose for which they are used. All certificates/permits/licenses etc. required under any law or regulation for the same shall be available and valid during the entire period of the execution of the work under this WO/Contract.
- 18. LSTK contractor shall not use any structure or equipments erected or under erection for fastening, lifting or flying tackle guy-ropes etc. which may impose such loads for which structure or equipments are not designed to carry. However, LSTK contractor has to get prior approval from Construction Manager of Owner before using beams, permanent structure for the above purpose.
- 19. When work is carried out at high elevations, it is the responsibility of the LSTK contractor to ensure that tools and materials are not left in a position where they can fall on peoples moving /working below. Where necessary, places below should be cordoned off and caution boards be provided by contractor. Also, LSTK contractor should not cut existing hand railing/structure.
- 20. Contractor's men must not tamper with any machines, switches, valve or equipment not connected with their work. Welding holders should not be tested on running pipe lines.
- 21. Nylon rope should not be used for scaffolding where hot line is running near by, because there is every possibility of wire rope catching the fire. Also, no scaffolding is to be made on hot as well as insulated lines.



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22. Necessary sign boards clearly indicating "RADIOGRAPHY HAZARDS" on all the four sides of the cordoned area surrounding radiography source will have to be displayed by Construction Contractor. Surrounding area will be cordoned with the help of manila rope and his personnel will be kept for watching/guard on all the four sides to prevent entry of personnel till the radiography work is completed. Construction Contractor's personnel should be able to communicate clearly/properly to stop entry of unauthorized personnel within the area cordoned for the radiography work.

### **Refuse Disposal**

- 23. Refuse must be removed daily to prevent accumulation. Materials liable to cause persons to slip or trip and fall should be cleared immediately.
- 24. Refuse removal teams working after work hour should be organized where normal cleaning can not cope with the build up of waste materials.
- 25. Projecting nails should be removed or bent over.

### **Personal Protective Equipments**

- 26. Helmets should be provided for all who are exposed to the dangers of falling material or structures they might strike against.
- 27. Suitable eye protection should be provided for all who are exposed to flying particles, harmful glare and dangerous substances.
- 28. In the handling of rough objects, gloves should be provided and used.
- 29. Safety footwear should be provided to all who are exposed to foot injury, should be good fitting and comfortable to wear.
- 30. Safety belts should be provided where other means are not practicable. Both the anchorage points and lifelines provided for attaching safety belts should be of adequate strength. The umbilical line should be fixed in such a way that user's freefall will not exceed 1 metre.
- 31. Catch net should be used where persons are liable to fall and these should be securely supported at a level as near as possible to the working level.
- 32. Noise defenders should be provided for work area where the noise level exceeds 85 dBA.
- 33. Respiratory protection should be pr ovided by employers and us ed by workers where the dust level remains high and where control at source is not practicable.

### Inspection & Record Keeping



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34. Where defects render the scaffolds unsafe, they should be rectified immediately. Where this is not practicable, a sign should be put warning against using it.

#### Winches

35. Adequate foundations should be provided for winches.

### **Lifting Gear**

- 36. All lifting gear and s linging should be t ested before use and thereafter inspected regularly by competent engineers. Workers should also check the lifting gear visually before using them.
- 37. Each piece of lifting gear should bear its safe working load, its identification number and its last inspection date. It could in addition be colour coded according to due date of inspection.
- 38. Wire ropes should be preserved against rusting, kinking, fraying, birdcaging and heat damage. Defective wires should be des troyed to prevent recycling.

#### **Concrete Mixers**

- 39. Moving parts which are liable to become nip points, such as gears, chains and rollers should be guarded.
- 40. Where concrete mixers are driven by internal combustion engineers, exhaust points should be located away from the workers' work station so as to eliminate their exposure to obnoxious fumes.

### **Electrical Components**

- 41. All components and conductors used must be in good condition.
- 42. Proper junction boxes and distribution boards from which electric power could be tapped should be provided at every floor level.

### **Demolition: General Provisions**

- 43. Uncontrolled collapse of walls or other structures under demolition should be prevented.
- 44. The throwing of materials over the sides of the buildings should not be permitted.

### **Waste Handling**

- 45. Where demolition is carried out near public areas:
  - a) Hoardings slopping inwards should be erected around the building.



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- b) Protective nettings should be hung around the building to prevent materials falling outside the periphery shelter
- c) asbestos

Where asbestos materials are present, appropriate dust control and respiratory protection approved by the local authority must be used.

### **Excavation: General Provisions**

- 46. Test for toxic gases should be c arried out where their presence is suspected.
- 47. Exposure of shorings to vibration such as that produced by engines or vehicular traffic should be kept to a minimum.

### **General – Ventilation, Fire Protection/Fighting**

- 48. Where flammable gas concentration could reach explosive levels, it may be necessary to provide intrinsically safe electrical equipments.
- 49. Adequate lighting and emergency lighting should be provided.
- 50. Adequate evacuation stairways should be provided for rapid evacuation in case of an emergency.

### First Aid

51. Sufficient First Aid Boxes containing simple dressings and supplies should be provided on the site under the control of the foreman.

#### **Awareness**

**52.** The contractor shall brief the visitor about HSE precautions which are required to be taken before proceeding to site and make necessary arrangement to issue appropriate PPE's like HELMET, Safety shoes etc. to the visitors.

The contractor shall promote and develop consciousness about Health, safety and environment among all personnel working for the contractor. Regular awareness programmes and fabrication shop/work site meeting at least on fortnightly basis shall be arranged on HSE activities to cover hazards involved in various operations during construction phase. During the awareness program, step shall be taken by the contractor to motivate & encourage the workmen and supervisory staff by issuing/awarding them the tokens/gifts/mementos/ Monitory incentives

A verbal warning shall be given to the workers during the first HSE violations. A written warning shall be issued on second violations and thereafter for the third volitions; the services of worker shall be terminated. For all these violations, a penalties' shall be imposed, separately on the contractor. Records of warning for each worker shall be kept in the records.



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### SECTION - VI -7.0

# CONSTRUCTION/ERECTION, PRE-COMMISSIONING, COMMISSIONING AND START-UP

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

0	23.02.2022	Issued for Tender	JKY	DKC	RRK
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### 1 General scope of Work and services - Construction/Erection

LSTK CONTRACTOR shall be responsible for construction and erection of the Plant/ Unit including but not limited to the following:

- 1.1 Construction and erection of Plant/Unit and perform all other activities required to be performed for implementation of the WORK.
- 1.2 Provide and supply in due course all construction Equipment and Materials, tools, and temporary facilities necessary for implementation of the WORK.
- 1.3 Establish and operate adequate material control system in site for receipt, unloading, inspection, maintenance, handling, storage and utilization to ensure all Equipment and Materials are preserved and available as necessary for completion of the Plant/Unit.
- 1.4 Provide and supply all staff, tradesmen and labours for implementation of the WORK.
- 1.5 Establishment of overall construction policy and procedures for the Plant/Unit.
- 1.6 Provision of overall management and control of construction phase of the Plant/Unit.
- 1.7 Ensuring that all parts of the Plant/Unit are constructed and tested strictly in accordance with the specifications and applicable codes and standards asked for in the project documents.
- 1.8 Ensuring that construction is accomplished in accordance with the schedules.
- 1.9 Provide transportation of all Equipment and Materials to be provided and supplied by LSTK CONTRACTOR under the CONTRACT either from inside or outside to Site.
- 1.10 Construct, operate and maintain all temporary facilities required for its personnel involved in the WORK.
- 1.11 Provide transportation in the area of the Site and between Site and temporary facilities for all its personnel involved in the implementation of the WORK, including field labour, administrative staff, etc.
- 1.12 Recruit field and organize, manage and supervise its Sub Contractors and field labour for the WORK.
- 1.13 Provide liaison with OWNER, Sub Contractors, Licensors and Vendors to ensure that the Plant/Unit is constructed in accordance with the respective standard and specifications, set forth in the CONTRACT.



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1.14 Establish with OWNER adequate procedures, control and reporting systems to provide close control of the progress of the WORK. 1.15 Provision of labour and facilities for loading, unloading and transportation of the Equipment within the site area. 1.16 Performance and/or provision of all other works and/or services required for performance of the WORK. 1.17 Execution of the whole civil, structural and building works of the Plant/Unit and/or utilities and off-site facilities. 1.18 Prefabrication of piping spools in a shop on the Site. 1.19 Erection and installation of EQUIPMENT and auxiliary facilities associated with the Plant/Unit. 1.20 Erection and field fabrication of structural steelwork, cladding ladders, handrails, stairs and platform of the Plant/Unit and/or utilities and off-site facilities. 1.21 Installation of pipe work including field fabrication at site. 1.22 Installation and testing of all instrumentation network and equipment of the Plant/Unit. 1.23 Installation and testing of electrical system and equipment of the Plant/Unit. 1.24 Installation of rubber lining, refractory brick lining & C-Brick lining, FRP/PVC/HDPE lining, as required for the Plant/Unit. 1.25 Painting of steelworks, piping, Equipment and building of the Plant/Unit. 1.26 Maintenance of construction equipment, vehicles and tackles of the Plant/Unit, during construction and erection period. 1.27 Pre-commissioning, Commissioning and Start-up of the Plant/Unit. 1.28 Carrying out Mechanical Completion. 1.29 Perform all material identification as per application codes and standards. 1.30 Provide winterization during construction. 1.31 Provide drawings and documents as required. 1.32 Supply to OWNER complete test records within three (3) days after completion of actual testing. 1.33 Installation and testing of all underground piping, if any.



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### 2.0 General scope of WORK and Services- Pre-commissioning

LSTK CONTRACTOR shall be responsible for the pre-commissioning phase of the Plant.

LSTK CONTRACTOR shall provide at SITE an adequate number of qualified precommissioning engineers to direct and control pre-commissioning activities.

LSTK CONTRACTOR shall also ensure that all special tools and test equipment required for pre-commissioning are available at its own cost.

LSTK CONTRACTOR shall provide adequate construction labour, construction tools and equipment for pre-commissioning.

Pre-commissioning which shall be performed by LSTK CONTRACTOR shall include, but not limited to the following:

- 2.1 Cleaning, flushing, draining blowing out, steaming out, drying and purging of Equipment and their linings and piping systems, including the installation and removal of temporary blinds, strainers, screens etc., and the replacement of all permanent items removed while the WORK is in progress.
- 2.2 Chemical cleaning wherever required, including but not limited to compressor suction piping and lube and seal oil piping, heaters, supply of chemical and disposal of wastes.
- 2.3. Chemical cleaning of feed water systems, and steam systems. Supply of chemical and disposal of wastes.
- 2.4 Chemical cleaning of any other parts, which have corroded to an extent, which, will detrimentally affect Plant/Unit performance or run length for such reasons as increased fouling due to rust. Supply of chemical and disposal of wastes.
- 2.5 Checking, Testing, calibration simulation test and adjustment of instruments, equipment and systems including control valves and safety devices, and installation and checking of orifices plates and other sensor devices in so far as this can be done before actual operation of the item concerns of complete system and loops.
- 2.6 Function test and checking out of electrical systems including substations, transformers, cables and switchgear, checking of all interlocks and setting of all relays. This shall include drying out operations, filtering of oil if required.
- 2.7 For motor driven equipment, amperage checking of motors and removal of temporary safety screens.
- 2.8 Cleaning of screens and filters replacement and adjustment of packing and seals and tightening of flanges.



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- 2.9 Introduction of fuels.
- 2.10 Introduction of lubricants and oil flushing for machinery.
- 2.11 Introduction of chemical into and initial operation of treatment plant.
- 2.12 Boiling out, bringing up to pressure and performing all required code tests on steam generation facilities and associated instrumentation.
- 2.13 Drying out of stacks and all refractory lined equipment.
- 2.14 For all piping systems, installation and removal of temporary blinds as required, circulation and commissioning of systems including process systems, services, effluent and drainage, utilities distribution, relief and blow down and interconnecting lines.
- 2.15 Test running of all other rotating equipment for 24 hours wherever possible.
- 2.16 Adjustment of all piping expansion and support devices.
- 2.17 Air-drying of Plant/Unit, which is required to be water-free.
- 2.18 Testing (including running, tightness and vacuum) of systems, as necessary to ensure that the sections and components of Plant/Unit are ready for operation.
- 2.19 All such further works which LSTK CONTRACTOR judges to be necessary or in the reasonable opinion of OWNER is necessary to bring the Plant/Unit to a state of readiness for the introduction of feedstock into Process Plant/Unit for processing requirements and for safe commencement of operation.

### 3.0 Basic Plan for Temporary Services

#### **Temporary Construction Facilities**

The LSTK shall arrange following facilities at his own cost for Construction/Erection purpose. Demolition and cleaning of temporary facilities developed for construction purpose shall also be under LSTK Contractor's scope.

- 1. 1 No. 415 V, 63 A Feeder at Existing Substation near 132 KV Switchyard shall be made available. Tapping of Construction Power (chargeable basis) from this feeder (including supply & erection of all required materials like structural supports for cable tray, cable trays, power cables, control cables, protection & metering, cable termination etc. as well as underground cabling work) and further distribution shall be in LSTK Contractor's scope.
- 2. Construction Water (on chargeable basis) shall be made available
- 3. Construction sheds



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- 4. Construction offices
- 5. Temporary Communication facilities
- 6. Office furniture
- 7. Labour colony during construction.

### 3.1 Sewage & Refuse Disposal

All temporary building like site office, canteen etc. shall be provided with individual septic tanks and soak pits for treatment and disposal of sanitary sewers. Construction site shall be provided with a network of temporary drain for disposal of rain water.

### 4.0 Mechanical Completion

Mechanical Completion means the time when all construction, erection & installation work per finally approved P&ID after HAZOP study and pre-commissioning related to the Plant is completed in accordance with the Project drawings and specifications, and all mechanical and pressure tests, including but not limited to hydro-testing, non-operating adjustments, cold alignment checks, final cleanup, hot bolting, refractory drying, field calibration of safety valves, calibration of all instruments, instrument loop checking and testing, monitoring / control / safety systems checking and testing, and all pre-commissioning activities have been completed, all incoming & outgoing services and utilities have been connected to each unit of the PLANT, interconnections of process lines and interconnection are completed and the Plant/Unit is ready in every respect for commissioning and for the first introduction of feed materials.

When OWNER is satisfied that Mechanical Completion of the plant has been achieved, OWNER shall issue certificate of Mechanical Completion to CONTRACTOR in accordance with the CONTRACT for Owner's Approval.

In order to meet this, LSTK CONTRACTOR shall perform all necessary mechanical works, tests and checks.

#### 5.0 COMMISSIONING

### 5.1 Schedule for Commissioning

LSTK CONTRACTOR shall prepare a schedule for commissioning, start-up, and performance testing and initial operation in conjunction with OWNER. This shall be issued at least three months before pre commissioning of the first facility.

This schedule shall include all activities as detailed herein and any other special activities, which require to be performed during commissioning.



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### 5.2 **Commissioning**

LSTK CONTRACTOR shall be responsible to perform commissioning of the Plants and to provide necessary facilities during commissioning of the Plant including the Performance Tests. LSTK CONTRACTOR shall provide commissioning engineers and supporting staff and adequate commissioning labour. LSTK Contractor shall associate OWNER's engineers and operating staff with the commissioning work.

### 6.0 START UP

LSTK CONTRACTOR shall be responsible to perform start-up of the Plant/Unit. LSTK CONTRACTOR shall provide necessary facilities and for Start Up of the PLANT.

### NOTE:

Detail COTRACTOR'S scope of work in relation with the construction / erection, and precommissioning, commissioning and start-up from the point of scope of execution as well as performing way are described in detail in the following Sub-Annexes of Section-7.0.

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### **Sub-Annexure:**

Annex 7 - 1: LSTK Contractor's Work Definition

Annex 7 - 2 : Detail Technical Scope

Annex 7 - 3 : Quality Control Procedures and Inspection

Requirement

Annex 7 - 4 : Schedule Progress Evaluation and Progress

Reporting

Annex 7 - 5 : General Notes



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### **ANNEXURE-7-1**

### LSTK CONTRACTOR'S WORK DEFINITION

# LSTK CONTRACTOR shall perform/provide the following activities but not limited to:

- 1. LSTK CONTRACTOR scope of work shall broadly consist of construction / erection, refurbishing, pre-commissioning, commissioning and Start Up of the Plant under the management of commissioning team it includes but not limited to civil works, fabrication & erection of structural steelwork, field assembly, mechanical erection and / or assembly and installation of all equipment and machinery, piping, electrical systems and network, instrumentation, insulation, painting, etc., except in so far as "Contract" otherwise provides, the provision of all temporary facilities, staff, tradesmen, labour, tools, tackle, construction equipment and materials, insurance, consumables and everything whether of temporary or permanent nature necessary and required in and for the work, so far as the necessity for providing the same is specified or reasonably inferred in or from the contract.
- 2. Perform all civil and building works as per Annex7 2A, titled civil and building works.
- 3. Perform all structural steel works as per Annex 7 2B, titled structural steelwork.
- 4. Perform all piping fabrication and erection works as per Annex7 2C, titled piping fabrication and erection work.
- 5. Perform all equipment erection works as per Annex 7 2D, titled equipment erection work.
- 6. Perform all electrical works as per Annex7 2E, titled electrical work.
- 7. Perform all instrumentation works as per Annex 7 2F, titled instrumentation works.
- 8. Perform all insulation works as per Annex 7 2G, titled insulation works.
- 9. Perform all painting works as per Annex 7 2H, titled painting Specification/work.
  - Supply the materials in order to execute WORK as per CONTRACT.
- 10. LSTK CONTRACTOR shall be responsible for providing services and materials for construction of all temporary facilities, which are essential for successful completion of construction and erection.

The LSTK CONTRACTOR shall establish, operate and maintain all temporary facilities, such



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as, but not limits to:

- a) Labour camp/officers camps
- b) Fabrication shops/yard
- c) Workshop for maintenance of construction/testing equipment.
- d) Field drawing office
- e) Temporary warehouses, including open storage yards.
- f) Construction offices (including facilities for photocopying, drawing reproduction, etc.)
- g) First aid along with ambulance
- h) Lab facilities, including NDT, for testing calibration, etc.
- i) All temporary or approach roads for carrying out the WORK including temporary approach roads for access to LSTK CONTRACTOR'S site office/workshop/camp, etc. ground preparation for heavy lifts including approaches to cranes for heavy lifts. OWNER does not take any responsibility for making temporary roads.
- j) Canteen & catering facilities for all LSTK CONTRACTOR'S work force.
- k) All drainage around the facilities created for his WORK, and sewage disposal arrangements for labour camps/officers camps, site offices, etc.
- I) Necessary transport for movement of its personnel, construction Equipment and Materials, consumables, etc.
- n) Watering of roads through water tankers for dust suppression.
- o) All temporary lighting for working during night.
- p)All temporary hutments, sanitary & potable water and domestic sewerage requirements of LSTK Contractor's work force.
- 11. Supply to OWNER complete survey report within three (3) working days after completion of any survey.
- 12. All excess soil shall be disposed of by LSTK CONTRACTOR outside the premises in a location designated by OWNER representative.
- 13. Perform all nondestructive, hydrostatic and pre commissioning testing required.



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Supply to OWNER complete test records within three (3) days after completion of actual testing.
Perform all welding including radiography required.
Provide drawings and documents as required.
Provide mobilization and demobilization, temporary material and temporary facilities and utilities required executing work.

- 18. Provide winterization during construction.
- 19. Provide scheduling, planning and reporting as per CONTRACT.
- 20. Keep complete administration and control of work, specified in CONTRACT.
- 21. Provide maintenance on all construction and permanent plant material as required during the CONTRACT period.
- 22. Perform all material identifications as per CONTRACT.
- 23. Perform all transportations as required.
- 24. Perform quality assurance, control and supply quality control documentation.
- 25. Perform all pre-commissioning activities as defined in the CONTRACT.
- 26. Provide and supply all procedures for execution of the work in accordance with drawings specifications, and applicable codes and standards.
- 27. Perform all other works and activities and supply all other materials which are required for completeness of the Work either mentioned in the CONTRACT or they are necessary for completeness of the work, in compliance with highest available standards and good quality.

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### ANNEXURE- 7 - 2

### **DETAIL TECHNICAL SCOPE**

### See accompanying by discipline

Annexure-7 - 2A	Civil and Building work
Annexure-7 - 2B	Structural steel work
Annexure-7 - 2C	Pipe prefabrication and Erection
Annexure-7 - 2D	Equipment erection
Annexure-7 - 2E	Electrical work
Annexure-7 - 2F	Instrumentation work
Annexure-7 - 2G	Insulation work
Annexure-7- 2H	Painting work (For detail refer TS-2001)



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### ANNEXURE- 7 - 2A

### CIVIL AND BUILDING WORK

#### 1.0 **SURVEYING**

- 1.1 Base line and base elevation will be furnished to LSTK CONTRACTOR. LSTK CONTRACTOR will furnish all surveys from this base line and elevation.
- OWNER shall have the authority at anytime to determine, in accordance with the drawings or written directives, the correctness on completeness of the lines in use by LSTK CONTRACTOR.
- 1.3 Any erroneous WORK shall be corrected to OWNER'S satisfaction at LSTK CONTRACTOR'S expense.
- 2.0 **SITE**

Finish grading elevation to be as shown on drawing.

LSTK CONTRACTOR'S access to the WORK areas shall be via existing roads.

Any other roads required by LSTK CONTRACTOR are to be developed by LSTK CONTRACTOR.

### 3.0 **EXCAVATION AND BACKFILL**

#### 3.1 Excavation

- Provide all excavation by machine or by hand according to the specifications.
- Excavation is to be executed by LSTK CONTRACTOR in a manner that will provide adequate space for performance, inspection and timely completion of the WORK.
   Supply dewatering as required. The method of dewatering shall be subject to Approval by OWNER.
- Temporary water drainage routing requires prior Approval by OWNER.

#### 3.2 Backfill

All backfills shall be according to the specifications.

All excavations shall be kept dry and workable prior to and during backfiring and compacting.

Material that LSTK CONTRACTOR excavates in the course of WORK and which can be used for backfill, must be approved by OWNER prior to use. All other backfill material as required in this scope of work, drawings and specifications, shall be supplied by LSTK CONTRACTOR.

Back filling shall be to ground level as shown on drawing. The placing of backfill may only

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start after approval by OWNER.

LSTK CONTRACTOR will inform OWNER to arrange for the required proctor tests. Tests shall be done by OWNER on his account.

### 4.0 PILES AND CONCRETE FOUNDATIONS

4.1 Install Piles and major and minor concrete foundations in accordance with the specification and drawings.

### 4.2 Blinding to Underside Foundation Work

Prior to placing a blinding layer of concrete, LSTK CONTRACTOR shall supply, place, compact and prepare the surface of excavated area. After this LSTK CONTRACTOR shall supply a blinding layer of concrete. Blinding layer to be in accordance with specifications and / or drawings.

### 4.3 Reinforcement of Concrete

Cut and bend to bar bending schedules, all type of reinforcing bars.

Store and protect all reinforcing bars against corrosion and any other deleterious effects prior to placing.

Installation of reinforcement including installation of spacers, supports, tying, wire in accordance with the specifications and drawings.

#### 4.4 Anchor Bolts

Install all anchor bolts, in accordance with the specifications and drawings.

The following WORK is included but not limited to LSTK CONTRACTOR'S scope for installation of anchor bolts:

- Deliver of all templates.
- Store and protect against corrosion and any other deleterious effects.
- Place anchor bolts accurately in formwork or by templates, if required, or in pockets.
- Clean and grease anchor bolts threads after Concrete pour and protect bolts after greasing with plastic covers.

#### 4.5 Inserted and Embedded Item

Install all concrete inserts and embedded items, including but not limited to the following items in accordance with the specifications and to the detail drawings to be furnished by LSTK CONTRACTOR.

- Cement In sockets.
- Cinch anchors.



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- Steel sleeves, various size angle.
- Channel shapes with anchors. Curb angles and steel plates.
- Anchor rails.
- Pipe sleeves of heavy duty PVC pipe.

The WORK shall include but not limited to:

Store and protect against corrosion and damage place accurately in Formwork or by templates, if required, or by temporary bars for proper positioning.

- 4.6 The following WORK is included but not limited to LSTK CONTRACTOR'S scope for installation of major and minor foundations:
  - All excavation, including sheet piling, if required, backfill, compacting and the transportation of surplus material, neatly stockpiled at a location, chosen by LSTK CONTRACTOR and approved by OWNER. The supply, installation and maintenance of a complete concrete batch plant, including concrete testing laboratory. Installation of selected backfill material, if required. Supply and delivery and installation of all formwork, assembly and disassembly of all reusable formwork, inclusive if any and all required supporting, bracing, pockets, cutouts, recesses, etc.
  - Bending and installation of concrete reinforcement bars to the requirements and supply of items as defined in 4.3 above.
  - Installation of all anchor bolts (including fabrication of templates), to the requirements and supply of items as defined in 4.4 above.
  - Installation of embedded and inserted items, to the requirements and supply of items as defined in 4.5 above.
  - Installation of construction and expansion joints where required.
  - Mixing, delivery and pouring of concrete in accordance with specifications. Stripping of formwork and removal of all surplus material to LSTK CONTRACTOR'S yard or locations designated by OWNER.
  - All temporary storage of formwork at SITE shall be of an orderly nature. In case storage
    does not comply with the above-mentioned rule, OWNER shall have the right to remove
    formwork from SITE within forty eight (48) hours after first warning and back charge LSTK
    CONTRACTOR for all related costs. OWNER shall not be held responsible for any of
    LSTK CONTRACTOR'S losses.
  - The finishing of concrete, where required to a finish in compliance with the specifications.

A copy of all-concrete mix truck delivery slips if applicable.



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Concrete composition analysis of the concrete batch plant.

All scaffolding required.

All required dewatering to keep the excavations I backfill dry for the WORK.

#### 5.0 CONCRETE STRUCTURES AND ELEVATED SLABS

Install concrete structures, in accordance with the specifications and drawings.

The following work is included but not limited to LSTK CONTRACTOR'S scope for installation of concrete elevated slabs:

See 4.6; however with -following exceptions: No-excavation, no backfill and- no dewater

### 7.0 YARD PAVING AND FINAL SURFACING

### 7.1 Excavation

Setting out and grading by machine and/or by hand for yard paving to the shape and depth in accordance with the specifications and drawings.

Disposal of all excavated material and neatly stock piling to a location chosen by LSTK CONTRACTOR and approved by OWNER.

### 7.2 Concrete Yard Paving

- Mix and install concrete for heavy duty paving areas, in accordance with the specifications and drawings.
- Mix and install concrete for light and medium duty paving areas in accordance with the specifications and drawings.
- The following work is included but not limited to LSTK CONTRACTORS scope for installation of concrete yard paving: See 4.6 above
- Surface preparation, including the supply and placing of waterproof building paper or similar waterproof material, well lapped at joints, laid on top of the well compacted sand layer and before pouring concrete.
- Reinforcement for heavy duty paving at top and bottom face and for light duty paving at top face only, with square mesh fabric reinforcement including protection against corrosion, the cutting, the bending and placement.
- Mixing and pouring of concrete in accordance with specifications, sufficient vibrating.
   Stopping clear from bases, plinths and piers and forming around surface and lay to give levels and falls.
- Installation of construction / expansion joints.



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### 7.3 Unpaved Areas

Install gravel, tiles or crushed stone on leveled unpaved areas, all in accordance with the specifications and drawings.

### 7.4 Concrete Tiles for Walkways

Install well compacted sub-base layer and install the tiles on the sub-base all in accordance with specifications and drawings.

### 8.0 **CONCRETE PIPE SLEEPERS**

Fabricate and install reinforced concrete sleepers for pipe, complete with foundations in accordance with the specifications and drawings.

### 9.0 MANHOLES AND CATCH BASINS, TRENCHES

- 9.1 Fabricate and install pre-cast or formed and poured in situ concrete manholes and catch basins and trenches in accordance with the specifications and drawings.
- 9.2 The following work is included but not limited to LSTK CONTRACTOR'S scope for installation of manholes and catch basins. All excavation including sheet piling of required, backfill, compacting and the transportation of surplus material, neatly stockpiled at a location, designated by LSTK CONTRACTOR and approved by OWNER.

#### For Poured in Site

- Delivery and installation of all formwork, inclusive if any and all required supporting, bracings, pockets, cutouts recesses etc.
- Bending and installation of concrete reinforcement bars to the requirements and supply of items as defined in 4.3 above.
- Fabrication and installation of embedded and inserted items, if any, to the requirements and supply of items as defined in 4.5 above.
- Mixing and pouring of concrete in accordance with specifications.
- Stripping of formwork and removal of all surplus material to LSTK CONTRACTOR'S yard or locations designated by OWNER.
- All required dewatering to keep the excavations / backfill dry for installation work.
- Install cast iron manhole frames and solid cover and fabricate and install steelwork catch basin grating and frames in accordance with specifications.

### 10.0 COLLECTION BASINS, PITS, SUMPS, RETAINING WALLS AND CULVERTS

- 10.1 Fabricate and install concrete collecting basins in accordance with the specifications and drawings.
- 10.2 Fabricate and install concrete sumps and pits in accordance with the specifications and drawings.



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- 10.3 Fabricate and install concrete walls around tanks and other retaining walls in accordance with the specifications and drawings.
- 10.4 Fabricate and install concrete pipe and bridge culverts including head walls in accordance with the specifications and drawings.

#### 11.0 **DITCHES AND TRENCHES**

11.1 Fabricate and install earthen and concrete ditches and trenches including connection pipes and boxes in accordance with the specifications and drawings.

#### 12.0 STEEL SLIDING PLATES AND PTFE SLIDING PLATES

### 12.1 Steel Sliding Plates

- Fabricate and install steel sliding plates in accordance with specifications and drawings.
- The following work is included, but not limited to LSTK CONTRACTOR'S scope for fabrication and installation of steel sliding plates
- Pick up materials, storage and protection against corrosion and any other deleterious effects.
- Fabricate, place in pockets, level and grout, protect against possible damage and corrosion.

### 12.2 **PTFE Sliding Plates**

- Install sliding plates, in accordance with the specification and drawings.

The following work is included but not limited to LSTK CONTRACTOR'S scope for installation of sliding plates pick up materials, transport, store and protect

- Place in pockets, level and grout, protect against possible damage.

#### 13.0 **GROUTING**

- 13.1 Mix and install grouting in accordance with the specifications and drawings.
- 13.2 LSTK CONTRACTOR shall grout under all structural steel columns and under all equipments, as specified.
- 13.3 The following work is included but not limited to LSTK CONTRACTOR'S scope for installation of grouting:
  - Prepare top surface of base and /or plinth, pockets, sleeves etc., prior to placing grout.
  - Mix and install grout mortar in accordance with specifications.



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- Grout mortar shall be used between steel base plate and concrete foundations.
- Mix and install non-shrink grout between reciprocating rotary equipment base frame including the filling of the equipment steel frame, if required, and concrete foundation in accordance with manufacturer specifications and project specifications.
- Grouting of equipment shall proceed only when equipment setting has been accepted by OWNER.

#### 14.0 **ASPHALT PAVING**

- 14.1 Mix and install asphalt paving over base courses installed by LSTK CONTRACTOR, in accordance with the specifications and drawings.
  - Roads/ Driveways/ Parking areas/ Sidewalks/ Tank pads
- The following work is included but not limited CONTRACOR'S scope for installation of asphalt paving to.
  - Installation of all materials necessary to make a complete installation.
  - Installation of sub-grade, sub-base and base courses all properly compacted.
  - Delivery and installation of all formwork, inclusive if any and all required supporting, bracing, pockets, cutouts, recesses, etc.
  - Installation of expansion joints where required and/or construction joints
  - Stripping of formwork and removal of all surplus material to LSTK CONTRACTOR'S yard or locations designated by OWNER.
  - Mixing, delivery, installation, spreading and compaction of asphalt paving mixture in accordance with specifications.
  - Any and all measures for proper asphalt paving installation and curing.

### 15.0 **ROAD REPAIR AND MAINTENANCE**

- 15.1 Supply and deliver necessary materials, equipments and labour to repair and maintain all plant roads, as necessary.
  - Repair work shall be in accordance with the specifications.
  - LSTK CONTRACTOR shall be responsible for repair of roads, all on the indication of OWNER due to the damage to the roads, caused by LSTK CONTRACTOR'S activities and construction operations, or due to faulty construction by LSTK CONTRACTOR. LSTK



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CONTRACTOR is not entitled for compensation for such repair work.

### 16.0 **REPAIR OF DYKES, SLOPES AND DITCHES**

- Supply and deliver necessary materials, equipment and labour to effect repairs on dykes, slopes and ditches as necessary.
  - Repair WORK shall be in accordance with the specifications.
  - LSTK CONTRACTOR shall be responsible for repair of dykes, slopes and ditches all on the indication of OWNER'S representative, due to damage to the dykes, slopes and ditches caused by LSTK CONTRACTOR'S activities and construction operations, or due to faulty construction by LSTK CONTRACTOR.
  - LSTK CONTRACTOR is not entitled for compensation for such repair work.

### 17.0 UNDERGROUND SEWERS AND PIPING SYSTEMS

- 17.1 Install the underground piping systems, in accordance with the specifications and drawings.
- 17.2 The following work is included but not limited to LSTK CONTRACTOR'S scope for installation of underground piping systems.
  - Excavation including sheet piling, if required, backfill, compacting and the transportation of surplus material, neatly stockpiled at a location designated by LSTK CONTRACTOR and approved by OWNER.
  - Installation of sand backfill if required
  - Receiving unload, inspect and transport LSTK CONTRACTOR'S supplied materials and store and protect.
  - Installation of piping materials necessary for a complete installation.
  - The installation of above ground fire hydrants, fire monitors and standpipe as well as the underground firewater system.
  - The fabrication and installation of supports and thrust blocks for the piping as required.
  - Surface preparations and installation of coating and wrapping of the underground piping, if required as per Technical specification Mentioned in **Annexure-7 2C**
  - Installation of glass fiber reinforced epoxy piping in accordance with manufacturer's instructions as well as the specifications.
  - Hydrostatic pressure testing of the underground piping systems including test apparatus,



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test piping, test blinds, bolts and gaskets in accordance with the specifications.

### 17.3 Hydro Testing of Sewers and Underground Lines

- Tests all sewers and underground piping systems as per test instructions. Testing is to be witnessed and approved by OWNER. A test schedule by test system shall be prepared by LSTK CONTRACTOR. Testing and completion shall be in accordance with project system priorities.
- Piping systems shall be tested with suitable water.
- Develop test system procedures and follow priorities established by OWNER. LSTK CONTRACTOR shall prepare detailed schedules based on this data for submittal to OWNER for his approval.
- The water for testing purposes is to be provided by LSTK CONTRACTOR.
- Inexpensive temporary gaskets shall be used in place of permanent gaskets where test blinds are located for hydrostatic testing. On successful completion of a test, the permanent gasket shall be installed when the blinds are removed.
- After hydro testing, LSTK CONTRACTOR shall perform the following activities:
- Flushing
- Remove temporary blinds
- Install permanent gaskets.
- Flange connection bolts tightened.
- Coat and wrap welds.
- Holiday testing and coating repairs.
- Backfill and compaction.

### 18.0 CIVIL PART FOR UNDERGROUND ELECTRICAL GROUNDING SYSTEM

- 18.1 Excavation of the routing for the direct buried cables, for the road crossing and for the branch conduit and sleeves in accordance with layout and detail drawings.
- 18.2 Transport of the excavated soil, neatly stockpiled to location chosen by LSTK CONTRACTOR and approved by OWNER.
- 18.3 Installation of all protection conduits and installation materials in accordance with the specification, and design and detail drawings.
- Transport of excavated soil and backfill including compacting of the round up to finished plant level.

#### 19.0 CIVIL PART FOR UNDERGROUND CABLE TRENCHES (AND CABLE) CIVIL PART



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19.1 Excavation of the routing for the concrete cable trenches for the direct buried cables, for the crossings and for the branch conduit and pipe sleeves by machine or by hand as dictated by local conditions. 19.2 Transport the excavated soil, properly stockpiled to a location off chosen by LSTK CONTRACTOR and approved by OWNER. 19.3 Installation of the concrete cable trenches in accordance with the specification and the design and detail drawings. 19.4 For scope of installation of concrete cable trenches see item 11. 19.5 Installation of the road culverts, protection sleeves and cable ducts at road crossing in accordance with layout and detail drawings. For scope of installation see item 10 19.6 Transport of the excavated soil and backfill of the surrounding area of the concrete trenches up to finished plant level. 19.7 Transport of the excavated soil and backfill of road crossing up to road including the supply and installation of the repair of the paving and / or asphalt road covering. 19.8 Transport and backfill of the trenches with a layer of clean sand, free from stones equalized up to the bottom level of the first (bottom) cable layer. 19.9 Transport and backfill of the layer of clean sand between cable. Layers and above top cable layer. 19.10 Transport of excavated soil and backfill including compacting of the ground up to the layer of concrete tiles or trench covers. 19.11 Installation of the cable protection covers and/or trench covers and /or cable routing colored marking tape. 19.12 Transport of the excavated soil and backfill including compacting of the ground above the layer of concrete tiles up to finished plant level. 19.13 Installation of the cable route designated, trench markers. 20.0 STORAGE TANK PADS AND DYKES 20.1 Install tank pads as specified and as quantified on the specifications and drawings. 20.2 Install tank dykes and ramps as specified and as quantified on the specifications and

drawings.



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20.3 Install impervious clay layer inside the dyked tankage areas in accordance with specifications and drawings.

#### 21.0 PERMANENT PLANT FENCING

21.1 Install permanent plant fencing, including personnel gates and truck gates as located, specified and quantified in the specifications and drawings.

#### 22.0 **SCAFFOLDING**

- 22.1 Supply and erect all scaffolding for WORK.
- 22.2 Scaffolding shall be supplied, erected and maintained in strict accordance with local and governmental regulations as well as OWNER'S safety requirements. If there are conflicts, the more stringent shall prevail.

LSTK CONTRACTOR shall dismantle all its scaffolding at the completion of its WORK.

#### 23.0 **TESTING**

- All necessary tests in order to control the quality of the field works shall be done and all such test certificates should be kept in record, such as but not limited to
  - Soil compaction tests.
  - Concrete testing
  - Asphalt testing
  - Reinforcing bars testing
- 23.2 If any test fails LSTK CONTRACTOR shall replace those items, which do not meet the requirements.

All costs for replacements shall be borne by LSTK CONTRACTOR.

### 24.0 WELDING PROCEDURES SPECIFICATIONS AND WELDING PROCEDURE QUALIFICATION RECORDS

- 24.1 Provide within two months before starting the construction execution, its welding procedures (for A.G, U.G piping and any structural steel) for comment and approval. Approval of welding procedures by OWNER is required before the start of welding.
- 24.2 Prior to start of filed welding LSTK CONTRACTOR shall submit one (1) copy of all welders' qualification paper and applicable welding procedures approved and stamped by regulating authorities to OWNER.

#### 25.0 DRAWINGS AND DOCUMENTS

25.1 LSTK CONTRACTOR will carry out all construction activities directly from the AFC construction drawings and specifications.

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- 25.2 LSTK CONTRACTOR shall submit reports of each test or inspection within three (3) days after actual test or inspection. Failure to comply with the above rule may result in OWNER arranging for additional tests or inspections. Costs of which will be back charged to LSTK CONTRACTOR.
- 25.3 LSTK CONTRACTOR shall submit material certificates and quality records of the materials, as specified in previous sections and the applicable engineering specifications and standards.
- 25.4 LSTK CONTRACTOR shall also furnish a concrete installation record within two (2) weeks after completion of the WORK indicating, date of installation and quantity of concrete of each foundations, floor slab, elevated slab, frames, columns, etc.

This concrete installation record shall also show a reference with the concrete compression test certificates of the respective concrete pours and the concrete delivery slip numbers.

Failure to comply with the above time may result in the preparation of the documents by OWNER in which case all related costs will be back charged to LSTK CONTRACTOR.

#### 26.0 MISCELLANEOUS

- 26.1 LSTK CONTRACTOR shall be fully responsible for the correct and accurate setting out of all elevations, positions, dimensions, alignments, profiles. etc, of all parts of the WORK and for the provision of all necessary instruments, appliances and labour in connection therewith The checking of any such matter by OWNER shall not relieve LSTK CONTRACTOR of its responsibility for the correctness thereof.
- 26.2 If during the construction or maintenance of WORK, any error is discovered in WORK, LSTK CONTRACTOR shall at its own cost rectify such error to the satisfaction of OWNER. LSTK CONTRACTOR shall in such case take all necessary actions such as overtime, etc. in order not to endanger the agreed upon time schedule.
- All dimensions shown on the plans and drawings are given in the SI system, unless otherwise stated.
- All costs for setting out the earthwork and for assisting OWNER in checking the various points, lines, levels, profiles, etc. shall be deemed to be included in the price.
- 26.5 LSTK CONTRACTOR shall under no circumstances extend its operations outside the limits of the area appropriated for WORK. LSTK CONTRACTOR will ensure that its operations shall not interfere in any way with properties of others.
- No excavation work shall be started before the exact positions of the WORK have been marked by means of stakes controlled and approved by OWNER.
- 26.7 OWNER shall notify LSTK CONTRACTOR of all known existing underground pipes, cables,

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drains, manholes, etc, in current use, together with the approximate locations and hazards involved and LSTK CONTRACTOR shall ensure that they will not be broken or damaged in any way by the execution of WORK. Hand labour shall be used for excavation within a horizontal distance of 1.5 meters from existing utilities.

- 26.8 Any damage as referred to above shall be reported by LSTK CONTRACTOR. LSTK CONTRACTOR shall repair the damage.
- The discovery of any unregistered pipes, drains, cables, etc., shall be promptly reported to and deals with as directed by OWNER. Excavation, as required to determine the exact location of existing underground pipes, drains, cables etc. shall be considered as a part of WORK.
- 26.10 LSTK CONTRACTOR shall take precautions i.e. mats, lining with timber, etc. not to cause damage to permanent plant roads curbing and sidewalks with its construction equipment.
- 26.11 LSTK CONTRACTOR shall provide and be responsible for the construction of all temporary dewatering. Drainage, sheet piling, timbering etc. to ensure the stability of slopes, trenches, embankments, etc. during excavation work and that all areas are adequately drained to the satisfaction of OWNER.
- LSTK CONTRACTOR is responsible for all soil slides that may occur during the execution of the WORK and for any detrimental effect of the same. LSTK CONTRACTOR shall as directed by OWNER either correct or repair the damage to the satisfaction of OWNER at its own expense or pay for the cost of repair by others of all damage caused to the WORK or adjacent property. No additional payments shall be made to LSTK CONTRACTOR to compensate the financial consequences of soil slides.
- 26.13 Collapse, cave-in, or movement of excavations, trenches, or the like shall be the responsibility of LSTK CONTRACTOR. LSTK CONTRACTOR acknowledges this responsibility and instructions of the OWNER.
- 26.14 Trenches, excavations, and the like shall be maintained in strict accordance with the requirements of the applicable national and local regulations.
- 26.15 LSTK CONTRACTOR shall be held entirely responsible for any effect or damage, which the execution of any of the earthwork may have upon, or which may be caused to any portion of WORK or any of the surrounding property.
- 26.16 Excavation will proceed until all unsuitable material is removed.
- 26.17 LSTK CONTRACTOR is responsible for the excavation required to installing bottom of footings at elevations as shown on drawings. The removal of a poor soil below the intended bottom of excavation is included in the CONTRACT. Any unnecessary over excavation will be in LSTK CONTRACTOR'S account.
- 26.18 Backfill shall be to the elevation shown on the approved drawings or as directed in writing



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by OWNER.

- 26.19 Special care must be taken in compaction operations over underground pipelines.
- LSTK CONTRACTOR shall furnish all field engineering, surveying, layout, and checking to properly install all foundations to meet all requirements of the drawings and specifications, on completion of each foundation LSTK CONTRACTOR shall mark all foundations with a clear center line, locating both North, South, East and West and a bench elevation mark. LSTK CONTRACTOR shall stencil or by other means, paint equipment and column designation and coordinates, to all foundations installed by LSTK CONTRACTOR. All markings shall be located above high point of paving. These markings shall be preserved for use by others.
- 26.21 LSTK CONTRACTOR shall design concrete mix specification and furnish by means of reports from OWNER'S laboratory, proof that the materials and mixes for concrete conform to the specifications and codes prior to pouring the first concrete on SITE. LSTK CONTRACTOR shall furnish all field labour to make concrete tests and fill cubes quality of concrete aggregates and mix design will be checked by OWNER'S laboratory regularly.
- All aboveground concrete for supports for steel structures must be smooth finished, and exposed edges of concrete to have a chamfer.

The top of the foundations shall be poured so as to ensure true surfaces and designated slopes in all cases. LSTK CONTRACTOR is to avoid damage or movement of already installed reinforcement and/or other structures, formwork, etc., when pouring concrete.

- All concrete pours for a given element must be monolithic, except where noted on the drawing or approved by OWNER.
- 25.24 If pouring cannot be finished within normal working hours, necessary actions shall be taken, sufficiently in advance for requesting permits for overtime. All pouring must be continued until the element is complete. OWNER shall be informed at least twenty-four (24) hours in advance.
- Damaged formwork must be repaired in such a way as not to mark the concrete finish. All formwork must be braced adequately and be of a rigid construction. Gravel nests, surfaces crack, honeycombs, etc., and shall be repaired to the satisfaction of OWNER.
- 26.26 LSTK CONTRACTOR shall use immersion-vibrating equipment but it needs to be of a type approved by OWNER prior and also during use. Vibration of formwork and fresh concrete WORK is not allowed. OWNER will have the right to require replacement of inadequate during all phases of the WORK. A must condition shall be maintained after pouring as set forth in specifications. The WORK involved in this is to be included in the pricing.
- OWNER reserve the rights to reject any WORK already poured which is not in accordance with drawing and specifications and of adequate quality.



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Serious inclusions appearing in concrete shall be reason for the rejection of WORK and LSTK CONTRACTOR requested to repair or replace at his own expense.

- 26.28 All costs involved in demolition, removal and replacement of rejected WORKS shall be the responsibility of LSTK CONTRACTOR all materials, equipment or auxiliaries not accepted by OWNER shall be removed immediately from the OWNER'S property.
- 26.29 Ready - mixed concrete shall be delivered without segregation. The concrete batch plant has to be approved by OWNER. Small quantities of concrete may be made at SITE after approval of OWNER.
- 26.30 The pouring of any reinforced concrete may only start after having obtained Approval of OWNER.
- 26.31 LSTK CONTRACTOR shall provide, during the period of this CONTRACT, temporary drainage ditches in WORK so that water will not be pended and so that all areas are adequately drained to the satisfaction of OWNER.
- 26.32 LSTK CONTRACTOR shall provide, during the period of this WORK, systems for the dewatering of all its WORK areas as required to properly execute the WORK. All dewatering methods shall be subject to the approval of OWNER.
- 26.33 All excavated boulders will be removed from SITE by LSTK CONTRACTOR.
- 26.34 Manholes are to be marked with M.H. Number.
- 26.35 Underground service lines have to be marked at their installation limits to aboveground piping, indicating line size, and service and line number.
- Prefabricated concrete -items are to be marked with date of fabrication, size, Length, 26.36 identification code and installation north arrow.

#### 27.0 **BUILDINGS**

- 27.1 LSTK CONTRACTOR shall do the construction of the buildings, including all activities and installations as specified, in drawing and specifications including the fabrication of all items that are not standard hardware components.
- 28.0 Quality of all civil and building materials shall be approved by OWNER before usage in the PLANT.



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#### **ANNEXURE-7-2B**

### STRUCTURAL STEELWORK

- 1. Delivery of all materials and fabricated structural steel to SITE, including all required transport, storage, intermediate storage, etc., including loading and unloading of materials.
- 2. LSTK CONTRACTOR will carry out all construction from the AFC construction *I* erection drawings and specifications.
- 3. LSTK CONTRACTOR shall be held entirely responsible for any effect or damage, which the erection of the structural steel may have upon, or which may be caused to any portion of WORK or any of the surrounding property.

### 4. Erect Structural Steel-Structure Frames

This item covers all activities required to erect prefabricated structural steel framing for single and multilevel structures.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Shimming of foundations and joints.
- Erecting.
- Cutting, drilling, welding and bolting to achieve fitment.
- Rectification required, if any.
- Final levelling, aligning and bolting (including torquing).
- Grouting of components and areas supplied unpainted or requiring finish coats, as per specifications.
- ♦ Touch up painting of damaged areas.
- Also included in this item are all clips plates, stiffeners, gussets, and connection material supplied loose for field installation.



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#### 5. Fabricate and Erect Structural Steel-Structure

This item covers all activities required to fabricate and erect structural steel framing for single and multilevel structures, from raw steel, if any, sections, plates, rounds, etc. It including, but is not limited to the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Preparation of detailed fabrication drawings and getting them approved from Owner.
- Shimming of foundations and joints.
- Measuring, cutting, bending, bolting and / or welding.
- Erecting.
- Cutting, drilling, welding and bolting to achieve fitment.
- Final levelling, aligning, bolting and /or welding (including torquing)
- Grouting of support piers.
- Painting as per specifications.

### 6. Fabricate and Erect Ladder and Safety Cages

This item covers all activities required to fabricate, assemble and erect ladders and safety cages in steel structures, from raw steel (unpainted) sections, plates rounds, etc.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Preparation of detailed fabrication drawings and getting them approved from Owner.
- Measuring, cutting, bending, bolting and / or welding.
- Assembly and erecting including cutting, drilling, bolting, welding to achieve fitment.
- Cutting, drilling, welding and bolting to achieve fitment.
- Final Bolting and / or welding in position.
- Fabrication and installation of safety barrier rail and gate.
- Installation of raw bolts and forming of concrete pads, or connecting to a lower platform.
- Painting as per specifications.

### 7. Fabricate and Erect Platform and Walkways

This item covers all operations required to fabricate erect platforms and walkways on vessels, towers, structures, etc or on the ground from raw steel (unpainted) sections, plates, rounds, etc.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Preparation of detailed fabrication drawings and getting them approved from Owner.
- Measuring, cutting, bending, bolting and / or welding.
- Erecting including any, cutting, drilling, welding for fitment.



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- ◆ Final levelling, bolting and / or welding.
- Installing anchor bolts and grouting.
- Painting as per specifications.

Not including is the installation of flooring or the erection of handrail.

### 8. Fabricate and Erect Welded Handrail

This item covers all operations required to fabricate and erect double rail handrail and tope plate of all welded construction, from raw steel (unpainted) sections, plates rounds, etc.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Preparation of detailed fabrication drawings and getting them approved from Owner.
- Fabrication including cutting, bending, welding, etc.
- Erecting of posts, top and middle rails toe plate including any cutting, trimming for figment and welding.
- Grinding smooth of all cut edges and welds.
- Painting as per specifications.

#### 9. Fabricate and Erect Galvanized Tubular Handrails

This item covers all operations required to fabricate and erect double rail tubular galvanized hand railing including all standards, fittings, bends, etc., from raw steel (unpainted) sections, plates, tubes, etc.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Fabrication including cutting, trimming edge stripping to required size & shape.
- Erecting into position.
- Bolting and/or welding.
- Trimming to suit platform structure and providing openings for pipe or cable, etc.
- Making good edges, and touch up painting including cold galvanizing of cut or welded parts.
- Painting of unpainted steel sections

### 10. Fabricate and Install Floor Grating



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This item covers all activities required to fabricate and install galvanized floor grating from large sheets ready for cutting, trimming, etc., to platform shapes.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Fabrication including cutting, trimming, edge stripping to required size & shape.
- Erecting into position.
- Bolting and/or welding.
- Trimming to suit platform structure and providing openings for pipe or cable, etc.
- Making good edges, and touch up painting including cold galvanizing of cut or welded parts.

### 11. Fabricate and Install Chequer Plate Flooring

This item covers all activities required to fabricate and erect chequer plate flooring, from sheets.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Fabrication including cutting, trimming edge stripping to required size & shape.
- Erecting into position.
- Bolting and/or welding.
- Cutting to suit platform structure and providing opening for pipe or cable, <etc.</li>

#### 12. Erect Davits

This item covers all activities required to erect fabricated davits on exchangers, vessels or in structures.

It includes, but is not limited to, the following:

- Delivery of davits and all other materials.
- Provision of all tools, equipment and consumables used in the course of the work.
- Erecting up painting of damaged areas.

### 13. Roof and Wall Sheeting

This item covers all activities required to erect by bolting of roof and wall sheeting. It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Cutting and fitting of sheeting including all shrilling, trimming and notching to facilitate openings.
- All flashing of ridges, corners gables, door jambs, etc.



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#### 14. Down pipes and Gutters

This item covers all activities required to install metal downpipes and gutters.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Erecting including fitting, trimming supporting and jointing.

### 15. Roof or Ridge Ventilator

This items covers all activities required for the erection of roof or ridge ventilators on a steel clouded building.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Erecting on roof including any trimming or figment.

### 16. Install Gantry Crane Rails

This item covers all activities required to install rails.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Erecting jointing levelling, aligning, and bolting or welding in passion.

### 17. Install Gantry/Overhead Travelling Crane

This item covers all activities required to erect and complete the installation of overhead cranes.

It includes, but is not limited to, the following:

- Provision of all tools, equipment and consumables used in the course of the work.
- Erecting into rails.
- Installing all controls, both mechanical and electrical.
- Testing and running of crane.

### 18. **Install Travelling Trolleys**

This item covers all activities required for the installation of beam mounted travelling trolley.

It includes, but is not limited to, the following:

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- provision of all tools, equipment and consumables used in the course of the work.
- Erecting into position.
- All levelling and shimming of trolley beam as required.
- Marking of all beams and trolley with safe Working Load.
- All testing and running as required.

#### 19. Inspection and Testing

- Inspection of steel structure shall be in accordance with the codes and standards.
- ♦ LSTK CONTRACTOR shall provide NDE services acceptable to OWNER. NDE inspection shall be carried out in accordance with standards, codes and specifications.
- ♦ LSTK CONTRACTOR shall be responsible for the repair of faulty welds and for all required extra radiography and inspection of the faulty welding work. In case of a faulty weld, 100% radiography on LSTK CONTRACTOR'S account can be done as per code.



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#### ANNEXURE- 7 - 2C

#### **PIPE PREFABRICATION AND ERECTION**

#### 1.0 **PIPING**

#### 1.1 Magnitude of Piping

LSTK CONTRACTOR shall prefabricate, install and test all piping as shown on the plan drawings and isometrics.

#### 2.0 PIPING FABRICATION AND ERECTION

- 2.1 Piping systems and pipe supports shall be designed, fabricated, inspected, and tested in accordance with rules, codes, specifications and drawings.
- 2.2 Miscellaneous piping materials for vents, drains, instrument connections, etc. on equipment shall be installed using P & ID'S and equipment drawings.
- 2.3 The fabrication and erection of piping includes field welds. It is LSTK CONTRACTOR'S responsibility to choose the number and location of field welds to ensure efficient transportation and handling during erection. Furthermore LSTK CONTRACTOR shall locate the field welds in such a way that final adjustment for fit-up purposes will be possible.

For alloy piping that has to be stress relieved after welding the number of filed welds shall be kept to a bare minimum. LSTK CONTRACTOR shall thoroughly evaluate the need for each field weld in alloy piping he deems necessary.

- 2.4 LSTK CONTRACTOR will furnish OWNER with a marked up set of isometrics identifying all spool pieces, and weld numbers. All piping spools shall be clearly identified, per isometric by means of stainless steel tags affixed with wire.
- 2.5 LSTK CONTRACTOR shall erect all prefabricated and straight run piping as required by the drawings and specifications.

The erection and installation of the piping shall include but not be limited to the following

- Control valves.
- Safety valves
- Rapture disks.
- Level instrument and gauges.
- External level displacers.
- Special fittings.
- Breaching of vents, drains, instrument connections, etc.
- Rota meters.



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- Orifice flanges.
- Orifice plates.
- In line instruments.
- Steam tracing.
- Steam traps.
- Extension stems. Valve operators.
- Bellows, expansion joints and similar specialty items.
- Thermowells (flanged, screwed and weld Ins.).
- Sample coolers.
- Instrument connections (up to and including the first block valve).
- Spring hangers and spring supports.
- Installation of miscellaneous piping and instrumentation supplied by equipment vendor.
- Temporary piping for drying, flushing and hydrostatic testing if necessary.
- Connection of piping to equipment.
- Connection of aboveground piping to underground piping.
- Pipe supports.

This shall include any necessary work to the piping to correct equipment misalignment.

- 2.6 Fastening of floor supports on concrete will be done with expansion type foundation bolts, if no anchor bolts are provided.
- 2.7 LSTK CONTRACTOR is responsible for the installation of steam tracing of piping, valves fittings and instruments where required, in accordance with the specifications and drawings. In general steam and condensate headers will be indicated on the piping plans. Lines to the traced will be indicated on P& ID'S and lines lists. Details of steam and condensate headers will be shown on separate drawings. Identification of steam tracers shall be by aluminum tag noting circuit number. Each end of system should be tagged.

A method of identification and tagging of the other various systems shall be established, subject to approval by OWNER and is for account of LSTK CONTRACTOR.

2.8 LSTK CONTRACTOR is responsible for the fabrication and erection of pipe supports, hangers, anchors and guides, as required by the drawings and specifications.

Spring pots and spring hangers, which shall be provided by LSTK CONTRACTOR as will be assembled, installed, adjusted and unlocked by LSTK CONTRACTOR after hydrostatic testing of the line. The required angle iron, will be decided in the field and supplied by LSTK CONTRACTOR.

2.9 LSTK CONTRACTOR shall install and remove all temporary strainers required for WORK defined herein. The removal of these items will be directed by OWNER. OWNER may decide to leave temporary strainers in during commissioning.



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2.10 LSTK CONTRACTOR shall be responsible for the fabrication, installation and dismantling of temporary spool pieces and blinds required for control valves, safety valves and in - line instruments during testing and cleaning. Requirements for these shall be minimized. Requirements for these will be prescribed by OWNER.

In general, in-line instruments, safety valves and control valves may be installed for fit-up purposes if available to avoid the use of temporary spool pieces. They shall be removed for flushing and testing and reinstalled as directed by OWNER. In the case of safety valves these must be installed for fit - up, taken down for calibration by LSTK CONTRACTOR, and reinstalled before mechanical completion. All open flanges and valves shall be blinded or plugged off.

- 2.11 LSTK CONTRACTOR is responsible for the installation and testing of all piping and steam, electrical tracing and all materials including all items necessary to completely close the systems in strict accordance with the established test system procedures and priorities as directed by OWNER.
- 2.12 **Wrapping & Coating:** Surface preparations and installation of Wrapping & Coating of the underground piping with Cold tape (Materials for line coating and wrapping shall be of Tape coating system (Polyethylene backed tape with butyl rubber based adhesive system), if required
  - 2.12.1 Protective coating shall consist of a coating system employing Primer, Inner Wrap and Outer Wrap.
  - 2.12.2 The coating system shall be mechanically applied by an approved type of wrapping machine utilizing constant tension brakes except at tie-in welds, repair patches and at other locations where mechanical application is not practicable.
  - 2.12.3 Coating and wrapping materials shall be handled, transported, stored and applied strictly in accordance with the manufacturer's instruction.
  - 2.12.4 Wrapping Coating material is Cold tape type from **Polyken/Denso/Atla** shall be used.

#### 2.13 Flushing and Cleaning Of Piping Systems

- i) Sections fabricated in LSTK CONTRACTOR'S workshop shall be fitted with plastic end caps to seal pipe ends, and jointing surfaces shall be suitably protected.
  - These caps shall not be removed until sections are in the course of erection after delivery at SITE and then shall be removed for refuse.
- ii) During fabrication and erection the sections shall be inspected or internal cleanliness.
- iii) The water which will be used for testing and flushing of the piping system shall be recollected per instruction given by OWNER.
- v) Piping systems shall be flushed with suitable water as supplied by LSTK Contractor FORM NO: 02-0000-0021 F2 REV3



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unless designated for nitrogen or air testing or otherwise specified by licensor. OWNER'S approval is required before start of flushing.

- v) LSTK CONTRACTOR shall supply all equipment, pumps, gauges, etc. required for flushing and testing of the piping systems.
- vi) For hydro testing and flushing the piping LSTK CONTRACTOR shall weld and caps and install drain plugs, remove end caps after successful hydro test.

#### 3.0 **HYDRO TESTING**

- Inspection and hydro testing of the piping systems shall be in accordance with the drawings and specifications and in strict witness by OWNER representatives.
- 3.2 Atmospheric pressure systems shall be:
  - Visually inspected that all joints are properly made.
  - Filled with water for a 24 hours leakage test under atmospheric conditions.

If any leakage occurs in the system during testing, repairs must be made without extra costs to OWNER.

- 3.3 LSTK CONTRACTOR shall test all piping systems as per the project test diagrams. Testing is to be witnessed and approved by OWNER and where applicable by the appointed (independent inspection authority) filed inspector. A test schedule by test system shall be prepared by LSTK CONTRACTOR and shall be submitted to OWNER for Approval.
- 3.4 Testing and completion shall be in accordance with project system priorities.
- 3.5 All equipment, pumps, gauges, pressure recorders temporary piping and fittings, test gaskets and bolting, required for testing of the piping systems and part of LSTK CONTRACTOR'S supply. Before testing LSTK CONTRACTOR shall calibrate its testing equipment.
- 3.6 LSTK CONTRACTOR shall supply and install blind flanges when required to enable testing of the lines.
- 3.7 Inexpensive temporary gaskets supplied by LSTK CONTRACTOR, shall be used instead of permanent gaskets where test blinds are located for hydrostatic testing. On successful completion of a test the permanent gasket shall be installed when the blinds are removed.
- 3.8 Piping systems shall be tested with suitable water. Extreme care shall be taken that suitable water is used for stainless steel systems. For stainless steel the water must be approved by OWNER and shall have a content of chlorides ≤ 50 mg/L
- The water for testing purposes will be furnished by LSTK CONTRACTOR.
- 3.10 LSTK CONTRACTOR is to perform the testing in a sequence so as to allow sufficient time for



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insulation and/or painting to complete within the time frame of the project schedule.

- 3.11 A formal system of documentation will be developed by LSTK CONTRACTOR and approved by OWNER for use by LSTK CONTRACTOR to certify this testing phase of the piping erection. This system will also include a section for supplying OWNER'S "But list" comments.
- 3.12 Erected piping shall be hydrostatically tested in test systems, but not through equipment, control valves etc. except where piping is welded to equipment.
- 3.13 LSTK CONTRACTOR remains responsible for ensuring that no item of equipment, or instrument, is damaged by the test pressure or the test fluid. Suitability of test fluid to be Approved prior to testing by the OWNER.
- It is emphasized that the installation of temporary strainers prior to testing shall be part of WORK. OWNER shall be contacted concerning installation of temporary strainers.
- 3.15 When lines are pressure tested, valves at the end of the lines must be covered with a test blank for safety reasons. A record, preferably on the test diagrams, shall be kept by LSTK CONTRACTOR indicating which sections have been completed.

Note: Testing against closed valves in not allowed (spades to be used)

- 3.16 All material damaged during tests shall be replaced on LSTK CONTRACTOR'S account. All joints broken after testing for installation of strainers, orifice flanges, safety valves, etc. must be remade tightly; labour is for LSTK CONTRACTOR'S account.
- 3.17 After testing the piping systems, they shall be completely flushed and drained. OWNER will approve when a line is considered flushed and drained by LSTK CONTRACTOR.
- 3.18 When each section or circuit has been pressure tested and passed, a certificate prepared by LSTK CONTRACTOR on LSTK CONTRACTOR'S furnished forms showing details must be signed by LSTK CONTRACTOR and OWNER, when the test has been completed and the system drained, test blanks must be removed by LSTK CONTRACTOR.
- 3.19 The following activities by LSTK CONTRACTOR are included for the reinstatement of piping after hydro testing:
  - LSTK CONTRACTOR installed temporary testing blinds to be pulled.
  - Temporary spool pieces taken out.
  - Gaskets renewed, temporary replaced with permanent.
  - Flange connection bolts tightened.
  - Post hydro punch list items corrected.



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- Temporary strainers installed.
- Chemical cleaning performed.
- Supports and hangers checked if in final position.
- Rotating equipment cold alignment checked.
- Reinstallation of control and safety valves and in line instruments which LSTK CONTRACTOR has removed for hydro-testing.
- 3.20 Nondestructive testing of welds and systems is to be performed in accordance with standards, codes and specifications prior to perform any hydro-test.

#### 4.0 PIPING MATERIAL IDENTIFICATION AND PAINTING

- 4.1 All piping materials are supplied by LSTK CONTRACTOR and shall be properly stamped and color-coded to ensure that the correct materials are used as required by the drawings, specifications, codes and regulations.
- 4.2 All materials will be adequately marked as to its specifications. Should LSTK CONTRACTOR be required to cut same or otherwise render piece(s) to have no marking, LSTK CONTRACTOR'S transfer or replacement of proper identification marking to the pieces involved, must be done according to approved stamping method and to be counter stamped by LSTK CONTRACTOR. Paint alone is unacceptable.
- 4.3 The governing principle shall be that in the installed piping systems, all components can be identified and their origin and complete specifications can be determined. The method for identification and stamping or tagging of the various components of the system shall be worked out in coordination with OWNER and only be implemented after approval.
  - LSTK CONTRACTOR shall be held responsible for this requirement as a minimum, and any other requirements of local codes and regulations as to identification and documentation of materials.
- 4.4 Surface preparation and paint application of piping system by LSTK CONTRACTOR, shall be per paint specification.
- 4.5 LSTK CONTRACTOR shall assure that no welds are covered by prime coats prior to acceptance of hydro test.
- 4.6 LSTK CONTRACTOR must ensure that all stamping such as code stamps, registration spool identification, charge numbers etc. shall be visible after paintwork.



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5.0 WELDING 5.1 All welding shall be carried out according to codes and specifications. 5.2 Welder's qualification 5.2.1 All welders including those with valid qualifications will be required to submit a test conducted by OWNER prior to start of welding. Welders that have a certificate which is still valid for the type of material and in accordance with ASME IX will not be tested by OWNER. 5.2.2 A current list of qualified welders must be maintained by LSTK CONTRACTOR and a copy furnished to OWNER each time a revision is made. 5.3 Welders' identification stamps shall be provided by LSTK CONTRACTOR. Each weld shall be clearly stamped with welders identification. All welding including tack welding shall be carried out by qualified welders. Unstamped welds shall be-removed and replaced at LSTK CONTRACTOR'S expense. 5.4 Job SITE fabrication shall be carried out under cover where possible. 5.5 Weld spatter shall be knocked off around all welds leaving a smooth clean surface. 5.6 Where openings for branches are cut in run of pipe, all material, which may drop inside the pipe, shall be completely removed before the branch line is welded in place. 6.7 The interior welds of orifice flanges shall be ground smooth. 5.8 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** 

#### 5.9 **Open Air Welding**

Where welding in the open air is unavoidable, WORK must be discontinued where the quality of the weld may be impaired by weather conditions. Including but not limited to airborne moisture, sand or high winds. After rain the metal surfaces shall be dried. For metal temperature below 5  $^{\circ}$ C joints to be preheated.

#### 5.10 Welding Procedure Qualification



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LSTK CONTRACTOR shall supply welding procedure specifications and qualification in accordance with the rules as set by OWNER.

5.11 Fees for inspection required for welding procedure and welders qualifications, supply of equipment required for the qualification test of welders and welding procedures are for account of LSTK CONTRACTOR.

#### 5.12 Inspection and Testing

- 5.12.1 Inspection of welds shall be in accordance with the instructions of OWNER and/or the requirements of codes and standards.
- 5.12.2 LSTK CONTRACTOR shall be responsible for the repair of faulty welds and for all the required extra radiography and inspection of the faulty welding work. In case of a faulty weld, 100% radiography, on LSTK CONTRACTOR'S account, shall be done on the weld performed as per code.

OWNER shall have absolute discretion in the selection of the welds, which are to be radio graphed.

5.12.3 LSTK CONTRACTOR shall provide NDE service, acceptable to OWNER.

NDT inspection shall be carried out in accordance with codes for all lines as indicated in the piping specification.

#### 6.0 STRESS RELIEVING

- 6.1 LSTK CONTRACTOR shall provide stress-relieving service acceptable to OWNER. Spool pieces shall be stress relived in an approved furnace equipped with thermostatic control and temperature recorder. Field welds to be stress relieved with electric resistance heaters. Temperature cycles to be monitored with portable temperature recorder.
- Stress relieved welds shall be hardness tested by approved procedure and must meet criteria spelled out in specifications.

#### 7.0 TRANSPORTATION

The following various categories of transportation of pipe, pipe fittings and prefabricated pipe spools will be performed by LSTK CONTRACTOR. All categories include loading and unloading materials. Categories will consist of but not limited to:

- From LSTK CONTRACTOR'S warehouse to LSTK CONTRACTOR'S pipe prefab shop.
- From LSTK CONTRACTOR'S pipe prefab shop to LSTK CONTRACTOR'S painting shop.
- From LSTK CONTRACTOR'S pipe prefab or painting shop to LSTK CONTRACTOR'S



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storage area or working area located on site or any other location on SITE.

- All transportation required performing nondestructive testing of prefabricated pipe spools.

#### 8.0 LIFTING, LIFTING EQUIPMENT AND GEAR

8.1 Rigging and hoisting shall be executed as per construction specification and local requirements and safety rules, as manufacturer's instructions. If there are stringent one shall prevail.

#### 8.2 **Testing And Certification**

All LSTK CONTRACTOR furnished cranes, lifting appliances and lifting gear must be properly tested, examined and/or inspected before being used on SITE, and at the intervals specified in the applicable regulations. Copies of the relevant certificates must always be available on SITE for inspection on request by OWNER or other authorities.

#### 8.3 **Operation**

- 8.3.1 LSTK CONTRACTOR shall not permit a lifting appliance to be operated otherwise than by a person trained and competent to do so.
- 8.3.2 LSTK CONTRACTOR shall take express steps to ensure that all personnel employed by LSTK CONTRACTOR are competent and experienced for their assigned tacks.

#### 9.0 **DRAWINGS AND DOCUMENTS**

LSTK CONTRACTOR shall fill in checklists as required by OWNER.

#### 10.0 MISCELLANEOUS

- 10.1 LSTK CONTRACTOR shall furnish all field engineering surveying layout, and checking to properly install all above ground piping to meet all requirements of the drawings and specification. OWNER is authorized to reject any WORK already installed, which is not in accordance with drawing and specifications and of adequate quality.
- All costs involved in demolition, removal and replacement of rejected works shall be the responsibility of LSTK CONTRACTOR. All materials equipment or auxiliaries not accepted by OWNER shall be removed immediately from SITE.
- 10.3 Underground service lines are marked at their installation limits to above ground piping, indicating line size, service and line number.
- During storage, fabrication and erection, care must be taken to ensure that sand, scrap materials, welding rods, items of clothing and other foreign bodies are not allowed to enter piping.

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- All connections which are left open by LSTK CONTRACTOR shall be well protected, so that no sand, dirt or any foreign object come into the system.
- 10.6 In certain instances special bolting torques might be required on critical connections. LSTK CONTRACTOR will arrange WORK in accordance with these requirements.
- 10.7 Flanged piping connections to vessels or equipment shall be aligned and shall be properly fitted before bolting up. Piping may be heated to bring it into alignment only when approved by OWNER. Extreme care should be exercised to avoid damage. Heating, welding and flame cutting on equipment will not be permitted.
- 10.8 No cold springing or pre- stressing of piping will be allowed other than indicated on piping drawings, isometrics and manufacturer's instructions (e.g. for expansion joints).
- 10.9 Flange faces shall be clean and free from foreign matter before assembly. Damaged flange faces may be dressed with a medium cut file only if the damage does not require new facing. This shall be decided by OWNER.
- During erection care shall be taken to remove all dirt, seals, sand and foreign matters from inside the pipe.
- 10.11 Since LSTK CONTRACTOR is responsible for both the prefabrication and the erection of all the piping, it is LSTK CONTRACTOR'S sole responsibility to ensure that all piping to be installed fits properly prior to lifting. LSTK CONTRACTOR is to check all equipment and underground piping to be piped to, for proper location and orientation. OWNER will not entertain any claims for extra work for :
  - i. Taking piping down for rework after it is lifted
  - ii. Re-lifting piping after it is reworked.
- 10.12 Final hookup of piping to equipment such as pumps and compressors shall be done together with the final alignment of this equipment and shall include checking of dimensions. Piping must fill these flanges without inducing any strain on equipment.
- 10.13 In all cases, all designated support and hangers should be in unlocked / cold position before final alignment. LSTK CONTRACTOR will be expected to expedite this critical phase of construction.
- 10.14 Certain small vessels will be considered to be piping items and shall be fabricated as such by LSTK CONTRACTOR.



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#### **ANNEXEURE- 7 -2D**

#### **EQUIPMENT ERECTION**

#### 1.0 **SURVEYING**

- 1.1 Baseline and base elevation will be furnished to the LSTK CONTRACTOR. LSTK CONTRACTOR will furnish all surveying from this baseline and elevation.
- OWNER shall have the authority at any time to determine in accordance with the drawings or written directives, the correctness or completeness of the lines in use by LSTK CONTRACTOR.
- 1.3 Any erroneous WORK shall be corrected to OWNER'S satisfaction at LSTK CONTRACTOR'S expense.

#### 2.0 RIGGING STUDIES AND PLANS

2.1 LSTK CONTRACTOR shall supply rigging studies and plans as specified.

#### 3.0 **EQUIPMENT HANDLING**

- 3.1 The handling of all equipment shall include, but not limited to the following activities by LSTK CONTRACTOR:
- 3.1.1 Submittal to OWNER of detailed rigging studies and plans for lifting, transporting and setting of equipment 4 weeks in advance of work for OWNER to review and approval. Complicated lifts shall be started in the morning and completed the same day.

The transportation plans are to include as a minimum:

Type of equipment to be used to transport each piece.

The planned route of the movement.

The estimated duration of the movement.

The obstructions to the route to be temporarily removed.

- 3.1.2 Receive, inspect, store, protect and perform preventative maintenance on all equipment in accordance with the specifications and drawings and/or equipment manufacturer's instructions.
- 3.1.3 Prepare foundations, pipe sleeves, paving, concrete structures and steel structures for



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setting equipment.

- 3.1.4 Transport form warehouse or point of unloading and install equipment on foundations, paving or structures.
- 3.1.5 Plumb level and align equipment with coordinates in accordance with the specifications and drawings.

#### 3.1.5.1 **GENERAL**

All of the equipment must be plumbed, leveled and aligned with the coordinates specified on the drawings both in plan and elevation and to the tolerances called out in the specifications, specific manufacturer's instructions or recommended manufacture's practices.

- LSTK CONTRACTOR will be required to verify field conditions and will be responsible for final alignment of mechanical items for this project. LSTK CONTRACTOR will check the anchor bolt locations against the equipment. Any deviation must be reported to OWNER in writing.
- LSTK CONTRACTOR will be required to supply and install shims required for all equipment erection. All cinch anchors required for equipment and supports will be supplied and erected by LSTK CONTRACTOR.

Prior to the placement of the equipment on a foundation, the surfaces of the foundation shall be cleaned of oil, grease, excess concrete and foreign matters by LSTK CONTRACTOR.

- Prior to setting the equipment on the foundations, the underside of the equipment base plate or supports will be cleaned free of oil, grease and other loose materials by LSTK CONTRACTOR.
- Anchor bolts shall be checked for damage to the thread and the threaded part shall be properly greased.
- Damaged anchor bolts must be replaced by LSTK CONTRACTOR and brought to the attention of OWNER.
- The openings between the anchor bolts and sleeves have to be cleaned of foreign materials to full depth of the opening by LSTK CONTRACTOR.
- All steel wear plates and guide keys shall be coated by CONTRACT with proper lubrication, prior to setting the equipment.
- Equipment shall be set true to line. at correct elevation and in proper orientation as shown and noted on the drawings.

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- Maximum allowable setting tolerances shall be in accordance with manufacturer's requirements or with the specifications, whichever is more stringent.
- All equipment, unless otherwise specified, shall be leveled with shims at each anchor bolt (shim on both sides of each anchor bolt) and at intermediate points as required to prevent distortion of the equipment. Shims shall have square cut edges (not trimmed or sheared) and shall be of various thicknesses to minimize the number of shims required. Shims shall be supplied by LSTK CONTRACTOR.
- The equipment shall be set, leveled, aligned and inspected with precision tools (steel straight edge, graduated machinist levels, dial indicators, theodolites, water level instruments, turbine levels, etc.). Setting, leveling and alignment shall be according to manufacturer's recommended tolerances and specifications.
- There may be a number of items not installed by the manufacturer, i.e. seals, packing, lubricators, gauges, miscellaneous piping and tubing, thermometers, etc. that will come separately packed from the equipment itself that must be identified, stored, preferably inside in accordance with project criteria, and finally installed. LSTK CONTRACTOR is responsible for these activities.
- LSTK CONTRACTOR shall remove all temporary shipping supports or erection materials.
- LSTK CONTRACTOR shall do surface preparation for, and apply coating and wrapping on buried vessels before installation.
  - Equipment supported on legs or on saddles shall be set to the tolerances specified in specifications of the required elevation measured on the flange of the largest diameter pipe-connecting nozzle.
- For equipment with sliding type supports, LSTK CONTRACTOR will remove dirt, grease or other foreign matter and will coat with graphite grease supplied by LSTK CONTRACTOR on the support.
- The anchor bolt nuts will be placed so as not to restrict the longitudinal movement of the sliding end.
- Vessels, drums, etc. shall be aligned, where applicable and leveled per shown or drawing.
- Shims shall be placed approximately evenly spaced under the support ring of vessels, drums, tanks.
- Towers with two or more pieces shall be assembled and welded at site by LSTK



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- LSTK CONTRACTOR is responsible to check and inspect at these equipments in the vendor's shop.
- All costs are included in the lump sum price.

#### 3.1.5.2 Rotating Equipment

- Rotating equipment will be installed in accordance with manufacturer's instructions.

Align drivers with all rotating equipment.

- LSTK CONTRACTOR shall install all ancillary equipment such as, but not limited to, drivers, guards, harness piping and all other interconnecting piping, casing drains, base plate drains and all necessary supports.
- The measurements for the positioning and leveling of mechanical equipment will be made on the suction flange.
- LSTK CONTRACTOR to install permanent packing, seals lubricating oils, greases and circulated oil systems.
- Services of manufacturer's technical representative by LSTK CONTRACTOR shall be used to the fullest extent.
- Rotating equipment base plates will be supported for positioning and leveling on shims located as follows.
- For bases with four (4) anchor bolts. one set of shims will be placed adjacent to each anchor bolt.
- For bases with six (6) or more anchor bolts, two (2) sets of shims will be placed adjacent to each anchor bolt, one on each side of the anchor bolt.
- In addition shims shall also be placed directly under those parts of the base plate carrying the greatest weight and shall be placed closely enough to give uniform support.
- When the base plate is level in all directions as indicated by an accurate instrument on the machined pads, the anchor bolt nuts shall be brought down evenly, but not too firmly. The unit is now ready for grouting. After the grout has adequately set, pull the anchor bolt nuts down tight and recheck the base for levelness.
- Release for grouting of base plates must be approved by OWNER.
- After completion of the electric installation to the motor, the direction of rotation of the



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motor will be determined. Prior to checking the direction of rotation, the coupling between the motor and the equipment will be disconnected for the test run of motor by LSTK CONTRACTOR.

- Rough aligning of the centrifugal units and their respective drivers shall take place after the equipment has been put on the foundation.
- Coupling alignment
- Dial indicators shall be used and where possible optical alignment equipment.

Peripheral alignment shall be checked by using one dial reading peripheral differences between coupling halves as they are rotated together.

Face alignment shall be checked using two dials reading face-to-face differences between coupling halves.

- Tolerances shall be in accordance with manufacturer's instructions with and without pipe work connected.
- Manufacturer's representative shall check that the final alignment of equipment is satisfactory before any running takes place. For small equipment. Where it is agreed by OWNER that the services of a manufacturer's representative are not required, manufacturer's written instructions shall be followed.
- The final checks will be supervised by LSTK CONTRACTOR and the results recorded by LSTK CONTRACTOR and signed by OWNER and LSTK CONTRACTOR.

Final alignment shall be carried out in two stages.

- After piping is complete with all bolts removed from the flange connections.
- Final alignment with piping assemblies 100% complete and all flanges bolted up to ensure that no unforeseen vertical or horizontal pipe loading is imposed on the unit.
- The final aligning supervised by OWNER to make sure that the detailed instructions furnished by the equipment suppliers are carried out to the full satisfaction.

LSTK CONTRACTOR to supply qualified personnel in the final alignment activities.

- Prior to putting pumps, etc. into operation, loose equipment such as guards and gauges shall be installed by LSTK CONTRACTOR.
- 3.1.6 Mount the drivers to the rotating equipment in case of turbines and any large motors that are shipped separately.

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3.1.6.1 In case electric motors have to be installed in the field, this shall be done after leveling of base plate, but prior to grouting.Chrome / nickel shim martial, supplied by LSTK CONTRACTOR shall be used for alignment

of drivers and pumps and shall be installed under the entire footing of the driver.

- 3.1.6.2 Equipment and drivers shall be doweled to bed plate if required by manufacturer's instructions.
- 3.1.7 Assembly whenever required for the items / package unit like Auxiliary Boilers, Waste Heat Boilers, Air cooled exchangers, furnaces, compressors, Turbo generators etc. units as part of the scope of WORK of installation by LSTK CONTRACTOR.
- 3.1.7.1 Compressor seal oil and lube oil systems and control panels are included in LSTK CONTRACTOR'S installation of compressors.
- 3.1.7.2 When equipment is delivered in two or more sections for site welding the weld preparation must match accurately on mating sections before assembling.
- 3.1.7.3 LSTK CONTRACTOR shall assemble and erect items, whether skid mounted or supplied in individual components as specified in the requisition or indicated on drawings in order to make a completed unit.
- 3.1.7.4 Installation, assembly and alignment of the various components shall be done by LSTK CONTRACTOR.
- 3.1.7.5 Installation of air cooled exchangers includes the erection of structural steel on the pipe rack, which will support the tube bundles must be done by LSTK CONTRACTOR.
- 3.1.7.6 Walkways, platforms, stairs, ladders shall be installed for the items / package unit like Auxiliary Boilers, Waste Heat Boilers, Air cooled exchangers, furnaces, compressors, Turbo generators etc. by LSTK CONTRACTOR.
- 3.1.7.7 Drying out systems, refractory and linings is included in LSTK CONTRACTOR scope of work.
- 3.1.8 Install ladders, platforms, davits, pipe supports and pipe guides in accordance with drawings and specifications.
- 3.1.9 Open man ways. Inspect. clean and close man ways of all tanks, towers. vessels and other equipment as directed by specification or manufacturer.
- 3.1.10 Install all trays and vessel internals and support for same shipped loose. in accordance with drawings, specifications and manufacturer's recommended installation instruction.
- 3.1.11 Under the supervision of OWNER and respective manufacturer's representative LSTK CONTRACTOR shall load the first loading of chemicals.



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- a) There will be certain items of equipment such as filters and package equipment that come with cartridges filled with -desiccants, resins, etc. Their items will be installed by LSTK CONTRACTOR if they are shipped separately from the equipment.
- b) Installations include the pick-up of these chemicals from the place of storage and transportation to point of installation.
- 3.1.12 Under the supervision of OWNER, LSTK CONTRACTOR install the first loading of catalysts. Installations include the pick-up of these catalysts from the place of storage and transportation to point of installation.
- 3.1.13 Touch up of painting on new equipment after erection.
- 3.2 LSTK CONTRACTOR shall install grout under all equipment as required.
- 3.3 Grouting will be as per the specification per the equipment manufacturer's recommendation, whichever is more stringent.
- The following work is included but not limited to LSTK CONTRACTOR'S scope for installation of grouting:
- 3.4.1 Prepare top surface of base and/or plinth, pockets, sleeves etc., prior to placing grout.
- 3.4.2 Install grout mortar consisting of one part Portland cement and one part of clean sand and sufficient clean water for workability.
  - This grout mortar shall be used between steel base plate and concrete foundations.
- 3.4.3 Wherever non-shrinkage grout is specified on the drawings, the same shall be supplied by LSTK CONTRACTOR and installed in accordance with manufacturer's instructing.
- 3.5 Install non-shrink grout between reciprocating *I* rotary equipment base frame including the filling of the equipment steel frame if required, and concrete foundation in accordance with manufacturer specifications and project specifications. Type of non-shrink grout to be approved by OWNER. After grouting, shims used in leveling equipment will not be removed except where removal is specifically required by manufacturer's instructions.
- 3.6 Unless indicated otherwise on drawings vessels supported on skirts and support rings will be grouted using a stiff mix under the support ring so as to obtain full bearing, Grout will be placed within the area of the skirt the high point of ground at the vertical axis of the tower (or vessel), sloping downward to the support ring with four (4) weep holes under the support ring sufficiently large to ensure drainage.



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4.0 MATERIAL HANDLING SYSTEM

#### 4.1 ERECTION & COMMISSIONING

- 4.1.1 The complete material handling system including its all equipment shall erected at site and commissioned in accordance with the best engineering practice.
- 4.1.2 Packing, forwarding, transportation, unloading and storage at site, safety and protection of various components at site, insurance etc. shall be the responsibility of the LSTK Contractor / supplier.
- 4.1.3 All men, material and tools required shall be arranged by the LSTK Contractor at his own cost. The LSTK Contractor shall also arrange for the safe handling, storage, protection and security of his good at site.
- 4.1.4 The purchaser shall be responsible for supplying his part of material only as covered by the clause pertaining to the work to be excluded from LSTK Contractor's scope of supply.
- 4.1.5 After erection at site, the belt conveyors and related equipment shall be tested for satisfactory operation for mechanical completion and full-load performance run. The LSTK Contractor shall carry out performance test as per mutually agreed procedure. The details of the procedure shall be submitted by the LSTK Contractor for purchaser's approval.

#### 4.2 MECHANICAL COMPLETION

- 4.2.1 Mechanical completion shall be considered as achieved when the system is mechanically complete along with the pre-commissioning activities and is ready for feeding. This shall include but not limited to the following:
  - 1. The installation as per FINAL PROPOSAL is complete in all respects in accordance with the drawings, specifications including any approved changes thereto and in accordance with all applicable codes and laws.
  - 2. The machinery, conveyors and all drives are aligned and run or cycled under no-load conditions.
  - The electrical system is installed and tested in accordance with applicable codes and specifications. All wiring is checked for correct hook-up. Motor rotation is checked and power system protective devices are set.
  - 4. Painting is completed to the extent that the incomplete work does not prevent plant start-up and commissioning.
  - 5. Successful completion of no-load test of all the equipment and the complete system.
  - 6. Temporary construction facilities are removed to the extent necessary to permit the plant start-up and commissioning.



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- 4.2.2 The OWNER shall inspect and certify that the LSTK Contractor executed the job in accordance with drawings and specifications.
- 4.2.3 When the complete belt conveyors and related equipment have been fully erected at site, LSTK CONTRACTOR shall request OWNER for his agreement to start the Noload Test Run. Owner shall, within 72 hours of receipt of such request, issue his agreement or advise LSTK Contractor in writing of any deficiencies noticed in the equipment.
- 4.2.4 Omissions / rectifications of minor items, if any, not affecting commissioning shall not withhold MECHANICAL COMPLETION as long as the LSTK Contractor agrees to supply / rectify the same within the specified period. The decision of the OWNER is final in this regard.

#### 4.3 COMMISSIONING AND GUARANTEE TEST

4.3.1 After issue of Mechanical completion certificates by Owner, LSTK CONTRACTOR & OWNER shall mutually decide the date of commissioning of the equipment. From the date of commissioning, the equipment shall be gradually brought up to full load or any other load at the discretion of OWNER, and thereafter the equipment shall be run for a minimum period of 5 days. OWNER shall have the right to reduce this period where deemed necessary because of OWNER's difficulties. During this period of 5 days of operation or the reduced period, the system shall run at an average of 90% of rated capacity. If the LSTK CONTRACTOR is not able to bring the load to 90% of the rated capacity as mentioned above within 2 (two) months, OWNER shall, without prejudice to any of his rights under the contract, has the right to take over the equipment and to proceed with modifications / rectifications / additions as he considers necessary at LSTK CONTRACTOR's cost and risk to achieve this sustained load run.

#### 5.0 PREPARE EQUIPMENT FOR OPERATION

- 5.1 Immediately prior to turnover, LSTK CONTRACTOR will make all the equipment ready for operation. This includes, but is not limited to such activities as:
- 5.1.1 Removal of preservatives and rust preventatives.
- 5.1.2 Installation of seals or removal of steel covers.
- 5.1.3 Removal of moisture absorbing materials.
- 5.1.4 Draining of oil reservoirs and the flushing and filling of the initial charge.
- 5.1.5 If required by OWNER for the final inspection the opening and closing of man ways of vessels and tanks.



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5.1.6	Assisting	equipment	manufacturer's	representatives	by fina	I checkout c	of equip	ment

- 5.1.7 Remove all temporary supports, bracing, or other foreign objects that were installed in vessels rotating equipment or other equipment to prevent damage during shipping, storage, transport and erection.
- 5.1.8 Conduct all flushing, blowing and chemical cleaning required by the specifications.
- 5.1.9 Check and run in all rotating equipment, i.e. compressors, pumps.
- 6.0 Scaffolding Sufficient amount of scaffolding required for good performance of the WORK shall be supplied by LSTK CONTRACTOR.

#### 7.0 **DRAWINGS AND DOCUMENTS**

LSTK CONTRACTOR will carry out all construction and any required procurement 7.1 activities directly from the AFC construction drawings and specifications and forming part of the CONTRACT. No additional design work or development e.g. completion of drawings will be required from LSTK CONTRACTOR.

> However, the plan type drawings called out to be supplied by LSTK CONTRACTOR in previous subsections of this section are included in LSTK CONTRACTOR'S scope of WORK.

- 7.2 All of LSTK CONTRACTOR'S drawings, calculations, documents, test reports, and test certificates are to be submitted to OWNER for approval in 6-fold. After receiving approval LSTK CONTRACTOR to submit for final approval all of the above and one (1) soft copy in CF format. LSTK CONTRACTOR drawings receiving "Approved as Noted" stamp may be worked on provided all notes are incorporated. It is understood that OWNER'S approval shall not receive in no way LSTK CONTRACTOR from any of his obligations and further more shall not relieve LSTK CONTRACTOR from his obligations to timely complete the WORK according to approved project schedule by OWNER.
- 7.3 LSTK CONTRACTOR'S drawings shall be clearly marked with titles, equipment numbers or other item identification.
- 7.4 Approval of drawings and calculations by OWNER in no way absolves LSTK CONTRACTOR from its responsibility for the accuracy or for the design, construction and timely performance of the WORK.
- 7.5 LSTK CONTRACTOR shall promptly submit reports of each and every. test or inspection.
- 7.6 LSTK CONTRACTOR shall submit quality records of the materials, as specified in previous sections and the applicable engineering specifications.
- 7.7 LSTK CONTRACTOR shall furnish an equipment installation record indicating date of installation and tag number of each piece of equipment.
- 7.8 LSTK CONTRACTOR shall furnish an equipment maintenance record indicating date and type or maintenance of each piece of equipment during the LSTK CONTRACTOR period.



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7.9 LSTK CONTRACTOR shall fill out checklists as required by OWNER.

#### 8.0 **LIFTING, LIFTING EQUIPMENT AND GEAR**

- 8.1 Rigging and hoisting shall be executed in accordance with construction specification local and governmental requirements and safety manuals, as well as specific equipment manufacturer's instructions. If there are conflicts, the more stringent shall prevail.
- 8.2 LSTK CONTRACTOR shall only perform the lifts and movements in accordance with approved LSTK CONTRACTOR submitted rigging studies and plans.
- 8.3 Preferably, equipment will be lifted in accordance with manufacturer's instructions, if include, using lifting trunnions, lifting lugs if provided, or by slings attached to or around the equipment, with adequate protective measures to prevent damage to equipment. No temporary lifting lugs shall be used without the written approval of OWNER.
- 8.4 No nozzles or other appurtenances not intended for lifting shall be used for attachment of slings.
- 8.5 Equipment shall be handled with sufficient care to prevent damage. Slings shall have adequate protection to prevent marring the surface of equipment. Where necessary, sling spreaders shall be used to prevent crushing or other damage to the equipment.

#### 8.6 **Testing And Certification**

All LSTK CONTRACTOR furnished cranes, lifting appliances and lifting gear must be properly tested, examined and /or inspected before being used on site and at the intervals specified in the applicable regulations. Copies of the relevant certificates must always be available on site for inspection on request by OWNER or proper authorities.

#### 8.7 **Operation**

- 8.7.1 LSTK CONTRACTOR shall not permit a lifting appliance to be operated otherwise than by a person trained and competent to do so.
- 8.7.2 LSTK CONTRACTOR shall take express steps to ensure that all personnel employed by LSTK CONTRACTOR are competent and experienced for their assigned tasks.

#### 9.0 **WELDING**

Welding of or on equipment shall only be permitted with the approval or OWNER.

#### 10.0 **EQUIPMENT PAINTING & INSULATION TOUCH**

Rotating and special equipment to be erected by LSTK CONTRACTOR will be delivered to SITE finished painted. LSTK CONTRACTOR is responsible to apply remedial *I* touch up painting for any damages to paint, or protective coatings on equipment handled by it in connection. With any aspect of this operations such as unloading. transport, handling and **erection as per Annexure mention in ITB Section.** 

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### **ANNEXURE-7-2E**

#### **ELECTRICAL WORK**

1.0	SCOPE : ELECTRICAL WORK COVERS					
1.1	Installation and erection of the following equipment (items) consists of the preparation for installation, connection, testing and pre-commissioning etc. as per specifications and as pedrawings.					
1.2	Provision of all tools, equipment and consumables used in the course of the work.					
1.3	The installation of the following systems (items) shall consist of the connection, testing and pre-commissioning etc., so that the systems are ready for use as per specifications and as per drawings.					
1.4	Transport, store and protect supplied materials to the construction location.					
2.0	ELECTRICAL ITEMS					
2.1	Motors					
2.2	Control panels					
2.3	Deleted					
2.4	Deleted.					
2.5	Deleted.					
2.6	Deleted.					
2.7	Cables in trench / conduit / tray / Rack.					
	Note:	Following items are also necessary .				
		<ul> <li>a) Measuring and cutting of cable and protection of cut ends.</li> <li>b) Identification of cables</li> <li>c) Fixing of cable to tray / rack</li> </ul>				
2.8	Cable Gla	ands				

Cable terminations

2.9



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2.10 2.11	Earthing cable in trench / conduit / tape on tray / Rack Deleted
2.12	Deleted
2.13	Deleted
2.14	Deleted
2.15	Deleted
2.16	Deleted
2.17	Deleted
2.18	Underground electrical grounding system

Note: All bellow items are also considered:

- a) Pulling of grounding cable in trenches, through culverts, protection sleeves and cable ducts as per grounding cable supplier installation instruction, project specifications and layout and detail drawings.
- b) Coil up and clearly designate the final destination of the cable ends, especially if cables have to be continued their routing underground or overhead via cable tray or otherwise to their final destination at a later date.
- c) Install, including the provision of the required tools, the required through branch and end connections.
- d) Installation of all grounding electrodes including inspection pits as per specification and the layout and detail drawings.
- e) Return of the cable drums to the storage area including a clear make up of cable lengthleft on the reels of drums that are not empty.
- f) Measure cable resistance for grounding continuity and grounding resistance of ground rods, record data and submit the rest result reports to OWNER prior to commissioning of the installation.
- g) Check cables are in proper trenches and ground rods at their location.
- h) Perform all test; witnessed by OWNER'S REPRESENTATIVES of the founding installation including the provision of all OWNER approved testing equipment and measuring devices.



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2.19 Miscellaneous Electrical equipment

2.20 Earth resistance testing including earth resistance rods for grounding, continuity of grounding, installation resistance testing for electrical cables and HL-POT testing for electrical cables.

#### 3.0 TESTING AND COMMISSIONING

Testing and commissioning consist of the complete testing prior to commissioning, including provision of required testing apparatus and testing documents as requested and as specified in the testing specifications.

- All test results shall be recorded on the test form and submitted to OWNER. Each test record shall include date of test, ambient temperature, climatic conditions, instruments used with serial numbers, names of test personnel and witnesses, identifications of equipment, ground electrode or circuit tested.
- Testing shall be scheduled at least 24 hours in advance and OWNER is to be notified by LSTK CONTRACTOR. LSTK CONTRACTOR will notify all necessary interested parties including manufacturer's representatives.

High potential tests shall not be repeated without authorization by OWNER.

#### 4.0 DRAWINGS AND DOCUMENTS

- 4.1 LSTK CONTRACTOR will carry out all construction and any required erection activities directly from the AFC construction drawings and specifications.
- 4.2 LSTK CONTRACTOR shall promptly submit reports of each and every test or inspection.
- 4.3 For more details LSTK CONTRACTOR shall follow **Electrical design philosophy** elsewhere mentioned in ITB.



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#### ANNEXURE- 7 - 2F

#### **INSTRUMENTATION WORK**

#### 1.0 **GENERAL**

- 1.1 Instrumentation symbols and identification of functions shall be based on the current edition of ISA S5.1.
- 1.2 Specifications for instruments and items of control equipment are shown on data sheets to be issued as they become available.
- 1.3 All materials and connections for control valves, relief valves, level controllers and similar equipment shall comply with applicable requirements for valves and fittings as noted in the piping specification.
- 1.4 LSTK CONTRACTOR shall install all shim plates, fixing material such as but not limited to anchors, red heads, etc.
- 1.5 LSTK CONTRACTOR shall install all instrument equipment tag plates.

#### 2.0 FIELD INSTRUMENT INSPECTION AND CALIBRATION AND INSTALLATION

- 2.1.1 This item covers all activities and supply of all materials to import calibration of instruments. It includes, but is not limited to, the following:
- 2.1.1 Provision of all tools, equipment and consumables used in the course of the work.
  - Calibration of instruments and provision of all necessary test equipment gauges, materials and ancillary items. All necessary testing instruments to be used must be certified by Govt. recognized testing laboratories.
  - Check orifice plates and control valves.
  - Protection of instruments to maintain cleanliness at all times.
  - Mark instrument to indicate status of calibration.
  - Return instruments, after calibration and checking to lay-down areas and / or stores including all packaging.
  - Pressure and leak test including the provision of all necessary test equipment gauges materials and ancillary items.

Note: The calibration of all instruments within the packages is also the responsibility of LSTK Contractor.

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2.1.2	LSTK CONTRACTOR shall install all instruments as listed in the instrument index and further
	per the relevant installation specifications, documents and drawings.

2.1.3 Field instrument installation includes, but is not limited to:

Mounting of instruments and related equipment, supports protection boxes, manifolds, junction boxes, nameplates, etc.

Installation of measuring elements (probes, sensors, detectors, etc) including their auxiliaries as required (thermo wells, supports, valves, etc.) unless done by others

Installation of on-line instruments (by piping)

The following is a typical list of on-line instruments:

- Safety blow down valves.
- Control valves (all types)
- Motor operated valves.
- Safety shut down valves (including solenoid valves).
- Safety / relief valves.
- Pressure / vacuum relief valves.
- Self regulating valves.
- Level gauges.
- Level displacer chambers.
- Orifice assemblies.
- Orifice plates.
- Venturies.
- Turbine meters, annubars, magnetic flow meter.
- Positive displacement meters.
- Variable area meters (rotameters)
- Stilling Wells.

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- Thermo wells and etc.
- Installation of process connections, impulse lines and capillaries.
- Installation of purge and flushing supply tubing, filter blocks and rotameters.
- Installation of air supply lines.
- Supply and installation of instrument nameplates for field instruments.
- 2.2 Cable, Supports and Fixing Wire pins, Conduit

LSTK CONTRACTOR shall use for cable installation for indoor and outdoor use the materials such as tubing, cable trays, etc. as called in the specifications.

- 2.2.1 Cable tray. ladder rack and tubing systems shall be installed to ensure electrical continuity throughout the run and such that water cannot collect or remain in any part of the system.
- 2.2.2 Pulling of the cables into the trenches, through culverts, protection sleeves and cable ducts as per cable supplier installation instructions and layout drawings, cable lists, trench sections and reel schedules.
- 2.2.3 Installation of the cable separation tiles, if specified.
- 2.2.4 Coil up and clearly designate the final destination of the cable ends, especially if cables have to be continued their routing underground or overhead via cable tray or otherwise to their final destination at a later date.
- 2.2.5 Installation of the sealing shrouds to avoid water ingress after cable cutting.
- 2.2.6 Installation of the cable markers stamped with cable number by LSTK CONTRACTOR as per cable list.
- 2.2.7 Installation of cable splicing if required.
- 2.2.8 Return of the cable drums to the storage area including clear markup of the cable length left on the reels of cable drums that are not empty.
- 2.2.9 Check if cables are spaced as specified.
- 2.2.10 Measure cable resistance and cable insulation, record data and submit the test result reports prior to commissioning of installation.
- 2.2.11 Check whether all cables are installed in the proper trenches.
- 2.2.12 Perform all tests, witnessed by OWNER of the underground cable installation including the



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provision of the OWNER'S approved testing equipment and measuring devices.

- 2.2.13 Record of actual installed cable lengths and location of cable splices.
- 2.2.14 Where cables required to be installed through or across the edges of tray or other metal work the edge of the lips shall be smoothed. painted and lined with a protective sleeving to avoid cable damage.
- 2.2.15 Supporting steelwork shall be fabricated and installed by LSTK CONTRACTOR. The material shall be primed in accordance with the painting specification by LSTK CONTRACTOR.
- 2.2.16 Storage and handling of cable before and during installation shall be carried out with due regard to manufacturer's recommendations. Cable drums shall be rotated only in the direction indicated by drum markings, and open ends of cables are to be effectively sealed immediately after cutting to prevent the ingress of moisture.
- 2.2.17 At all times, the utmost care shall be exercised to avoid damaging the protective sheathing to cable or of causing excessive bending or twisting which may result in damage to core insulation, sheaths armor and so on.
- 2.2.18 The bending radius of a cable either during or after installation shall not be less than manufacturer's recommended minimum.
- 2.2.19 Cables shall be run in continuous unbroken lengths and joints shall not be permitted unless specifically called for in the cable drum-cutting schedule.
- 2.2.20 Cables installed above ground shall be routed to avoid high-risk areas, e.g. high fire risk areas, and those areas where accidental leakage or spillage may occur and cause damage to cables and supports.
- 2.2.21 During installation, the ends of cables shall temporarily be protected using compound, tape, heat shrink seals or similar approved methods to avoid damage or entry or moisture until they are permanently terminated.
- 2.2.22 Pre-cast concrete members should not be drilled for any reason. Fixing shall always be by means of clamping brackets in the most efficient way and in consolation with OWNER.
- 2.2.23 Under no circumstances shall welding be carried out to any process plant equipment, vessels, pipelines, or structures or to any protected surface unless specifically indicated on the drawings and documentation and then in strict accordance with a procedure subject to Approval of OWNER.
- 2.2.24 Fixings to the above shall normally be made where brackets and so on, have already been provided or when agreed by the use of purpose built clamps.
- 2.2.25 On trays horizontal cable runs shall be fastened every 1200 mm, vertical cable runs every



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600 mm.

#### 2.2.26 **Grouping**

The cables employed to convey electricity shall be grouped according to the signal kinds. The main group kinds are but not limited to the followings

- a) Intrinsically safe signals.
- b) Signal cables not intrinsically safe.
- c) Instruments power supply cables.
- d) Coaxial cables or telephone cables used as serial data buses.
- 2.2.27 All cable trays, ladders, tubing and supports and fixing material for indoor and outdoor use shall be installed by LSTK CONTRACTOR.
- 2.2.28 All cables shall always be installed and connected in such a way that no forces can act on terminals. Further, all instrument and power supply cables inside and outside buildings shall be installed in accordance with both cable lists and drawings by LSTK CONTRACTOR.

Carbon steel coated cable stub ups shall be installed by LSTK CONTRACTOR for all cables from sand trenches to 500 mm above ground, in accordance with electrical connection detail drawings.

#### 2.2.29 Conduit system

Single pair cables shall be used to connect field mounted instruments to local junction boxes. Single cables shall be armoured type laid in galvanized carbon steel / aluminium pipes with open ends or on closed cable trays. In order not to damage the cable, a plastic annular cap shall cover the pipe end.

Multipair cables shall be used to connect above said local junction boxes to the control room. Multipair cables shall be armoured type and shall run over head in closed cable trays / ladders supported on the pipe racks.

#### **2.2.30 Wire Pins**

All stranded cable conductors shall be fitted with crimped taper pins, amp (or equivalent) and all screens with lugs. Installation of all amp wire pins and screen lugs by LSTK CONTRACTOR.

Further, in general, all standby conductors shall be wired to terminals.

#### 2.2.31 Cable Marking

All instrument cables, conductors and the instrument screen/earth wires shall be tagged on both sides in accordance with the instrument connection list for local and central control room signals by LSTK CONTRACTOR.



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### 2.2.32 Cable Entry Sealing

#### - General

After installation of all cables and on direction of OWNER, LSTK CONTRACTOR shall seal off all cable entries and passages.

#### Outside walls

All cable entries in outside walls and below grade level shall be watertight sealed. Method of sealing shall be supplied by LSTK CONTRACTOR.

#### - Separation walls

All cable entries in separation walls of buildings shall be sealed with a fire resistant sealing as described hereafter.

#### Control Room Floors

All cable and cabinet entries in floors shall be sealed with polyurethane foam.

#### - Fire - resistant sealing

All fire resistant sealing shall be class H-30. Small openings in walls shall be sealed with CSD –F (or equal) in luminescent foam.

Large openings in walls and between computer floor and cable basement shall be sealed by inserting CSD-F (or equal) in luminescent plates under between and above the cables. The remaining openings shall be sealed with CSD-F (or equal) in luminescent foam.

#### 2.3 Alarm Systems

- 2.3.1 LSTK CONTRACTOR shall install the fire alarm including sensors, cabling, local panels, mimic panels and host system. In accordance with:
  - Project engineering specification and codes and standards.
  - Cabling between panel and detectors, alarms, switches etc. as described above.
  - Installation of all junction *I* terminal boxes, cable terminations and connections, supporting brackets for cabling as described above.
- 2.3.2 All work related to the fire and gas system, including overall test / loop check as per specifications and drawings, among which the installation, placing and connection of all cables of the fire and gas panel located in the control building and panel in the firehouse shall



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be done by LSTK CONTRACTOR.

#### 2.4 Analyzers Installation

LSTK CONTRACTOR shall install all analyzers and sampling conditioning systems in the analyzer house as well as in the field consisting of, but not limited to:

- Installation of all vents and drains from analyzers.
- Installation of calibration gas bottles as well as regulators and connecting tubing, as required.

#### 3.0 LOCAL PANELS

LSTK CONTRACTOR shall install local panels, consisting of, but not limited to:

- a) Mounting, aligning and fixing to the foundation or steelwork. Uncoil, install and terminate underground cable ends. Install and terminate all aboveground cable to / from panels.
- b) Install and connect air supply and air signal piping and tubing to 'from panels.
- c) Install cabling and connect alarm horns.
- d) Identification *I* tagging of all equipment, terminals, cables and tubing which is not installed by panel vendor. Tag plates to be installed by LSTK CONTRACTOR.
- e) Installation of brackets / supports for cable, etc. and installation material as required to complete the installation.

#### 4.0 TERMINATION OF CONTROL CABLES FROM THE LV SWITCH ROOM

The control cables running from the switch room shall be installed and connected in the marshaling cabinet by LSTK CONTRACTOR.

#### 5.0 CONTROL BUILDING INSTRUMENT INSTALLATION

5.1 LSTK CONTRACTOR shall install all control building instrumentation in accordance with the relevant installation specifications and drawings.

#### 6.0 CABINETS AND CONSOLES

- 6.1.1 LSTK CONTRACTOR shall install align and anchor all equipment cabinets and consoles in accordance with design drawings and seller's installation instructions.
- 6.1.2 The false floor shall be completely installed by LSTK CONTRACTOR.



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All panels, cabinets, tables, boxes, computers etc. located on the instrument equipment layout shall be place and installed by LSTK CONTRACTOR.

- 6.1.3 Where cable passage is required according to installation drawings, LSTK CONTRACTOR to indicate locations of holes and passages.
- 6.1.4 FCS/ESD/PLC cabinets and data base unit:

These groups / cabinets shall be installed in place and bolted together by LSTK CONTRACTOR.

Internal wiring *I* cabling and *I* or connections between these groups—of cabinets shall be done by LSTK CONTRACTOR in accordance with the instructions of the system vendor's representative.

#### 6.1.5 FCS Consoles

The consoles shall be installed in place and bolted together by LSTK CONTRACTOR, including installation of special table with peripherals.

Internal wiring and cabling and/or connections between consoles shall be done by LSTK CONTRACTOR in accordance with the instructions of the system vendor's representative who will be present during these operations.

- 6.1.6 Communication racks with the same work description as specified elsewhere in Tender documents.
- 6.1.7 Main processor cabinets (data base units) with the same work description as as specified elsewhere in Tender documents.

#### 6.1.8 Marshaling Cabinets

Cabinets shall be installed in place and bolted together by LSTK CONTRACTOR.

Cross wiring between these assembled sections shall be done by LSTK CONTRACTOR.

#### 6.1.9 Fire Panel Cabinets.

#### 6.2 Handling and installation. Termination and Connection of Cabling

Cables entering instrument room are installed under false floor. These cable shall be handled, cut to length, stripped and after installation of the cabinets be terminated and connected by LSTK CONTRACTOR.

LSTK CONTRACTOR shall leave slack in the cables and provide markings.



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#### 6.3 Installation of System Cables

LSTK CONTRACTOR shall install, plug in and support all system cables. Cable supporting rail in cabinets is installed by cabinet *I* console vendors, but in any case LSTK CONTRACTOR is responsible.

 System cable shall be installed by LSTK CONTRACTOR under false floor in auxiliary room. System cables are covered by instrument cable list.

#### 6.4 Conduits Cable Tray / Trucking. Support Frames and Brackets

All cable trays, cable trucking, supports / brackets, etc. if required , shall be installed by LSTK CONTRACTOR. For cable tray installation see respective part.

#### 6.5 **Auxiliary Cable Installation and Termination.**

LSTK CONTRACTOR shall install, terminate, support and connect all auxiliary cables.

Auxiliary cables are all cables covered by instrument cable list and instrument cable layout for control room.

LSTK CONTRACTOR shall open *I* remove and close parts of the false floor as required for cable installation.

#### 6.6 Communication Cables

LSTK CONTRACTOR shall install and support communication cables. The connection of the cables in the consoles and cabinets shall be done by LSTK CONTRACTOR, under direct supervision of system vendor. LSTK CONTRACTOR shall open *I* remove and close parts of the false floor as required for cable installation. Communication cables are listed on instrument cable layout for control room and the system cable list.

#### 6.7 **Power Supply Cabling**

LSTK CONTRACTOR shall install. terminate and connect all power supply cables between power distribution boards and cabinets, consoles, printers and other instrument equipment when listed on the power supply list

#### 6.8 Earthing System

LSTK CONTRACTOR shall install and connect the insulated earthing cabling *I* wiring from the earth buses to the cabinets, consoles and all other instrument equipment.

All cabinets and consoles shall be fitted with earthing bus bars and earthing connection bolts by the vendors and under supervision of LSTK CONTRACTOR.



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LSTK CONTRACTOR shall install utility, shield and dedicated earth (clean earth) cabling and connections including tags at both ends.

LSTK CONTRACTOR shall check and test earthing system in accordance with relevant documents.

#### 7.0 **LIFTING**

- 7.1 Major instrument equipment shall be rigged from points designated or suitable to accept rigging. When available, LSTK CONTRACTOR shall utilize lugs on equipment.
- 7.2 When establishing hoisting loads, riggings plans and crane capacities, LSTK CONTRACTOR shall adhere to the requirements and instructions as defined in the specifications and as instructed by OWNER.

#### 8.0 TESTING AND PRECOMMISSIONING (FUNCTION TEST)

- 8.1 Testing and pre-commissioning consist of the complete testing and pre-commissioning prior to commissioning, including provision of required testing apparatus and testing documents, comprising, but not limited to:
- 8.1.1 Check for completion and conformance to specifications.
- 8.1.2 Check the accessibility of all instruments and components for field adjustments, routine maintenance and removal for overhaul, and relocate as necessary.
- 8.1.3 Perform pressure test on all air sub headers as required by the line specifications.
- 8.1.4 Clean all instrument air sub headers, transmission tubing and control tubing by blowing with dry, filtered air prior to connection of instrument components
- 8.1.5 Leak test pneumatic transmission and control tubing, using an approved method acceptable to OWNER
- 8.1.6 Perform hydrostatic or, where appropriate, pneumatic pressure tests on all instrument process piping, as required by the respective line specifications. Drain and below free of water, as necessary after test.
- 8.1.7 Check continuity and identification of transmission and control systems for each instrument to ensure proper hookup. Perform megger and continuity tests for instrument electrical wiring. Check correct source of power, polarity and earthing (take into account intrinsically safe technology of this procedure).
- 8.1.8 Check the bore of the orifice plates and flow direction during and after installation.



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- 8.1.9 Check (on/off valve and) control valves for direction of flow and proper operation, e.g. travel, action with air failure, etc.
- 8.1.10 Calibrate all instruments (including the instruments in the fire and gas system) and synchronize transmitter and receiver readings for each instrument loop. Check the orifice plates and flow nozzles. Set air pressure regulators.
- 8.1.11 Install pressure and temperature gauges after line flushing.
- 8.2 Check fuses, perform voltage checks and energize all electrically powered instruments, alarm and shutdown system, etc. Maintain power supply.
- 8.3 Set pneumatic and electronic type switches and local control by simulation of input signals.
- 8.4 Check thermocouples and resistance thermometer circuits from element to measuring instrument by simulation.
- 8.5 Check and adjust calibration of all other field and panel mounted instruments.
- 8.6 Complete loop functional test of all instruments, including the instruments in all package units and in the fire and gas system. Functionally test complete control loops alarm and shutdown systems and partial process sequence, etc., to verify capability to measure, operate and stroke final control elements in the direction and manner required by the process application. All test results shall be recorded and submitted to OWNER. Each test record shall include date of test, ambient temperature, climatic conditions, instruments used with serial numbers, names of test personnel and witnesses, identification of equipment, ground electrode or circuit tested.

Testing shall be scheduled at least 24 hours in advance and OWNER is to be notified by LSTK CONTRACTOR. LSTK CONTRACTOR shall advise OWNER prior to testing, of make, type and accuracy of test equipment used for above-mentioned items. All required test certificates should be of a recent date not exceeding 6 months.

#### 9.0 **PAINTING**

Surface preparation and application of all required paint layers shall be executed in accordance with paint specifications and related standards.

#### 10.0 **WELDING**

LSTK CONTRACTOR shall perform welding in accordance with the normal accepted industrial standards.

#### 11.0 MECHANICAL COMPLETION

LSTK CONTRACTOR shall advise OWNER in writing when erection is completed.

Mechanical completion date shall be the date when the activities have been accomplished by LSTK CONTRACTOR as dictated by the construction schedule, which shall be submitted by LSTK CONTRACTOR and approved by OWNER on due time.



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- 12.0 QUALITY ASSURANCE, QUALITY CONTROL, INSPECTION, CALIBRATION TEST AND MATERIAL CERTIFICATES
- 12.1 LSTK CONTRACTOR shall perform quality control, inspect, calibrate required testing, pre-commissioning and supply certificates.
- 12.2 LSTK CONTRACTOR shall submit reports of each and every test or inspection within three (3) days after actual test or inspection is made.
- 12.3 Calibration and Testing.
- 12.3.1 Calibration and testing to be executed by LSTK CONTRACTOR in accordance with respective specifications.

Local instruments such as transmitters, converters, receivers and so on, will be preset by bench testing by LSTK CONTRACTOR in accordance with the specifications before installation on the process, so that no new settings will be necessary for loop acceptance tests.

- 12.3.2 LSTK CONTRACTOR shall inspect all materials up on receipt for damage and completeness. In case of damage incomplete material, LSTK CONTRACTOR shall modify and immediately inform OWNER.
- 12.3.3 LSTK CONTRACTOR shall carry out all tests included in this paragraph shall fill out the installation checklists and shall submit all required test certificates and documentation as required.
- 12.3.4 All tools and test gear necessary to carry out described tests shall be provided by LSTK CONTRACTOR.
- 12.3.5 Inspection and testing shall be phased with construction and installation in such a manner as to involve the minimum necessary concentration of effort and manpower and the minimum loss of time in reaching the pre-commissioning stage.
- 12.3.6 All inspection and testing shall be witnessed and approved by OWNER / authorized representative.
- 12.3.7 LSTK CONTRACTOR shall be responsible for the complete loop continuity check of the field and control room installation, including the parts of the package units, which have been connected by others.
- 12.3.8 OWNER reserves the rights whenever distinguished package Plant(s)/Unit(s) vendor's representative to be present at site LSTK CONTRACTOR shall be responsible to arrange this WORK.
- 12.3.9 LSTK CONTRACTOR shall be responsible for the loop continuity checks from the marshaling cabinets or direct connected cabinet cables in the control room (termination point of



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underground multi core cable). The loop continuity checks shall be performed on a complete loop, including all parts of the loop as indicated on the instrument loop diagrams (ILD'S).

- 12.3.10 The communication equipment between field and control room building and/ or other buildings shall be the responsibility of LSTK CONTRACTOR.
- 12.3.11 Only complete loops shall be accepted, signed by OWNER after all calibration / function checks have been demonstrated successfully completed and recorded.
- 12.3.12 For all package units and systems supplied by LSTK CONTRACTOR, installed or partly installed and connected by LSTK CONTRACTOR.

LSTK CONTRACTOR shall perform a normal wiring and loop check of signals and supplies to and from these systems.

The following systems apply:

- Analyzer system
- Bentley Nevada system
- Flow metering system
- Fire, smoke and gas detection system
- Tank gauging
- FCS / ESD / PIC system, etc.

For more details LSTK CONTRACTOR shall follow **Electrical design philosophy elsewhere mentioned in ITB.** 

#### 13.0 Miscellaneous

LSTK CONTRACTOR shall remove all waste and debris from the SITE.



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## **ANNEXURE-7-2G**

### **INSULATION WORK**

#### 1.0 **GENERAL**

#### 1.1 SCOPE

This standard covers the requirement for supply and application of materials for thermal insulation of equipment, piping and other items.

#### 1.2 REFERENCE 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, standards and statutory regulations considered as minimum requirements are as follows:-(Latest revision of these shall be followed)

IS 14164	Code of Practice for Industrial Application and finishing of thermal insulation material at temperature -80°C and up to 750°C.					
IS 737	Wrought aluminimum and aluminium alloys, sheet, strip					
IS 1254	Specification for corrugated aluminum sheet					
IS 1322	Bitumen felts for waterproofing and damp proofing					
IS 3069	Glossary of terms, symbols and units relating to thermal insulation materials.					
IS 8183	Specifications for bonded mineral wool.					
IS 9743	Thermal insulation finishing cements					
IS 12436	Specification for Preformed Rigid Poly-urethane (PUF) and Polyisocyanurate (PIR) Foams for Thermal Insulation					
IS 13205	Code of practice for the application of polyurethane insulation by the insitu pouring method.					
ASTM C921	Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.					
ASTM C1029	Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation					
ASTM C1696-16	Standard Guide for Industrial Thermal Insulation Systems					
ASTM C411	Standard Test Method for Hot-Surface Performance of High - Temperature Thermal Insulation					
ASTM C450	Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging					



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ASTM C871	Test Methods for Chemical Analysis of Thermal Insulation Materials for Leachable Chloride, Fluoride, Silicate, and Sodium Ions
ASTM C1338	Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
ASTM C1055	Guide for Heated System Surface Conditions that Produce Contact Burn Injuries
ASTM C1139	Specification for Fibrous Glass Thermal Insulation and Sound Absorbing Blanket and Board
ASTM D1622	Test Method for Apparent Density of Rigid Cellular Plastics
ASTM C680	Standard Practice for Heat Loss or Gain and Surface Temp.

#### 1.3 **Deviations**:

Should unforeseen difficulties arise to comply with requirements of this standard.

Alternative material and application techniques superior to the requirements of this standard be submitted with complete details for approval of owner.

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 specification.

#### 1.4 **LIMITATIONS**

#### **Temperature Limits.**

This standard deals with insulation applied externally on piping equipments etc. as per the table below:-

Maximum Operating Temperature	Type of Insulation	
60°C to 750°C for C.S., A.S. & S.S.	НОТ	
- 180°C to 20°C	COLD	

#### 1.5 THICKNESS DESIGN BASIS

Thickness calculation method as per procedure given in ASTM C-680

#### 1. Hot Insulation

Design Ambient Temperature : 35°C
Design Surface Temperature : 45°C

Permissible Heat Loss : 100 kcal./m2 hr.
Permissible Wind Velocity Outside : 1 m/sec



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Permissible Wind Velocity Inside : 0.25 m/sec

2. Cold Insulation

Design Ambient Temperature

35°C Design Surface Temperature

: 2 °C below ambient/ 0.5 Deg C above the Dew Point

Permissible Heat Gain : 10-12 kcal/m2 hr

Relative Humidity : 85% Permissible Wind Velocity Outside : 1 m/sec. Permissible Wind Velocity Inside : 0.25 m/sec.

#### 1.6 **GENERAL REQUIREMENTS**

#### 1.6.1 Information to be supplied

- Material of construction / dimension of equipments / pipes required to be insulated.
- Temperature
- Location of equipment (Indoor/Outdoor/Elevn.)
- Requirement of removable box type insulation if any
- Special requirements if any regarding type of insulation material and other properties.
- These information shall be supplied in form of insulation schedule.
- Design calculations, drawings and insulation material schedule.
- Material Test certificate's.
- Insulation works execution schedule.
- Detailed procedure for all types of execution works.
- Bill of Quantities, Initial material take-off, final material take off and material requisition.
- QA/QC plan.

#### 1.6.2 STORAGE OF MATERIAL

Insulation material shall at no time be stacked directly on the ground; instead it will be stored at a level higher than ground level. It should not only be covered by tarpaulin but other effective protections against weather are also to be provided. The contractor shall provide a properly covered storage to the satisfaction of engineer-in-charge (Refer IS: 10556).

#### 1.6.3 HYDROSTATIC TEST FOR PIPES

Before taking up insulation job on piping or vessels it shall be ensured that hydrostatic test of the concerned equipment / piping is completed. Where it is felt necessary to take up the insulation job before such testing are performed all welded and mechanical joints shall be left un-insulated for a length of at least 150mm on either side of the joint.

#### PROTECTION OF INCOMPLETE JOBS 1.6.4

Any part of insulation job which is not provided with final weather proofing will be adequately protected by means of tarpaulins and other aids. After the day's work similar protection should be provided for the partially completed jobs to be continued the next day to avoid any absorption of rain / moisture during the night.



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### 2.0 INSULATION SUPPORTS (CLEATS) TO BE PROVIDED BY EQUIPMENT SUPPLIER

Suitable supports (cleats) in the form of rings, lugs, studs or pins shall be provided on equipment by equipment supplier, however should any additional supports or anchorage be felt necessary for insulation works, the same shall be also considered in LTSK's scope, including all allied work necessary for the same. These will be installed by the contractor free of any extra cost. Owner shall be informed about the same in advance, so also design/drawings shall be updated accordingly.

#### 3.0 MATERIAL REQUIREMENTS

#### 3.1 **INSULATION MATERIALS**

#### 3.1.1 **General**

Whenever reference to any Standard is made it is presumed that the latest revision as on date should be considered unless otherwise specified.

#### 3.1.2 Specification and other requirements

Specification and other requirements will be as per below mentioned table:-

#### Hot Insulation:

For operating temperature Upto 400 deg.C,	Rockwool Mattress of density 120 kg/m3 conforming to IS:8183.
For operating temperature 401-450 deg.C,	Rockwool Mattress of density 150 kg/m3 conforming to IS:8183.
For operating temperature 451-500 deg.C,	1 <sup>st</sup> layer insulation shall be 25mm Ceramic Fibre Blanket of density 128 kg/m3 conforming to IS :15402 and balance layers with Rockwool Mattress of density 150 kg/m3 conforming to IS:8183.
For operating temperature 501-550 deg.C	1 <sup>st</sup> layer insulation shall be 50mm Ceramic Fibre Blanket of density 128 kg/m3 conforming to IS :15402 and balance layers with Rockwool Mattress of density 150 kg/m3 conforming to IS:8183.
For operating temperature 551-600 deg.C,	1 <sup>st</sup> layer insulation shall be 75mm Ceramic Fibre Blanket of density 128 kg/m3 conforming to IS :15402 and balance layers with Rockwool Mattress of density 150 kg/m3 conforming to IS:8183.

Bands/Wires for securing insulation shall be of ASTM 8209 Alloy 3003 H16 or 18-737 designation 31000 (old NS3) condition H3 or 18/8 Stainless steel.

For securing cladding on insulation on piping, aluminium band 12mm (min) X 24 SWG thick shall be used. For securing cladding on insulation on equipment, aluminium band 20mm wide X 24 SWG shall be used.

Other insulating materials may be used provided they have the same or better properties and durability aspects.



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Insulation thickness of insulating materials shall be based on design calculation of thermal conductivity, insulation class, etc. Same shall be submitted to the Owner with necessary design calculations, drawings, test certificates and durability parameters.

#### For Valves, Turbines & Compressors Insulation

Prefabricated factory made Ceramic Fibre pad to be used made out of Ceramic Fibre Blanket of density 128 kg/m3 encased in high temperature resistant cloth. The minimum thickness of the pad shall be -

1. 0 Deg.C to 300 Deg.C = 25mm 2. 301 Deg.C to 400 Deg.C = 50mm 3. 401 Deg.C to 500 Deg.C = 75mm

Removable insulation for flanges and valves, like tailor made jackets or pre formed insulation boxes, shall be suitable for quick removal and reinstallation. All tailor made jackets shall fit the actual valve/flange/equipment and secure adequate overlap to incoming insulated pipes.

Technical data sheet of the Ceramic Fibre Pad is as below:

Α.	Purpose/Application					
	This Engineering specification is for Fabric jacketed supercera ceramic Fibre insulated flexible					
	reusable covers/pad for application on pipes: pipe fittings, valves, flanges etc vessels &					
	equipments, tubes etc in hot service					
01	Dimension (mm)	As per dra	wing/sketch pi	rovided by OEN	И.	
02	2 Thickness (mm) 25-100					
1. 5	Specification of Protective jacketed n	naterial				
i	Vest Cover	Liner Fibre	Glass Fabric			
ii	External Top Cover Fabric	Polymer C	oated Fibre G	lass fabric Tem	np. resistance 300	
	(for cold face)		& water resist			
iii	External Bottom Cover fabric (for hot face)	High silica	cloth for Tem	o Resistance u	p to 900 Deg C	
2.	Specification of insulation Material		Cerar	nic Fibre Blank	et	
				per IS 15402)		
i	Classification Temperature	1260 degree Celsius				
ii	Thickness		25 – 100mm			
iii	Bulk Density	128kg/m3				
iv	Shot content on 70 mesh (%)			<30		
V	Tensile strength (KPa)			>40		
vi	Mean Fibre Dia (Micron)			2-4		
Vİİ	Linear Shrinkage (%) At 1200			3.5		
	Deg. C for 24 Hrs					
viii	Thermal Conductivity (W/mK)	1000C	2000C	3000C	5000C	
	Max.	0.046	0.072	0.078	0.150	
ix	Chemical composition	SiO2% 49-58				
		Al2	2O3%		41-48	
		Zr	O2%		0-7	
		FeO3% <0.1			<0.1	
3	Hardware & Non Metal fastening					



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# INSTRUMENT AIR/PLANT AIR SYSTEM TFL, TALCHER

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i)	Buckle/Draw Stings	Stainless steel (min SS 316), High Temp Braided Chord of fibre glass
ii)	Stic Pins	Stainless Steel (min SS 316), Pins to prevent the insulation from movement inside the cover
iii)	Stitching	Double sewn with Teflon coated Fibre glass wrapped stainless thread. The sewing thread shall not resolve or decompose in typical chemical plant environment.
iv)	Belting	High Temp Fabric same as used in hot face cover
4	Other Properties	
li	Fire Resistance	Non-Combustible

Rockwool Insulation shall be of water Repellent Grade and tested as per BS: 2972 for Water Absorption. Maximum water absorption is 0.5 kg/m2 in 48 hours duration.

Precautions must be implemented in the design and fabrication of the insulation jackets to avoid the insulation material from sagging causing reduction of the insulation properties of the jackets.

#### **Cold Insulation:**

(As per BS 476 Part-4)

Corrosion/water Shock Resistance

Chemical Stability/Resistance of

Insulation material and specifications for cold insulation for operating temperatures up to (-) 180°C and dual temperature (cold/hot) service where, upper temperature limit is 125°C shall be as given below for all sizes of piping/equipment:

#### Polyurethane Foam

Preformed pipe section's and radial lags (for higher diameter pipe) of polyurethane foam of self-extinguishing type shall be in accordance with ASTM C591 TYPE-II Grade 2.The physical requirement of bulk density, chloride content, thermal conductivity and PH value of the material shall be as follows:

Temp. Limit Bulk density: Upto (-)180°C & 120°C (max) 35.0 to 39.9kg/m3

Chloride content : 20 ppm (max)

Thermal conductivity: 0.221 mw/cm°C at mean temp. 10 deg C

PH Value : Neutral. Closed cell content : 95% (min)

High density polyurethane foam block of bulk density more than 300 Kg/m3 shall be used for supports.

#### Polyurethane Foam Cast-in-Situ

Cast-in-Situ Polyurethane Foam of density 42±2 kg/m3 conforming to IS: 13205 shall be used. High density polyurethane foam block of bulk density more than 300 Kg/m3 shall be used for supports.

Temp. Limit : Up to (-) 45°C and 120°C (max.)



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#### Polyisocynaurate

Temp. Limit

Up to (-) 180°C and 125°C (max.)

Other insulating materials may be used provided they have the same or better properties and durability aspects.

Insulation material specification/ thickness/application mentioned in this document are the minimum requirements. Insulation specification/ thickness/ application shall be based on design calculation of thermal conductivity, insulation class, relevant IS/ ASTM codes etc. Same shall be submitted to the Owner with necessary design calculations, drawings, test certificates and durability parameters. LSTK shall submit detailed material specifications, durability parameters assured, test certificates and application procedure to OWNER/ PMC approval.

#### 3.2 AUXILIARY MATERIALS FOR CLADDING

#### a) Aluminium Cladding

#### - Horizontal Vessels

Aluminium sheet as per IS-737 (designation 31000, condition H3 for flat sheet & 31500/51300, H4 for corrugated sheets)) shall be used for cladding. Insulation on overall piping, vessel and equipment, cladding will be coated on the side in contact with insulation with 3 mil thick polysurlyn film.

Specifications for aluminium Cladding material shall be as follows:

Material	Reference Code / Standard	Thickness	Application
Aluminium sheet with applied moisture barrier	IS: 737 / ASTM C-653	22 SWG (0.71mm)	For all piping, tanks, vessels, heat exchanger, flanges, valves, equipments etc. upto 24" outside dia
of 3 mil thick Polysurlyn coating		20 SWG (0.91mm)	For piping, tanks, vessels, heat exchanger, flanges, valves etc. above 24" outside dia

Removable cover for flanges, valves etc. shall be made out of minimum 18 SWG thickness Aluminium Sheets.

#### - Vertical Vessels

Cladding material for vessels with insulation O.D. 900 mm and less shall be same as for pipes. For vessels above 900 mm insulation O.D. 22 SWG corrugated aluminium sheet as per IS-1254 or ribbed aluminium sheet 32 mm x 5 mm deep corrugations may be used.

Aluminium Foil to protect stainless surfaces in Temperature below 0 deg c shall be 0.1 mm (42 SWG) thick per ASTM 8209 alloy 3003 H16 or IS-737 designation 31000 (0IdNS3) condition H3. For securing aluminium foil on stainless steel surface 24 SWG thick x 20mm wide aluminium bands shall be used.



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#### b) Screws

Screws used with aluminium sheeting shall be of self tapping type, A No.8x12mm long cadmium plated / SS of high quality at intervals of 150mm.

#### c) S-Clips.

Aluminium, 20x1.5mm or 25mm wide stainless steel banding bent to form a shape of "S" provide a minimum lap of 50mm.

#### d) Bands for securing cladding.

Aluminium of dimensions 12mm width x 0.56 mm thick (24 SWG) for pipes. Stainless Steel bands Type 304, 0.4mm thick x 13mm wide for large dia pipes (above 24") and cylindrical equipment up to outside dia 900mm, 0.5mm thick x 19mm wide for cylindrical equipment above 900mm outside dia meter.

#### e) Quick release clips for removable covers.

Suitable quick release clips will be made as shown in fig. 7 from 20Cm width x 20 SWG aluminium sheet and some fig.7 from 20mm width x 20 SWG aluminium sheet and some suitable rectangular ring.

- f) Sealant for cladding joints with Foster 95-44 /TIKI F9544.
- g) The vapour barrier mastic shall be Foster 60-38/39 /TIKI M6038/39
- h) Adhesive for cold insulation shall be Foster 81-33 /TIKI P8133
- i) Vapour Stops at pipe support location shall be Foster 90-66 /TIKI F9066
- j) Rivets: Aluminium 'POP' blind eye type / Stainless Steel 9.5mm long x 5mm dia meter.
- k) Filler material shall be PUF dust or mineral wool mixed with specified adhesive shall be placed lightly so as to fill irregular voids and sealant shall be Foster Foam Seal Sealer 30-45. Glass cloth to be used for vapour barrier reinforcement shall be open weave 10 mesh having glass fibre thickness of 5 mils.

Galvanised steel sheets/ Annealed galvanised steel sheets/ Galvanised colour coated sheet are strictly **PROHIBITED** for use in cladding works. Other cladding materials (except G.I.) may be used provided they have the same or better properties and durability aspects, after prior approval from Owner/PMC.

Cladding material / auxiliary material specification/ thickness/ application mentioned in this document are the minimum requirements. Cladding material/ auxiliary material specification/ thickness/ application shall be based on design calculation of thermal conductivity, insulation class, corrosion aspects, durability, relevant IS/ ASTM codes, etc. Same shall be submitted to the Owner with necessary design calculations, drawings, test certificates and durability parameters.

LSTK shall submit material specifications, durability parameters assured, test certificates and application procedure to OWNER/PMC approval.

#### 4.0 **INSPECTION.**

#### 4.1 General

All insulation material shall be subject to inspection by owner before application. In case of doubt, Owner's representative will have the liberty to get the material tested by the contractor at any approved test laboratory. Any material not meeting specified requirement will be



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rejected and the rejected material shall have to be replaced by the contractor with material of specified type and quality. Insulation found to be improperly installed shall be removed and reinstalled properly by the contractor.

Contractor shall maintain detailed log of various insulation works and same shall be updated on daily basis. QA/QC checks of work done and materials shall be also registered in the daily logs. Owner will have the liberty to check the logs.

#### 4.2 Inspection

Inspection of materials and / or installation by owner shall not relieve the contractor of his responsibility to ensure that finished insulation conform to specified requirements and is free from defects, contractor shall correct any defects due to poor workmanship. Contractor shall maintain test certificates and other relevant data from manufacturer.

#### 4.3 Test for thickness

Test for thickness shall be carried out after application. Thickness at any point shall not be less than 2mm than the indicated designed thickness and excess thickness up to 115% of the designed thickness is permissible.

#### 4.4 Testing for bulk density

Testing of bulk density of the insulating materials shall be carried out before the application of insulation. This should be within  $\pm$  15% of the specified value. Test location shall be selected by owner and its repair shall be done by contractor.

#### 5.0 APPLICATION

#### 5.1 General

Insulation thickness shall be as per design calculations as specified in the drawings/insulation schedule/ specification/isometric drawings prepared for equipments/piping.

Contractor shall submit detailed calculations and procedure for different insulation works based on relevant IS / ASTM codes.

#### 5.2 No. of Layers

When insulation thickness exceeds 75 mm, the insulation shall be applied in multi-layers with all joints staggered. Each layer will be separately secured with metallic bands/wires.

No. of layers shall be as follows:

**Insulation Thickness** 

Up to 75mm 76 to 150 mm 151 and above No. of Layers (Min.)

1 Layer

2 Layers

3 Layers or more.



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#### 5.3 **GENERAL REQUIREMENTS**

### 5.3.1 **Surface preparation**

- Surface to be insulated shall be cleaned of all dirt. Oil loose scale etc. by wire brushing. Insulation works shall commence only after necessary clearance from QA/QC for painting works as per painting specification. All insulation shall be applied at ambient temperature and both the metal surface and insulation material shall be dry prior to application of insulation.
- The surface for cold insulation shall be then coated with a bitumen emulsion or a mastic coating.
- If the vessel is made of stainless steel, it shall be wire-brushed. with stainless steel wire brush.

#### 5.3.2 Expansion / contraction joint

Depending on the type of insulation used the operating temperatures and nature of the material it may be necessary to provide expansion/contraction joints on vessels or pipes to prevent the insulation from rupturing/buckling when the surface expands/contracts. Joints are to be designed as per relevant IS / ASTM codes.

#### 5.3.3 **Filling of Voids**

All voids, irregularities and joints shall be packed with loose insulation material/insulation cement trowelled smooth whichever is applicable.

#### 6.0 MEASUREMENT OF INSULATION WORK.

6.1 Measurement of insulation works shall be as per IS: 14164.

#### 7.0 **GUARANTEE**

- There shall be a surface temperature recording as mentioned in the Design Parameter to be performed with the help of Thermography Camera, post the line/ equipment is charged in operating conditions. The same shall be in LSTK's scope and LSTK shall give a detailed report of the same.
- -The guarantee test shall be carried out when plant is fully operative.
- -The surface temperature, reading shall be taken at six points per pipe line and at each point it shall be taken on all four sides in top, bottom, left side and right side.
- -The above reading shall be taken at 2 hours intervals and shall be taken for 18 hours starting from 11 a.m. in the morning.
- Simultaneously ambient temperature shall be taken as per IS: 14164
- A graph shall be plotted between ambient and surface temperature reading
- From this graph the surface temperature against ambient temperature shall be found out



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- The ambient and surface temperature shall be measured by the instrument provided by the contractor. The instrument shall be calibrated to the satisfaction of owner/consultant.
- The contractor is required to guarantee the surface temperature of 60°C (max.) for equipments and piping in case of Hot Insulation. For cold insulation of equipments and piping, the difference between skin temperature and ambient temperature shall not exceed 2 °C.
- Ambient temperature and surface temperature shall be measured by duly calibrated instruments provided by CONTRACTOR.
- The CONTRACTOR shall undertake immediate replacement of insulation material damaged in transit, storage or application, at no additional cost to Owner.
- LSTK shall produce required number of copies of test certificates as per relevant IS/ASTM Standard. LSTK shall certify/ensure that Test to be done are from NABL approved laboratory, approved by Owner.
- All materials are new and unused and are as per specifications called for in this standard.
- The operating thermal conductivity shall be as specified
- The workmanship shall be in accordance with good practice.
- Other terms & conditions of the guarantee clause shall be as per NIT / purchase order / Commercial documents of ITB.



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#### **ANNEXURE-7-2H**

#### **PAINTING SPECIFICATION**

#### 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 (1-1/4 Cr through 9 Cr) alloys

S.S - Stainless steel, such as 304,316, 321, 347,

Non-ferrous - copper, aluminium and their alloys.

High Alloy - Monel, Inconel, Incoloy, Alloy 20, Hastelloy, etc.

DFT - Dry Film thickness, the thickness of the dried or curved 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 25m2 of surface area to be painted.

Maximum allowable contaminant levels and pH range is as follows:

Sodium chloride, less than 50 microgram / cm2;

Soluble iron salts, less than 7 microgram / cm2; 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/Cm² 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.

- Vacuum or suction head abrasive blast-cleaning,
- Wet jet abrasive blast-cleaning,



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- 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.

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.



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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. > 50m2) 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.

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.



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#### 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.

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.



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#### 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°C (depending on local condition)
  - The metal temperature is less than 3°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

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.



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Coating thickness checks in accordance with reference code shall be performed, and the Contractor shall undertake remedial action if the measured thickness is less than specified.

Build up of each material to required thickness shall be made prior to the application of the subsequent coat; final film build shall be the minimum specified.

#### 4.2.7 Multiple Coat Applications (Except Wet-On-Wet)

Before successive paint coats are applied, intermediate coats shall be inspected for surface contamination. The presence of any grease or oil, shall be removed by a suitable solvent, and any salt and dirt adhering to the surface shall be removed by scrubbing with a solution of non-toxic detergent (except those prescribed by the manufacturer as "wet-on-wet"). Removal of contaminants shall only be performed after an intermediate coat has had sufficient time to cure.

The surface shall then be pressure hosed or dusted down by brush to disturb and remove deposits not apparent on visual inspection.

Coatings shall be applied only under the following conditions:

- The surface has been cleaned and is dry;
- The manufacturer's stated minimum time for re-coat has elapsed;
- The manufacturer's stated maximum time for re-coat has not elapsed. If the maximum time has elapsed then pre-treatment shall be in accordance with the paint manufacturer's recommendations; and

Damaged areas in preceding coat have been made good in accordance with this Specification.

When multiple coat of finish paint are indicated, they shall be applied in different shades to ensure that multiple coats have been applied.

#### 4.2.8 Protective Coatings for Fasteners

Black and galvanised erection bolts/nuts and galvanised holding down bolts/nuts shall be prepared and painted in accordance with Section 4.4 of this Specification.

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 confirm 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.



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The coating mass of zinc shall be as specified on equipment data sheets and the Drawings. Galvanised coatings shall be tested by the methods described in referred code.

After galvanising all material shall be cooled to air temperature in such a manner that no embrittlement occurs.

Galvanised coatings shall be smooth, uniform, adherent and free from stains, surface imperfections and inclusions.

All gratings and fixtures including nuts, bolts and washers that are required to be galvanised, shall be hot dipped galvanised and all nut threads shall be re-tapped after galvanising and a lubricant applied on Cold working of galvanised steelwork shall be avoided.

#### 4.4 Damaged or Inaccessible Surfaces

#### 4.4.1 Damaged Paint Surface

Repair of damaged painted surfaces, as well as painting of galvanised and black bolts, and galvanised holding down bolts after erection shall comply with this Clause. The treatment shall be:

- Pre-clean the damaged or unpainted areas in accordance with Section 4.2.1 of this Specification;
  - Disc or hand sand to clean bright metal;
- Inorganic zinc primers subject to mechanical damage or weld etc shall be power tool cleaned
- Feather backs by sandpapering or whip blasting the original coatings surrounding the damaged area over a 50mm distance. A rough surface shall be obtained on epoxy coatings;
  - 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.



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#### 4.5 Surfaces Not To Be Coated

The following surfaces shall not be blasted or coated unless specifically directed:

Machined surfaces, bearings, seals, grease fittings, adjusting screws and name plates, and identification tags.

- Valve stems;
- Raised faces on pipe and equipment flanges;
- Electrical cabling;
- Instrumentation, gauges and sight glasses;
- Titanium, stainless steel and non-metallic surfaces; and
   Field weld margins, 50mm either side of weld, on tankage and piping, prior welding.

The rear face of piping flanges shall be shop prime coated only. Flange holes for fasteners shall be fully coated.

### 4.6 Wash-Up

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/cm2) 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



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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.

#### 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	Application					
No.		Surface	Generic Coating	Minimum	Remarks	
		Preparation	System	DFT		
01	Structural Steel work with operating temp. Up to 90° C (Steel structures, Piping support, uninsulated CS piping, flanges, valves, stairways, walkways etc.	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS- 05-5900 (Latest).	P2: ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  F1: One coat of two packs. Polyamide Cured Epoxy.  F5: One coat of two pack aliphatic acrylic	P2:60 microns F1:120 – 200 microns F5:60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High durability	Total dry film thickness of paint system: 320 microns as per C5 – High durability
02	except grating).  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)	polyurethane P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleo resinous based heat resistant ready mixed Aluminium Paint.	P1:75 microns F3:2 x 25 microns for each coat Total - 125 microns.	Total dry fil thickness of system: 12	of paint



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Ref	Application				
No.		Surface Preparation	Generic Coating System	Minimum DFT	Remarks
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).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1:75 microns F4:2 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).	F8 : One coat of high temperature epoxy phenolic	F8 : 2 x 125 microns	Total dry film thickness of paint system: 250 microns.
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	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8:2x 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).	F9 : Two coats of Inorganic Co-polymer based coating With an Inert Multipolymer Matrix.	F9 : 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).	P2: ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  F1: One coat of two packs. Polyamide Cured Epoxy.  F5: One coat of two pack aliphatic acrylic polyurethane	P2:60 microns F1:120 – 200 microns F5:60 microns	Total dry film thickness of paint system: 240 320 microns as per C4 – High Durability Total dry film thickness of paint system: 320 microns as per C5 – High Durability
08	Uninsulated CS equipment with operating temp. From 91°C to 200°C, to be	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS-	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1	P1:75 microns F3:2 x 25 microns	Total dry film thickness of paint system: 125 microns.



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Ref	Application				
No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
	treated at Manufacturer's shop.	05-5900 (Latest).	F3: Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	for each coat	
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).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1: 75 microns  F4: 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).	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8:2x 125 microns	Total dry film thickness of paint system:250 microns
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).	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8:2x 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).	F9: Two coats of Inorganic Co-polymer based coating With an Inert Multipolymer Matrix.	F9:2x 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,	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS- 05-5900 (Latest).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of	P1:75 microns F3:2 x 25 microns for each coat	Total dry film thickness of paint system: 125 microns.



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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	
	metal stacks and similar with operating temp. Up to 200°C. (With exclusion of stair ways, walk ways etc.).	'	single pack special Oleo resinous based heat resistant ready mixed Aluminium Paint.			
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).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1:75 microns F4:2 x 25 microns for each coat Total - 50 microns.	Total dry fil thickness of system: 12	of paint
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).	P2: ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  F1: One coat of two packs. Polyamide Cured Epoxy.  F5: One coat of two pack aliphatic acrylic polyurethane	P2:60 microns F1:120 – 200 microns F5:60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability
		excepti be trea same s	urfaces shall be galvar on of the end header of a ted as described above a surfaces shall not be trea cording to environmental	air cooled hea at Manufactui ted at shop, t	at exchanger rer's shop. they shall be	s that shall In case the treated at
16	For surfaces of air cooler heads not galvanized with operating temperature up to 91° 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).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	P1:75 microns F3:2 x 25 microns for each coat	Total dry fil thickness of system: 12	of paint



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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks	Remarks	
		NOTE: 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	STORAGE TANKS						
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).	P2: ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  F1: One coat of two packs. Polyamide Cured Epoxy.  F5: One coat of two pack aliphatic acrylic polyurethane	P2:60 microns F1:120 – 200 microns F5:60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability	
b)	CS Storage Tanks, Excluding indicated in SI. No. (a)	Blast cleaning to near white metal grade 2 ½, of Swedish Standards SIS- 05-5900 (Latest).	P1: One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1  F1: One coat of two pack Polyamide Cured Epoxy.  F5: Two-pack aliphatic Isocyanate cured acrylic finish paint	P1:60 microns F1:120- 200 microns F5:60 microns	Total dry film thickness of paint system: 240 microns as per C4 – High Durability	Total dry film thickness of paint system: 320 microns as per C5 – High Durability	
19	Cold Insulated Carbon Steel and low alloy Steel (1-1/4 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).	F7 : Two coats of Tar Free Epoxy paint suitably pigmented	F7 : 2 x 125 microns	Total dry fil thickness o system: 25	f paint	
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	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8 : 2 x 125 microns	Total dry fil thickness o system:250	f paint	



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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
		(Latest).			
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).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F6 : Temperature indicating paint	P1:75 microns F6:2 x 25 microns for each coat Total - 50 microns.	Total dry film thickness of paint system: 125 microns
23	PACKAGE:				
(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).	P2 : ONE coat of two pack zinc rich epoxy Primer meeting SSPC Paint 20 level 1  F1 : One coat of two packs. Polyamide Cured Epoxy.	P2:60 microns F1:120 – 200 microns F5:60	Total dry film film thickness of paint system: 240 320 microns as per C4 Total dry film thickness of paint system: 320 microns as per C4
			F5 : One coat of two pack aliphatic acrylic polyurethane	microns	– High – High Durability
b)	Surfaces (CS) with operating temperature upto 91° 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).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F3 : Two coats of single pack special Oleouresinous based heat resistant ready mixed Aluminium Paint.	P1:75 microns F3:2 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).	P1 : One coat of Ethyl Silicate zinc rich with solvent Primer meeting SSPC Paint 20 level 1 F4 : Two coats of Heat Resisting Silicon Aluminium Paint.	P1:75 microns F4:2 x 25 microns for each coat Total -50 microns.	Total dry film thickness of paint system: 125 microns
d)	Package in	Blast cleaning	F7 : Two coats of Tar	F7:2x	Total dry film



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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
	Carbon Steel and low Alloy Steel (1-1/4 Cr through 9 Cr) with cold insulated surface treated at manufacturer's shop (Upto 60 Deg. C)	to near white metal grade 2 ½, of Swedish Standards SIS- 05-5900 (Latest).	Free Epoxy paint suitably pigmented	125 microns	thickness of paint system: 250 microns.
e)	Package in Cold Insulated high alloy Steel. (Upto 200 Deg. C)	Lightly Blast cleaned as per Sa 1.0 Swedish Standards SIS- 05-5900 (Latest).	F8 : Two coats of high temperature epoxy phenolic (novolac)	F8 : 2 x 125 microns	Total dry film thickness of paint system:250 microns
f) 24	DELETED 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).	F2 : Two coats of two pack amine adduct cured Phenolic (Novolac) epoxy (immersion grade)	F2:2x 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).	F7: Two coats of Tar Free Epoxy paint suitably pigmented OR F8: Two coats of high temperature epoxy phenolic (novolac)	F7:2x 200 microns OR F8:2x 150 microns	Total dry film thickness of paint system: 400 microns.  OR  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	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.



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Ref No.	Application	Surface Preparation	Generic Coating System	Minimum DFT	Remarks
	wide operating temperature				

#### 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.

Volume solids	:	Min.64% ±2
DFT Range	:	50 – 75 microns
Theoretical Spreading Rate	:	12.8 – 8.53 sqm/litre
Colour	:	Grey
Application	:	Spray (airless/air)
Drying time ( dry to handle )	:	< 45 mins. @ 30 Deg. C and 65% RH
Curing	:	<16 hrs @ 30 Deg. C and 65% RH
% of total metallic zinc in dry film (As per the ASTM D520 – Spherical size)	:	(SSPC SP 20 Level 1) >85% by wt.
Specific Gravity	:	2.5 Kg/Litre min.
Storage life	:	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.

Volume solids	:	65% min. ±2
DFT	:	50 – 100 microns
Theoretical Spreading Rate	:	13 – 6.5 sqm/litre
Colour	:	Grey
Application	:	Airless spray/air spray/brush
Drying time ( dry to handle )	:	<10 min. @ 30 Deg C
Hared Dry	:	< 1.5 hrs @ 30 Deg C
% of total metallic zinc in dry film (As per the ASTM D520 – Spherical size)	:	(SSPC SP 20 Level 2) 81% by wt. min.
Specific Gravity	:	2.3 Kg/Litre min.
Storage life	:	12 months under sealed conditions



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#### **Finish Paints**

### **HIGH BUILD EPOXY FINISH - F1**

This finish paint is fast drying, high build, Two-pack polyamide cured epoxy resin

Volume solids	:	85% min. ±2
DFT Range	:	100 – 200 microns
Theoretical Spreading Rate	:	7.6 – 3.8 sqm/litre
Colour	:	As per Manufacturer List
Binder	:	Polyamide cured epoxy resin, Lead & Chrome Free
Application	:	Brush or spray
Drying time		< 2 hrs @ 30 Deg C
Over coating time		< 2 hrs @ 30 Deg C
Storage life		24 months under sealed conditions

#### HIGH BUILD EPOXY FINISH (Immersion Grade) - F2

This finish paint is high build, Two-pack phenolic (novolac) epoxy

Volume solids	:	68% min. ±2
DFT Range	:	100 – 150 microns
Theoretical Spreading Rate	:	6.8 – 4.5 sqm/litre
Colour	:	As per Manufacturer List
Binder	:	Amine adduct cured epoxy resin
Application	:	Brush or spray
Drying time	:	< 1.5 hrs @ 30 Deg C
Over coating time	:	< 6.5 hrs @ 30 Deg C
Storage life		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.

Volume solids	:	25% min. ±2
DFT Range	:	25 microns
Theoretical Spreading Rate	:	10 sqm/litre
Main pigment		Aluminium (ASTM 962), Lead & Chrome Free
Colour	:	Metallic Aluminium
Pigment Volume Concentration	:	15 – 20%
Application	:	Brush or spray



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Drying time	:	Surface dry <1hr. @ 30 Deg. C
		Hard dry < 3 hrs. @ 30 Deg. C
Storage life	:	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

paint with maximum neat resistance of	1 :	25% min. ±2
Volume solids	•	20 /0 //////
DFT Range		25 microns
Theoretical Spreading Rate		10 sqm/litre
Main pigment	:	Aluminium (ASTM 962), Lead & Chrome Free
Colour	:	Metallic Aluminium
Pigment Volume Concentration	:	15 – 20%
Application	:	Brush or spray
Drying time	:	Surface dry < 1hr. at 30 Deg. C
		Hard dry < 3 hrs. at 30 Deg. C
Storage life	:	12 months under sealed conditions

#### **TWO PACK ALIPHATIC ACRYLIC POLYURETHANE FINISH PAINT - F5**

It Consists of Acrylic Resin in Part A. Part B consists of an aliphatic poly-isocyanate with appropriate solvents and additives.

Volume solids	:	51% min. ±2
DFT range		50 – 100 microns
Theoretical Spreading Rate	:	10.2 – 5.1 sqm/litre
Main pigment	:	Suitable pigments to get the desired colour,  Lead & Chrome Free
Colour	:	Metallic Aluminium
Binder	:	Shall not contain any binder other than



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		acrylic resin; should not contain any alkyd / acrylate alkyds / esters.
Application	:	Brush or spray
Drying time	:	Surface dry < 1hr. @ 30 Deg. C
		Hard dry < 8 hrs. @ 30 Deg. C
ISO 11507/ASTM G 154, QUV A - Accelerated weathering	:	Gloss retention: approx. 80 % and colour change approx. DE 1.2 after 3000 hours exposure
Storage life	:	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.

Volume solids	:	40% min.
DFT	:	25 microns
Theoretical Spreading Rate	:	16 sqm/litre
Main pigment	:	As per shade requirement, Lead & Chrome free
Colour	:	As per manufacturer
Binder	:	Based in silicone Resins
Application	:	Brush or spray
Drying time	:	Surface dry < 1hr. @ 30 Deg. C
		Hard dry < 4 hrs. @ 30 Deg. C
Storage life	:	12 months under sealed conditions

#### TAR FREE EPOXY - F7 (Coal Tar is Banned Globally being Carcenogic)

A high build two component abrasion resistant, pure epoxy with anti-corrosive properties meant for excellent performance.

Volume solids	]:	Minimum 72%
DFT Range	:	150 – 200
Theoretical Spreading Rate	:	4.8 – 3.6 sqm/litre
Application	:	By brush or airless spray



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Drying time		Touch Dry within 4 hrs. @ 30 Deg C
		Hard dry < 9 hours @ 30 Deg. C
Storage life		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.

Volume solids	:	68% min.
DFT Range	:	100 – 150 microns
Theoretical Spreading Rate	:	6.8 – 4.5 sqm/litre
Binder	:	Epoxy phenolic (novolac)
Dry Temp. Service	:	Min196 to max. 205 Deg. C.
Application	:	Airless Spray / Brush Touch up
Drying Time	:	Surface dry < 1.5hr. @ 30 Deg. C
		Hard dry < 6 hours @ 30 Deg. C
Storage life	:	12 months under sealed conditions

#### **INORGANIC CO-POLYMER COATING - F9**

MIO pigmented single component inorganic copolymer coating which cures to form an inpolymer matrix able to resist temperatures up to 650°C/1202°F and thermal shock/cycling dry or dry/wet service.

Volume solids	:	74% min.	
DFT Range	:	150 microns	
Theoretical Spreading Rate	:	5 sqm/litre	
Binder	:	Inorganic copolymer coating	
Dry Temp. Service	:	Min196 to max. 650 Deg. C.	
Application	:	Airless Spray / Brush Touch up	
Drying Time	: Surface dry < 0.5hr. @ 30 Deg. C		
		Hard dry < 1.5 hours @ 30 Deg. C	
Storage life	:	12 months under sealed conditions	

#### 6.0 MACHINERY, ELECTRICAL AND INSTRUMENT EQUIPMENT:

#### 6.1 Machinery

Steel surfaces shall be treated with complete paint system at Manufacturer's shop. The paint system shall be according to Manufacturer's Std. However, suitable for operating condition and the environmental condition where the machinery will operate. Where necessary machinery shall be restored at site by Contractor with suitable finish.

#### 6.2 Electrical and Instrument Equipment

Steel surfaces shall be treated with complete paint system at Manufacturer's shop. The paint system shall be according to Manufacturer's Std., however suitable for operating condition and the environmental condition where the electrical and instrument equipment will operate. Where

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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	u	
-	Cooling Water Piping	SEA GREEN		и	
-	Fire fighting Piping	Red	3002	u	
-	Structures upto 2 MT	BLACK	9005	u	
-	Structures above 2 MT	GREY	7010	u	
-	Stair cases – ladders	BLACK	9005	и	
-	Walkwais	GREY	7010	ű	
-	Handrails assemblies	YELLOW	1004	ű	
-	Equipment	GREY	7035	ű	
-	Hot equipment	SMOOTH	ALUMINIUM	ű	
-	Fire fighting equipment	RED	3002	ű	
-	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 90°C	GREY	7035	и	
-	Machinery (compressors & pumps) with operating temperature above 90°C	SMOOTH	ALUMINIUM	и	
FURN	ACES				
	Cassing and connected steel works	SMOOTH	ALUMINIUM	u	
_	Steel work not connected to casing	SMOOTH	ALUMINIUM	"	
AIR C	OOLER				
-	High Temperature Surfaces (Temp. > 90°C)	SMOOTH	ALUMINIUM		



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Description	Colour	Ra1	Correspond. Asian Paint colors to be defined – See Note-2
- Low Temperature surface (Temp. < 90°C)	GREY	7035	66
- Flare <u>&lt; 9</u> 0°C	GREY	7035	u
- Flare <u>&gt;</u> 90°C)	SMOOTH	ALUMINIUM	и
TANKS			
- Shell of fixed roof	WHITE	9010	и
- Roof of fixed roof tank	WHITE	9010	

NOTE-1:

The colours shall be according to IS2379:1990/International STD. RAL or BS,

proposed by Contractor or Manufacturer

#### 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.

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.



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The Contractor shall provide suitable protection for all adjacent plants or equipment from airbone 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 preformed on the site, the contractor shall ensure that any
  works applied by others is acceptable.

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.



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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 orientativally fixed according to following:

- (A Dimension of side of unitary elements of grid)
- a) Storage Tanks A 60 mm
- 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  $A-20 \ \text{mm}$
- d) Equipments and pipings with O.D. less than 300 mm and for machinery with small dimensions A 10 mm

#### 12.2 <u>Inscription's Colours</u>

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 confirm to the following Table:-

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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 Jensons & Nickolson
- 3.M/s Jotun Paints
- 4. M/s Asian Paints
- 5. M/s Grauer & Weil (India) Limited
- 6. M/s Shalimar paints
- 7. M/s Garware Paints
- 8. M/s Goodlass Nerolac Paints Ltd
- 9. M/s.HEMPEL Paints
- 10. M/s International Paints (Akzo Nobel Brand)
- 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
  - 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,



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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).



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#### ANNEXURE-7-3

#### QUALITY CONTROL PROCEDURE AND INSPECTION REQUIREMENTS

#### 1.0 LSTK CONTRACTOR'S QUALITY CONTROL

1.1 LSTK CONTRACTOR shall provide a quality control program manual include specific WORK methods and inspections, which assure quality.

This quality control program manual must be submitted to OWNER for Approval before starting the construction activities.

All installation WORK must be in strict accordance with this approved manual.

- 1.2 The quality control program shall include as a minimum the following:
  - Methods use to control drawings; specifications and CONTRACT correspondence to assure that only the latest revisions are being used in the field.
  - Inspection personal name, organization.
  - Inspection methods and documentation of inspection (or tests) for shop fabrication, if required, and installation.
  - Material control procedures from SITE receiving point, through "over, short and damage inspection" through storage and through installation.
  - Positive material identification Procedures for:
  - Electrical cable pulling and testing.
  - Asphalt placement inspection.
  - Handling and storage methods to prevent damage.
  - Inspection and testing procedures and reports for civil, structural, piping, electrical, instrument, equipment and all installation WORK.
  - Repair.
  - Scrap and reject.
  - Grouting.
  - Welding.
  - Welder qualification.
  - Receiving all permanent plant material & equipment.
  - Rigging.
  - Welder's tests.
  - Nondestructive examinations to be used.
  - Positive material identification, etc.
  - Identification of LSTK CONTRACTORS and ensuring their compliance with the manual and WORK required.
  - Material certification verification methods.
  - Calibration procedures for measurements and test equipment.
  - Marking and identification of components in process and complete assemblies.

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- 2.0 Shop fabrication and field installation inspection OWNER'S REPRESENTATIVE to ensure specifications. in the following areas will be performed by full adherence to Receiving and inspection.
  - Calibration of test inspection equipment.
  - Preventive maintenance and storage protection.
  - Internal cleanliness.
  - Proper material use and control.
  - Nondestructive testing and its results.
  - Workmanship.
- 3.0 OWNER'S REPRESENTATIVE or others as authorized by OWNER are to be permitted access to LSTK CONTRACTOR'S work areas for the purpose of inspection of material, equipment, documentation and other areas as required in LSTK CONTRACTOR'S quality assurance / quality control program.
- 4.0 No concrete will be placed by LSTK CONTRACTOR without an OWNER "Pour Release Form".
- 5.0 OWNER'S construction inspections will not relieve. LSTK CONTRACTOR of inspection or other responsibilities.
- 6.0 For piping all welders test pieces shall be supplied by LSTK CONTRACTOR and fully prepared for welding by LSTK CONTRACTOR.
- 7.0 LSTK CONTRACTOR shall evidence its familiarity and experience with the execution of the installation of WORK to the requirements of the applicable codes and shall perform its WORK in accordance to these requirements and to instructions issued by OWNER'S REPRESENTATIVE in this regard.
- 8.0 CHECK ON QUALITY OF WORK
- 8.1 OWNER'S REPRESENTATIVE'S inspector shall have free access to the place where the WORK is performed at all times, in order to check the quality of WORK
- 8.2 If during inspection *I* check reveals unsatisfactory WORK, LSTK CONTRACTOR shall immediately at LSTK CONTRACTOR'S expense. take such corrective measures as deemed required.
- 9.0 **CONTROL SYSTEMS**

LSTK CONTRACTOR shall initiate and maintain the following control systems

- 9.1 **Backfilling** 
  - Compaction tests.
- 9.2 Concrete
  - Design mix and approval record(s).
  - Batch plant inspection record.
  - Slump test record.
  - Compressive test record.
  - Pour release record.
  - Grouting release record.
  - Placement inspection records.
  - Concrete curing records.
- 9.3 **Asphalt** 
  - Design mix and approval records.
  - Batch plan inspection records. Placement inspection records.

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9.4 **Piping** 

- Weld x-ray file.
- Pipe and fitting certificate file.
- Isometric weld control sheet. Hydrostatic test records.

9.5 **Grounding** 

Earth resistance test records.

#### 9.6 Electrical Cable and Instrument cable

- Insulation resistance test records.
- Continuity test records.

#### 9.7 Material certification files

#### 9.8 **Equipment**

- Weld x-ray file.
- Material certificate files.
- Equipment installation records.
- Equipment maintenance record.
- Hydrostatic test records.
- Grouting release records.
- Alignment records.
- Vibration records.

#### 10. Requirements for Certification of Materials

10.1 Mill certification of materials will be required based on the material type, the use and the codes and requirements.

#### 10.2 LSTK CONTRACTOR shall provide:

Type A certification of compliance, for all but not limited to the following materials which LSTK CONTRACTOR is responsible to supply:

- Imported backfill materials.
- Ready mix concrete.
- Asphalt paving materials
- Prefab concrete items, including pre-cast manholes, catch basins, pits, sumps and sleepers.
- Paving stones and tiles.
- Inserted and embedded items, other than rebar, wire mesh and anchor bolts.
- Masonry blocks.
- Steel sliding plates.
- Special grouting materials, i.e. non-shrink type.
- Grouting materials, including grounding loop and branch wire which they are LSTK CONTRACTOR'S supply.

Type "B "certificate, for all but not limited to the following materials, which LSTK CONTRACTOR is responsible to supply:

- Materials to be considered structural or structural grade.
- Reinforcing grade.
- Wires mesh reinforcement fabric.
- Anchor bolts.

### 10.3 **Definition of Type of Certificates Type A (certificate of Compliance):**

This is a certificate of compliance, issued by the manufacturing or processing works and FORM NO: 02-0000-0021 F2 REV3



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signed by the quality department or persons to carry the responsibility for quality and conformity, stating that the materials) supplied correspond (5) with what was agreed in the purchase order.

#### Type B (mill Certificate):

This is a certificate on which the manufacturer's head of quality department confirms that the product supplied corresponds with what has been agreed in the purchase order. Certification shall be on the basis of tests carried out on the material of the product itself, as per purchase order specification. The testing and certification are to be carried out by a testing center which is independent of the production section of the manufacturing works and which has the codeapproved facilities. Independence of such testing center should be warranted by LSTK CONTRACTOR.

10.4 LSTK CONTRACTOR will maintain a systematic filing system of all certificates and reports for all tests and inspections carried out by it under the applicable specifications, standards and codes of practice quoted therein.

LSTK CONTRACTOR may use its own format for records but this must be submitted to OWNER'S REPRESENTATIVE for his approval prior to use.

LSTK CONTRACTOR can expect to be audited on a continuous basis. Originals of all documents to be sent to OWNER'S REPRESENTATIVE.



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#### ANNEXURE-7-4

#### SCHEDULE, PROGRESS EVALUATION AND PROGRESS REPORTING

#### 1.0 **GENERAL**

1.1 WORK shall start and be completed in the field as indicated on the approved project construction schedule.

LSTK CONTRACTOR shall follow the sequence of construction in executing the WORK as shown in the schedule or as modified by OWNER.

The detailed scheduling of WORK will be supplied by the LSTK CONTRACTOR. WORK shall be conducted in such a manner that other construction activities are not affected.

Once detailed schedule, established and approved by OWNER, LSTK CONTRACTOR commits itself to follow the schedule in detail.

#### 2.0 **DETAILED & SCHEDULE**

- 2.1 Detailed construction schedule must cover all construction work, from lowest level up to highest level.
- 2.2 Activities shown by means of a bar chart must include as a minimum the activities listed in 4.

#### 3.0 **PROGRESS REPORTING**

LSTK CONTRACTOR shall issue a reporting procedure and a representative sample of all progress reports.

Following schedules and reports must be issued by LSTK CONTRACTOR to OWNER:

Construction schedule. (preliminary and detailed)

Monthly status report.

Weekly progress report.

Monthly construction guide schedule.

Daily manpower reports.

All except detailed construction schedule based on approved project construction schedule.

#### 4.0 CONSTRUCTION SCHEDULE

Within **Two** months after Effective Date, LSTK CONTRACTOR will issue separate graphical "S" curves for the following work activities of total CONTRACT.

#### Installation of:



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- Concrete foundations, pits. manholes. catch basins, trenches and concrete structures.
- Prefabricated concrete items
- Concrete paving and elevated slabs
- Other paving and final surfacing
- Grouting.
- Final road paving.
- Underground piping.
- Underground cable trenches and cables.
- Building erection.
- Structural steel erection.
- Engineering and design of small bore carbon steel piping systems.
- Prefabrication of piping.
- Electrical installation.
- Instrument installation.
- Equipment assembly and elect
- Erection of piping.
- Flushing and cleaning
- Hydro-testing
- Painting
- Insulation.

#### 5.0 **INTRODUCTION**

The introduction to the monthly status report shall include LSTK CONTRACTOR'S comments on the overall construction schedule with a status update line as attachment, and shall consist of the following items:

- Goals achieved last month.
- Goals for next month.
- Reason for delay, if any. Reason for deviation of original schedule.
- Average manpower by craft, including management and indirect staff.
- LSTK CONTRACTOR'S comments to general situation.

#### 6.0 **CONSTRUCTION ACTIVITIES STATUS**

This section consists of scheduled versus actual progress curves.

The progress curves are to be commented upon by LSTK CONTRACTOR.

The basis for reporting shall be the construction schedule:

The monthly status shall be reported as a percentage of the total WORK per type of WORK.



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#### 7.0 MANPOWER AVAILABILITY / REQUIREMENTS FOR THE MONTH COMING

LSTK CONTRACTOR shall submit its manpower availability requirements for the next month. This section consists also of the scheduled versus the actual manpower curves.

These manpower curves are accompanied by LSTK CONTRACTOR'S comments hereon.

### 8.0 MAIN CONSTRUCTION EQUIPMENT AVAILABILITY / REQUIREMENTS FOR THE MONTH COMING

LSTK CONTRACTOR shall submit its main construction equipment availability / requirements for the next month. This section consists also of the scheduled versus actual construction equipment requirement curves. These by LSTK CONTRACTOR'S comments hereon.

#### 9.0 WEEKLY PROGRESS REPORT

Progress reporting will be done on a weekly basis by the actually completed work based on details of work such as quantities or piece of equipment as a percentage of the total anticipated work per work activities as defined in item 4.

9.1 Progress will only be reported on the basis of completed activities as per the percentage breakdown of the major steps as follows:

#### **Progress Measurement Parameters**

Actual physical progress in the field shall be measured based upon standard percentage of completion of progress stages, that, they are to be prepared by LSTK CONTRACTOR and Approved by OWNER to calculate actual physical progress of the WORK, the exact weight value of each activity from lowest level up to highest level in each category of the WORK shall be specified by LSTK CONTRACTOR and supplied to OWNER.

After OWNER'S Approval this weight value can be used for calculation of actual progress of the WORK

#### 10.0 WEEKLY PROGRESS MEETING

#### 10.1 Weekly Work List

In the weekly progress review meeting LSTK CONTRACTOR shall forecast the WORK it plans to perform during the week by means of a weekly WORK list including its manpower resource allocation as per the activities listed in 4 and 6.

This weekly program shall be in accordance with the construction guide schedules.

#### 10.2 Work Front

LSTK CONTRACTOR shall submit monthly and weekly a total recapitulation Of the total work



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front available with estimated manpower requirements, materials and equipment which shall be supplied by LSTK CONTRACTOR.

#### 11.0 MONTHLY CONSTRUCTION GUIDE SCHEDULE

Based on approved overall construction schedule, LSTK CONTRACTOR must issue a monthly construction guide schedule covering a two (2) months period, for each individual activity.

Progress updating of construction guide schedules must be weekly and presented in the weekly progress review meeting at site.

The updated issue will show for each individual activity:

- Percent complete.
- Weight factor complete.

#### 12.0 DAILY MANPOWER REPORTS

LSTK CONTRACTOR shall be furnished daily manpower report as per agreed format.



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#### ANNEXURE- 7 – 5

#### **EXECUTION PLAN**

#### 1.0 **BIDDER ORGANISATION**

#### 1.1 **Company Organisation**

Bid shall include a description of the organization, its management structure and organization chart of Bidder's company with particular reference to the means whereby the execution of this project will be related to the overall company organization.

The Bidder shall also furnish the name(s) of their partners, associated/ subsidiary companies & their activities, and whether any such associated/ subsidiary company will be involved in the execution of WORK, and if so, their scope thereof.

#### 1.2 **Project Organization**

Bidder shall give charts of organization, which he intends to use in the execution of the work. Such charts must show lines of authority and communication of senior personals who will be assigned to this work in Bidder's home - office and other offices where WORK shall be performed (if any) and the lines connecting such Project Organization to the Bidder's internal overall organization including partners (if any). The chart shall be supported by a narrative, which shall explain how the proposed organisation will operate and in particular will provide

The name of the location of the office(s) in which the Basic and Detail Engineering Design Packages of the plant shall be carried out.

If any parts of the Basic and Detail Engineering Design Packages are to be carried out in more than one office, then details of the distribution of the jobs between offices and coordination procedure shall also be presented.

A description of the facilities offered to the OWNER'S resident engineers.

#### 2.0 Estimated project and Engineering man-hours

Bidder shall give an estimate of the engineering man-hours and its break down for all activities

#### 3.0 **Methods and procedures**

Bidder shall summarise the methods and procedures that BIDDER intends to implement during the performance of the WORK. It shall include the proposed procedures such as Engineering, Procurement, construction strategy, WORK Progress Measurement, Pre-commissioning, Commissioning and Performance Test Run of the PLANT, and Training.

BIDDER shall also furnish proposed procedures for the Project management, communication and method and frequency of reporting the progress of the WORK.

The final form for reports, which will be subject to OWNER's Approval, shall include as a minimum the following:

- a) Planning and Scheduling
- b) Work Progress
- c) Safety and Security

#### NOTES:

- Sample reporting forms and other key standard forms shall be included. a)
- b) Bidder shall state the extent to which he will be using computerized drafting, etc.



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#### 4.0 Job descriptions and personnel resumes

Bidder shall include job descriptions and personnel resumes of his staff nominated to the key positions, including (where applicable) at least the followings, or Bidder's equivalent:

Project director

Process engineering co-ordinator

Construction manager

Process engineer

Project engineering co-ordinator

Senior pre-commissioning engineer

Senior commissioning engineer

Training co-ordinator and instructor.

Construction Engineering Coordinator

Construction Quality Control Engineer

Construction Project Control Engineer

Welding Specialists

Heavy Lift Rigging Specialist

Senior Specialist Engineers

Senior Planning Engineers

**Materials Coordinators** 

Senior Construction Engineers

Senior Pre-commissioning Engineers

Warehousing Officer

Material Planning Engineers

Resumes shall give at least the name, age, nationality, education, professional exception/deviation and previous experience of each assigned personnel. Additionally, one alternative shall be offered for each position. Bidder shall ensure that personnel to be deployed meet the minimum criteria specified in Annexure-7-6

Bidder shall confirm that these key personnel will be made available to WORK on the Project as required by the schedule on full time basis.

Bidder shall furnish Summary of its Deployment Schedule Personnel as per Annexure-7-7.

Bidder understands that the said proposal represents the minimum deployment and the Bidder acknowledges that the said deployment may have to be augmented with additional number and/or categories, if required, if directed by Engineer-in-Charge in order to complete the work within the completion schedule and quoted lump sum price.



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#### 5.0 Construction equipment and machinery

The BIDDER shall furnish details of construction equipment & machinery, testing equipment, tools/tackles, etc., which will be made available by the Bidder at the Site. Bidder shall furnish Summary of such details as per **Annexure-7-8**, **Annexure-7-9**.

Such list shall, in no way limit the CONTRACTOR's responsibility to arrange & provide any additional construction equipment, tools, tackle, etc., which might be required to execute and complete the WORK as per contractual schedule.

BIDDER shall furnish the procedures and his tools for erection of the Heavy Lift Equipments including tall columns):

#### 6.0 Heavy lifts

BIDDER shall furnish his proposed, site transportation, lifting, along with preliminary rigging schemes and erection procedure for the heavy lifts. Such plans / schemes shall be furnished along with detailed write -up on heavy cranes proposed to be deployed by CONTRACTOR, duly supported by relevant technical literature.

#### 7.0 BIDDER experience & exception/deviation to perform the work

The BIDDER should have experience in the construction of similar Plants. The BIDDER should have successfully executed and completed construction of at least one similar Plant with his own project management and with complete responsibility of construction / erection and precommissioning.

The BIDDER shall furnish, as a part of his Tender Documents establishing the BIDDER'S experience and exception/deviation to perform the CONTRACT. Such documentary evidence shall also establish to OWNER's satisfaction that the BIDDER has the necessary financial, technical, project management capabilities and the requisite resources to execute the Work.

Such documentary evidence shall also be furnished for BIDDER'S proposed Subcontractors, if any. The Bidder shall furnish, in a tabular from, a list of jobs of similar type and magnitude executed by them in the past. BIDDER shall also furnish details of their experience in erection of heavy lifts. The Bidder shall furnish documentary evidence, establishing to OWNER satisfaction, that such jobs have been timely and successfully executed by them. The BIDDER shall also furnish the details of their present major commitments.

#### 8.0 QA/QC Program

Bidder shall furnish a summary description of their proposed QA/QC program.

Bidder shall furnish any other technical information / details as per the requirements of ITB.

#### 9.0 Technical assistance

The extent of the Technical Services and Assistance to be rendered by CONTRACTOR for, commissioning and performance test run, etc., is to be proposed

#### 10.0 Training

Bidder shall furnish the following details regarding the Training of OWNER'S personnel:

a) Bidder's organisation set up for Training program.



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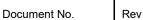
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- b) Training facilities available with the Bidder to train the OWNER'S personnel in
  - Theory of process, operation, maintenance and manufacturing of products
  - Field (on the job) training in process, operation, maintenance and manufacturing of products, to train the personnel on the job.
  - Test procedure and other matters.
- c) The courses and their duration, number of attendees in each course and location where such courses will be held that the Bidder would recommend OWNER to consider.
- d) Bidder's experience of training the personnel for units similar to the subject PLANT.

11.0 Estimate of the	ie num	bel of personnel required for the sale and satisfactory operation of the Flant.
For and on behalf of		
Stamp & Signature	:	
Name	:	
Designation	:	
Date	:	



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#### **ANNEXURE-7-6**

#### Minimum Qualification & Exp. Of Key Supervisory Construction Personnel

01	LOATEGODY	LOUALIEIOATION A EVERTITION
SL. NO.	CATEGORY	QUALIFICATION & EXPERIENCE
1	RESIDENT CONSTRUCTION MANAGER / RESIDENT ENGINEER / SITE-IN-CHARGE	Degree in Engg. With minimum 20 years relevant experience in construction should successfully constructed & commissioned at least one process unit in hydrocarbon / fertilizer sector.
2	LEAD DISCIPLINE ENGINEER	Degree in relevant Engg. discipline with minimum 15 years experience in Construction or Diploma in relevant Engg. Discipline with minimum 20 years experience in Construction.
3	LEAD WELDING / NDT ENGINEER	Degree in Mechanical Engg./Metallurgy with minimum 15 years experience in Welding / NDT (Non-Destructive Testing) plus Level-II in RT (Radiographic Testing) or diploma in Mechanical Engg. / Metallurgy with minimum 20 years experience in Welding / NDT plus Level-II in RT.
4	LEAD QA/QC ENGINEER	Degree in Engg. With 15 years Construction Experience of which 5 years should be as QA Manager.
5	LEAD PLANNING ENGINEER	Degree in Engg. With 15 years experience in Planning & Scheduling.
6	LEAD SAFETY OFFICER	Degree / Diploma in Engg. And Diploma in Industrial Safety with min. 10 years relevant experience in Construction Safety.
7	WAREHOUSE-IN-CHARGE / MATERIALS MANAGER	Graduate in Science or Diploma in Engg. / Materials Management with 15 years experience in Warehousing / Stores Management of similar nature.
8	DISCIPLINE SURVEYORS	Degree in relevant Engineering Discipline with minimum 3 years experience in Construction or diploma in relevant Engineering Discipline with minimum 6 years experience in Construction.
9	QUANTITY SURVEYORS	Degree in relevant Engineering Discipline with minimum 3 years experience or diploma in relevant Engineering Discipline with minimum 6 years experience in quantity estimation, field measurement, rate analysis etc. in construction field.



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Name	:	
Designation	:	
Date	<u>.</u>	



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# ANNEXURE-7-7 <u>Deployment Schedule of Supervisory Personnel</u>

	DESCRIPTION .	1																					
SL. N	DESCRITPION	DEP	LOYMEN	T SCI	IDULE		1		1	1			1		1	ı	1		1				
0.		1	2	3	4	5	6	7	8	9	1		:							3 5	3 6	<mark>3</mark> 7	T O T A L
1	PROJECT MANAGEMENT																						
1. 1	PROJECT MANAGER																						
1. 2	PLANNING MANAGER																						
1.	PLANNING ENGINEERS																						
2	RESIDUAL DESIGN AND DETAILED ENGINEERING																						
2.	PROJECT ENGINEERING MANAGER																						
2.	ENGINEERING COORDINATOR																						
2.	ENGG. PERSONNEL FOR VARIOUS DISCIPLINE																						
2. 3. 1	CIVIL STRUCTURA	L																					
(i)	ENGINEERS																						
2. 3. 2	PRESSURE VESSEL	.S																					
2. 3. 3	MECHANICAL EQF EQPT.	PT/ RO	TARY																				
2. 3. 4	PIPING																						
(i)	ENGINEERS			Ī																	Ī	Ī	
2. 3. 5	ELECTRICAL																						

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L															
(i)	ENGINEERS														
2. 3. 6	INSTRUMENTA-TION														
(i)	ENGINEERS														
2. 3. 7	MISCELL-ANEOUS														
3	PROCUREMENT														
3. 1	PURCHASE														
3. 1. 1	PURCHASE MANAGER														
3. 1. 2	PURCHASE COORDINATOR														
3. 1. 3	PURCHASE OFFICER														
3. 2	INSPECTION														
3. 2. 1	INSPECTION MANAGER														
3. 2. 2	INSPECTORS														
3. 3	EXPEDITING														
3. 3. 1	EXPEDITING COORDINATOR														
3. 3. 2	EXPEDITORS														
3. 4	CUSTOM CLEARANCE, IMPORT LICENCE, TRANSPORTA -TION PERSONNEL														
4	SITE CONSTRUCTION														
4. 1	PROJECT MANAGER														
4. 2	CONSTRUC-TION MANAGER														
4. 3	CIVIL STRUCTURAL														

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4. 3.I	LEAD ENGINEER														
4. 3. 2	SITE ENGINEER														
4. 3. 3	SUPERVISORS														
4. 4	MECHANICAL WORKS														
4. 4. 1	LEAD ENGINEER														
4. 4. 2	SITE ENGINEER														
4. 4. 3	SUPERVISORS														
4. 5	PIPING WORK														
4. 5. 1	LEAD ENGINEER														
4. 5. 2	SITE ENGINEER														
4. 5. 3	SUPERVISORS														
4. 6	ELECTRICAL WORK														
4. 6. 1	LEAD ENGINEER														
4. 6. 2	SITE ENGINEER														
4. 6. 3	SUPERVISORS														
4. 7	INSTRUMENTA-TION WORK														
4. 7. 1	LEAD ENGINEER														
4. 7. 2	SITE ENGINEER														
4. 7. 3	SUPERVISORS														

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4. 8	QUALITY ASSURANCE/ QUALITY CONTROL														
4. 8. 1	QC/QA MANAGER														
4. 8. 2	INSPECTOR (CIVIL)														
4. 8. 3	INSPECTOR (PIPING)														
4. 8. 4	INSPECTOR (MECH EQPT)														
4. 9	SAFETY ENGINEER														
4. 10	SITE ENGINEERING WORKS														
4. 10 .1	ENGINEERS														
4. 10 .2	SUPERVISORS														
4. 11	COMPUTER ENGINEER														
4. 12	ADMINISTRA – TION MANAGER														
4. 13	MISCELLAN-EOUS														
4. 14	WAREHOUSE PERSONNEL														
4. 15	MATERIAL MANAGER														
4. 16	COMMISSION-ING														
i)	COMMISSION-ING COORDINATOR														
ii)	COMM ENGINEER (SHIFT- IN- CHARGE)														
iii)	CONTROL ROOM COORDINATOR														

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iv)	FIELD SUPERVISOR													
v)	TECHNICIAN													

For and on behalf of		
Stamp & Signature	:	
Name	:	
Designation	:	
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# ANNEXURE-7-8 <u>Deployment Schedule of Construction Equipment</u>

aa	DESCRIPTION	CAPA- CITY																					
SL. NO.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	 3	3 4	35	36	<mark>37</mark>	TOTAL
1	CRANES																						
1.1	1200 MT																						
1.2	700 MT																						
1.1	500 MT																						
1.2	300 MT																						
1.3	150 MT																						
1.4	75 MT																						
1.5	50 MT																						
1.6	20 MT																						
1.7	15 MT																						
1.8	10 MT																						
1.9	5 MT																						
2	DIESEL GENERATORS																						
2.1	500 KVA																						
2.2	300 KVA/250KV																						
2.3	150 KVA/125KV																						
3	COMPRESSORS																						
3.1	600 CFT																						
3.2	350 CFT																						
4	WELDING M/CS																						
4.1	DIESEL WELDING M/C																						
4.2	DIESEL GENERATOR																						

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a:a	DESCRIPTION	CAPA- CITY																					
SL. NO.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	3 3	3 4	35	36	<mark>37</mark>	TOTAL
4.3	WELDING TRANS FORMERS/RE C-TIFIERS																						
4.4	TIG WELDING M/CS																						
5	GRIT BLASTING M/CS																						
6	SPRAY PAINTING M/CS																						
7	STRESS RELIEVING M/CS																						
8	RADIO-GRAPHY M/CS																						
9	TEST PUMP																						
10	WATER PUMP																						
11	TRANSPORTA-TION EQPT																						
11.1	TRACTOR -TRAILOR																						
11.2	TRUCKS																						
11.3	BUS																						
12	JACKS																						
12.1	MECHANICAL																						
12.2	HYDRAULIC																						
13	CIVIL																						
13.1	EXCAVATORS																						
13.2	DUMPERS																						
13.3	BATCHING PLANT																						

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	DESCRIPTION	CAPA- CITY																					
SL. NO.			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	 3	3 4	35	36	<mark>37</mark>	TOTAL
13.4	CONCRETE PUMP CAR																						
13.5	TRANSIT MIXER																						
13.6	MIXER																						
13.7	VIBRATORS																						
13.8	COMPACTORS																						
13.9	THEODOLITES																						
14.0	OTHERS																						
14.1	INSULATION TESTING EQUIPMENT																						
14.2	SECONDARY INJECTION TESTING KIT																						
14.3	METERS, TOOLS & TACKLES ETC.																						
14.4	CALIBRATION EQUIPMENT																						
14.5	OTHER TOOLS & TACKLES																						
14.6	MULTI METERS CALIBERAT- ORS ETC.																						
14.7	INDUCTION PIPE BENDING PLANTS																						
14.8	METALOGRAPHY																						
14.9	SPECTRO- METERS																						

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Name	:	
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# ANNEXURE-7-9 <u>Details Of Equipment Proposed to be used for Tendered Work</u>

### I / We, shall use the following MAJOR equipments owned by the tenderer for the work, if awarded to me /us :

SI. No	Description	Quantity. (Numbers)	Make	Capacity	Owner	Approximate date when it will be deployed at site	Period of retention at site

For and on behalf o	f
Stamp & Signature	:
Name	:
Designation	:
Data	



#### **PROJECTS & DEVELOPMENT INDIA LTD**

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SECTION – VI: TECHNICAL

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VENDOR LIST

# INSTRUMENT AIR/PLANT AIR SYSTEM AT TALCHER FERTILIZERS LIMITED



# INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED VENDOR LIST

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Bidder shall select sub vendors from the vendor list as specified below. Bidder shall ensure that sub vendor for the specified item has supplied item for the specified service & the supplied item is in satisfactory service.

Vendor shall have well proven record for the specified services.

Any addition to vendor list shall be reviewed and approved by Owner/PMC subject to submission of back-up credentials with proven & reliable record of performance for similar or comparable plant design capacity by LSTK contractor.

#### 1.0 STATIC EQUIPMENTS:

S.NO	ITEM DESCRIPTION	COUNTRY
VESSELS	S IN CS/AS/SS PRESSURE UPTO 10 Kg/cm2g	
1.	BTL EPC LIMITED (CS OONLY)	INDIA
2.	AERO ENGINEERS	INDIA
3.	AIRFRIGE INDUSTRIES	INDIA
4.	ARTSON ENGINEERING LIMITED	INDIA
5.	BHPV	INDIA
6.	BHARAT HEAVY ELECTRICALS LTD.	INDIA
7.	FABTECH PROJECTS & ENGINNERS LTD. (For CS Only)	INDIA
8.	FLOWLINK INDUSTRIES PVT. LTD. (CS/SS Except Urea Service)	INDIA
9.	FURNACE FABRICA (INDIA) LTD. (CS/SS)	INDIA
10.	G R ENGINEERING PRIVATE LIMITED	INDIA
11.	GANSONS LTD.	INDIA
12.	GEMINI ENGI-FAB PVT. LTD. (Excluding AS Mati)	INDIA
13.	GHANSHYAM STEEL WORKS LTD. (CS/SS)	INDIA
14.	GMM PFAUDLER LIMITED	INDIA
15.	GODREJ & BOYCE MFG. CO. LTD	INDIA
16.	GRAND PRIX ENGINEERING PVT. LTD. (upto 4m D x 6m L x80mm Thk)	INDIA
17.	GRASIM INDUSTRIES	INDIA
18.	HEATEX INDIAN CORPORATION	INDIA



#### **INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED VENDOR LIST**

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19.	HINDUSTAN DORR-OLIVER LTD.	INDIA
20.	ICEM ENGG. CO. LTD.	INDIA
21.	INDIA TUBE MILLS & METAL INDUSTRIES LTD. (For CS/SS only)	INDIA
22.	INDUS PROJECTS LTD (FORMERLY INDUS ENGG)	INDIA
23.	ISHAN EQUIPMENTS PVT. LTD. (CS/SS only)	INDIA
24.	KINETICS TECHNOLOGY INDIA LTD.	INDIA
25.	LARSEN & TOUBRO LTD.	INDIA
26.	LLOYDS STEEL INDUSTRIES LIMITD	INDIA
27.	LOYAL EQUIPMENTS PVT. LTD. CS/SS and Non IBR only)	INDIA
28.	MARS DESIGN PVT. LTD.	INDIA
29.	MISTRY PRABHUDAS MANJI ENGG. PVT. LTD.	INDIA
30.	MOD FABRICATORS	INDIA
31.	MULTI-MAX ENGINEERING WORKS PVT. LTD. (CS and SS Material only)	INDIA
32.	NAVA BHARAT FERRO ALLOYS LTD	INDIA
33.	NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. CS/SS Only)	INDIA
34.	NIVITA ENGINEERING WORKS	INDIA
35.	NOVATECH PROJECTS INDIA (P) LTD. (CS and SS material only)	INDIA
36.	ORIENTAL MANUFACTURERS PROVATE LIMITED (CS/SS only)	INDIA
37.	PATELS AIRTEM (INDIA LIMITED	INDIA
38.	PRECISION EQUIPMENTS (CHAANAI) PVT LTD	INDIA
39.	PROJECT TECHNOLOGISTS PVT. LTD.	INDIA
40.	R.D. ENGINEERS (INDIA) PVT. LTD.	INDIA
41.	RAJ ENGG. CO.	INDIA
42.	RELIANCE FABRICATIONS PVT. LTD.	INDIA
43.	REYNOLDS CHEMEQUIP PRIVATE LIMITED (CS/SS)	INDIA



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44.	SHRENO LTD. (UNIT 2)	INDIA
45.	TAS ENGINEERING CO. (P) LIMITED	INDIA
46.	TATA CHEMICALS LTD	INDIA
47.	THE ANUP ENGINEERING LIMITED	INDIA
48.	THE KCP LIMITED	INDIA
49.	ISGEC HEAVY ENGINEERING LIMITED	INDIA
50.	TITANIUM EQUIPMENT AND ANODE MFG. CO. LTD.	INDIA
51.	TRIVENI STRUCTURALS LTD.	INDIA
52.	UNITOP ENGINEERS PVT. LTD. (Max. Shell Dia 4.65, Water vol. 140m3)	INDIA
53.	HYOSUNG CORPORATION (CS/SS/LAS only)	KOREA
54.	APPARATEBAU SCHWEISS TECHNIK GMBH	AUSTRIA
55.	SCHOELLER-BLECKMANN NITEC GMBH	AUSTRIA
56.	OLMI SPA	ITALY
57.	JAPAN STEEL WORKS LTD	JAPAN
58.	DOOSAN MECATEC CO. LTD.	KOREA
59.	HANJUNG DCM CO. LTD.	KOREA
60.	HUNDAI HEAVY INDUSTRIES	KOREA
61.	KOREA HEAVY INDUSTRIES & CONSTN. CO. LTD	KOREA
62.	CHEM PROCESS SYETEM PVT. LTD. (CS/SS ONLY)	INDIA
63.	COPERION IDEAL PVT. LTD.	INDIA
64.	ESSAR HEAHY ENGINEERING SERVICES	INDIA
65.	PHILS HEAVY ENGINEERIG PVT. LTD.	INDIA
66.	PRAJ INDUSTRIES LIMITED	INDIA
67.	SPETECH PLANT EQUIPMENT PVT. LTD. (CS ONLY)	INDIA
68.	TECHNO PROCESS EQUIPMENT (I) LTD. (CS/AS/SS(AS	INDIA
69.	only for P3 Material))  UNIVERSAL HEAT EXCHANGER LIMITED (CS/SS/LTCS only)	INDIA
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70.	VIJAY TANKS & VESSELS LIMITED (CS/LAS AND SS ONLY)	INDIA
71.	CRYOSTAR TANKS AND VESSEL PVT. LTD (CS ONLY)	INDIA
72.	VIJAY TANKS & VESSELS LIMITED (KANDLA) (CS/ SS ONLY)	INDIA
73.	SUNGJIN GEOTECH CO. LTD. (CS and SS only)	KOREA
74.	ATV PROJECTS INDIA LIMITED (CS ONLY)	INDIA
75.	PRECEISION GASIFICATION SERVICES PRIVATE LIMITED (NON IBR)	INDIA
76.	TECKSON STEEL INDUSTRIES (SS & CS ONLY)	INDIA
VESSEL	S IN CS/AS/SS PRESSURE 11 TO 60 Kg/cm2g	
1	ALTECH INFRASTRUCTURE (INDIA) PVT. LTD. (Upto 20 Kg/cm2(g)CS Material)	INDIA
2	ARIEN NEW DELHI PRIVATE LIMITED (CS/SS UP TO 11 to 30 kg/cm2(g))	INDIA
3	BHPV	INDIA
4	BHARAT HEAVY ELECTRICALS LTD.	INDIA
5	EXPO GAS CONTAINERS LTD. (Upto 30 Kg/sq cm (g) CS/SS Material.)	INDIA
6	FABTECH PROJECTS & ENGINNERS LTD. (For CS Only)	INDIA
7	FURNACE FABRICA (INDIA) LTD. (CS/SS UP TO 11 to 30 kg/cm2(g))	INDIA
8	G R ENGINEERING PRIVATE LIMITED	INDIA
9	GANSONS LTD.	INDIA
10	GHANSHYAM STEEL WORKS LTD (CS/SS)	INDIA
11	GODREJ & BOYCE MFG. CO. LTD	INDIA
12	GRAND PRIX ENGINEERING PVT. LTD.	INDIA
13	GRASIM INDUSTRIES (upto 30Kg/cm2g)	INDIA
14	HEATEX INDIAN CORPORATION	INDIA
15	HINDUSTAN DORR-OLIVER LTD. (CS/SS Only)	INDIA
16	INDIA TUBE MILLS & METAL INDUSTRIES LTD. (For CS/SS only upto 30 Kg/cm2g)	INDIA
17	INDUS PROJECTS LTD (FORMERLY INDUS ENGG)	INDIA



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18 ISHAN EQUIPMENTS PVT. LTD. (CS/SS Upto 30 Kg/Cm2(g) only) 19 INDCON PROJECTS & EQUIPMENT LIMITED. (CS/LTCS/SS Upto 30 Kg/Cm2(g) only) 20 KAVERI ENGG. INDUSTRIES LTD., INDIA 21 LARSEN & TOUBRO LTD INDIA 22 LLOYDS STEEL INDUSTRIES LIMITED INDIA 23 LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2, CS/SS and Non IBR only.) 24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only) 25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only) 26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only) 27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only) INDIA 28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g) 29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA 30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only) 31 THE ANUP ENGINEERING LIMITED INDIA 32 ISGEC HEAVY ENGINEERING LIMITED INDIA 33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) 34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA 35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA 36 BORSING GmbH GERMANY 37 BELLELI S.P.A ITALY 38 FBM HUDSON ITALIANA S.P.A ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY 41 WALTER TOSTO SPA ITALY 42 HITACHI ZOSEN JAPAN			
INDCON PROJECTS & EQUIPMENT LIMITED. (CS/LTCS/SS Upto 30 Kg/Cm2(g) only)	18	( , , ,	INDIA
Upto 30 Kg/Cm2(g) only)  20 KAVERI ENGG. INDUSTRIES LTD., INDIA  21 LARSEN & TOUBRO LTD INDIA  22 LLOYDS STEEL INDUSTRIES LIMITED INDIA  23 LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2, CS/SS and Non IBR only.)  24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only)  25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only)  26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS india)  27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only) INDIA  28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.p.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY		- /	
20 KAVERI ENGG. INDUSTRIES LTD., INDIA 21 LARSEN & TOUBRO LTD INDIA 22 LLOYDS STEEL INDUSTRIES LIMITED INDIA 23 LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2, CS/SS and Non IBR only.) 24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only) 25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Up to 30 Kg/cm2g (CS/SS Only) 26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only) 27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only) INDIA 28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto INDIA 44Kg/cm2g) 29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA 30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only) 31 THE ANUP ENGINEERING LIMITED INDIA 32 ISGEC HEAVY ENGINEERING LIMITED INDIA 33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) 34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA 35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA 36 BORSING GmbH GERMANY 37 BELLELI S.P.A ITALY 38 FBM HUDSON ITALIANA S.p.A ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	19	· ·	INDIA
21 LARSEN & TOUBRO LTD INDIA 22 LLOYDS STEEL INDUSTRIES LIMITED INDIA 23 LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2, CS/SS and Non IBR only.) 24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only) 25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only) 26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only) 27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only) INDIA 28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g) 29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA 30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only) 31 THE ANUP ENGINEERING LIMITED INDIA 32 ISGEC HEAVY ENGINEERING LIMITED INDIA 33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) 34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA 35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA 36 BORSING GmbH GERMANY 37 BELLELI S.P.A ITALY 38 FBM HUDSON ITALIANA S.P.A ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY		1 3 (8) 17	
22 LLOYDS STEEL INDUSTRIES LIMITED INDIA 23 LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2, CS/SS and Non IBR only.) 24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only) 25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Up to 30 Kg/cm2g (CS/SS Only) 26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only) 27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only) INDIA 44Kg/cm2g) 28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g) 29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA Only) 31 THE ANUP ENGINEERING LIMITED INDIA 32 ISGEC HEAVY ENGINEERING LIMITED INDIA 33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) 34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA 35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA 36 BORSING GmbH GERMANY 37 BELLELI S.P.A ITALY 38 FBM HUDSON ITALIANA S.P.A ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	20	KAVERI ENGG. INDUSTRIES LTD.,	INDIA
LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2, CS/SS and Non IBR only.)  24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only)  25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS SO Only)  26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only)  27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only)  28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only)  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.P.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	21	LARSEN & TOUBRO LTD	INDIA
LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2, CS/SS and Non IBR only.)  24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only)  25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS SO Only)  26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only)  27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only)  28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only)  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.P.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	22	LLOYDS STEEL INDUSTRIES LIMITED	ΙΝΠΙΔ
CS/SS and Non IBR only.)  24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only)  25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only)  26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only)  27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only)  28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only)  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.P.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	22	LEGIDO GIELE INDOGINILO EINITED	INDIA
24 MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30 Kg/cm2g (CS and SS Materials only) 25 NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only) 26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only) 27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only) 28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g) 29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA 30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only) 31 THE ANUP ENGINEERING LIMITED INDIA 32 ISGEC HEAVY ENGINEERING LIMITED INDIA 33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) 34 HYOSUNG CORPORATION (CS/SS/LAS only) 35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA 36 BORSING GmbH GERMANY 37 BELLELI S.P.A ITALY 38 FBM HUDSON ITALIANA S.P.A ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	23	LOYAL EQUIPMENTS PVT. LTD. (Upto 11-30 Kg/cm2,	INDIA
Kg/cm2g (CS and SS Materials only)       INEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only)       INDIA         26       ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only)       INDIA         27       PATELS AIRTEMP (INDIA LIMITED (CS & SS only)       INDIA         28       PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)       INDIA         29       NEWTON ENGINEERING & CHEMICALS LIMITED       INDIA         30       RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)       INDIA         31       THE ANUP ENGINEERING LIMITED       INDIA         32       ISGEC HEAVY ENGINEERING LIMITED       INDIA         33       THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)       INDIA         34       HYOSUNG CORPORATION (CS/SS/LAS only)       KOREA         35       SCHOELLER-BLECKMANN NITEC GMBH       AUSTRIA         36       BORSING GmbH       GERMANY         37       BELLELI S.P.A       ITALY         38       FBM HUDSON ITALIANA S.p.A       ITALY         40       ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)       ITALY         41       WALTER TOSTO SpA       ITALY		CS/SS and Non IBR only.)	
NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS/AS Only)  Regional (CS/SS/AS Only)  Regional (CS/SS/AS (P3 & P4 Only))  Regional (CS/SS/AS Only)  Regional	24	MULTI-MAX ENGINEERING WORKS PVT. LTD. (Up to 30	INDIA
NEW FIELD INDUSTRIAL EQUIPMENT PVT. LTD. (Upto 30 Kg/cm2g (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS Only)  Regional (CS/SS/AS Only)  Regional (CS/SS/AS Only)  Regional (CS/SS/AS (P3 & P4 Only))  Regional (CS/SS/AS Only)  Regional		Kg/cm2g (CS and SS Materials only)	
Kg/cm2g (CS/SS Only)  26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS ONLY)  27 PATELS AIRTEMP (INDIA LIMITED (CS & SS ONLY)  28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 ONLY)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS ONLY)  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GMbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.P.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	25		INDIA
26 ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only)  27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only)  28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  31 THE ANUP ENGINEERING LIMITED  32 ISGEC HEAVY ENGINEERING LIMITED  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only)  35 SCHOELLER-BLECKMANN NITEC GMBH  36 BORSING GmbH  37 BELLELI S.P.A  38 FBM HUDSON ITALIANA S.p.A  1TALY  39 GE POWER (NUOVO PIGNONE SPA)  1TALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  1ITALY		, ,	
only)  27 PATELS AIRTEMP (INDIA LIMITED (CS & SS only)  28 PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  31 THE ANUP ENGINEERING LIMITED  32 ISGEC HEAVY ENGINEERING LIMITED  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only)  35 SCHOELLER-BLECKMANN NITEC GMBH  36 BORSING GmbH  37 BELLELI S.P.A  38 FBM HUDSON ITALIANA S.p.A  1TALY  39 GE POWER (NUOVO PIGNONE SPA)  1TALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  1TALY	26		INDIA
PATELS AIRTEMP (INDIA LIMITED (CS & SS only)  PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  PRECISION ENGINEERING & CHEMICALS LIMITED  RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  THE ANUP ENGINEERING LIMITED  INDIA  SEGEC HEAVY ENGINEERING LIMITED  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  SEGEC HEAVY ENGINEERING LIMITED  INDIA		`	
PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto 44Kg/cm2g)  PREWTON ENGINEERING & CHEMICALS LIMITED  RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  THE ANUP ENGINEERING LIMITED  INDIA  IN	27		INDIA
44Kg/cm2g)  29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA  30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.P.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	_,	Tribute function (International Cook and only)	
29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA 30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only) 31 THE ANUP ENGINEERING LIMITED INDIA 32 ISGEC HEAVY ENGINEERING LIMITED INDIA 33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) 34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA 35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA 36 BORSING GmbH GERMANY 37 BELLELI S.P.A ITALY 38 FBM HUDSON ITALIANA S.P.A ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY	28	PRECISION EQUIPMENTS (CHENNAI) PVT. LTD (upto	INDIA
29 NEWTON ENGINEERING & CHEMICALS LIMITED INDIA 30 RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4 only) 31 THE ANUP ENGINEERING LIMITED INDIA 32 ISGEC HEAVY ENGINEERING LIMITED INDIA 33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) 34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA 35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA 36 BORSING GmbH GERMANY 37 BELLELI S.P.A ITALY 38 FBM HUDSON ITALIANA S.P.A ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY		44Kg/cm2g)	
only)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.P.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY	29	J	INDIA
only)  31 THE ANUP ENGINEERING LIMITED INDIA  32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only) KOREA  35 SCHOELLER-BLECKMANN NITEC GMBH AUSTRIA  36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.P.A ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY			
THE ANUP ENGINEERING LIMITED  INDIA  ISGEC HEAVY ENGINEERING LIMITED  INDIA  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  SCHOELLER-BLECKMANN NITEC GMBH  BORSING GmbH  GERMANY  BELLELI S.P.A  ITALY  BELLELI S.P.A  ITALY  ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  INDIA	30	RAJ ENGG. CO. (up to 30kg/cm 2 (g) CS/SS/AS (P3 & P4	INDIA
32 ISGEC HEAVY ENGINEERING LIMITED INDIA  33 THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only)  35 SCHOELLER-BLECKMANN NITEC GMBH  36 BORSING GmbH  37 BELLELI S.P.A  38 FBM HUDSON ITALIANA S.p.A  39 GE POWER (NUOVO PIGNONE SPA)  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  41 WALTER TOSTO SpA  INDIA		only)	
THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  KOREA  SCHOELLER-BLECKMANN NITEC GMBH  BORSING GmbH  GERMANY  BELLELI S.P.A  ITALY  BELLELI S.P.A  ITALY  GE POWER (NUOVO PIGNONE SPA)  ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  ITALY  WALTER TOSTO SpA  INDIA  ITALY  ITALY  ITALY  ITALY  ITALY  ITALY  ITALY	31	THE ANUP ENGINEERING LIMITED	INDIA
THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  KOREA  SCHOELLER-BLECKMANN NITEC GMBH  BORSING GmbH  GERMANY  BELLELI S.P.A  ITALY  BELLELI S.P.A  ITALY  GE POWER (NUOVO PIGNONE SPA)  ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  ITALY  WALTER TOSTO SpA  INDIA  ITALY  ITALY  ITALY  ITALY  ITALY  ITALY	32	ISGEC HEAVY ENGINEERING LIMITED	INDIA
DAHEJ (Except Urea Plant Critical Equipment)  34 HYOSUNG CORPORATION (CS/SS/LAS only)  KOREA  35 SCHOELLER-BLECKMANN NITEC GMBH  36 BORSING GmbH  GERMANY  37 BELLELI S.P.A  ITALY  38 FBM HUDSON ITALIANA S.p.A  ITALY  39 GE POWER (NUOVO PIGNONE SPA)  ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  ITALY  41 WALTER TOSTO SpA  ITALY			
34 HYOSUNG CORPORATION (CS/SS/LAS only)  35 SCHOELLER-BLECKMANN NITEC GMBH  36 BORSING GmbH  37 BELLELI S.P.A  38 FBM HUDSON ITALIANA S.P.A  39 GE POWER (NUOVO PIGNONE SPA)  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  41 WALTER TOSTO SpA  KOREA  AUSTRIA  ITALY  ITALY  ITALY	33	THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC),	INDIA
35 SCHOELLER-BLECKMANN NITEC GMBH  36 BORSING GmbH  37 BELLELI S.P.A  38 FBM HUDSON ITALIANA S.p.A  39 GE POWER (NUOVO PIGNONE SPA)  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  41 WALTER TOSTO SpA  AUSTRIA  AUSTRIA  ITALY  ITALY  ITALY		DAHEJ (Except Urea Plant Critical Equipment)	
36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.p.A ITALY  39 GE POWER (NUOVO PIGNONE SPA) ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY	34	HYOSUNG CORPORATION (CS/SS/LAS only)	KOREA
36 BORSING GmbH GERMANY  37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.p.A ITALY  39 GE POWER (NUOVO PIGNONE SPA) ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY		, , , , , , , , , , , , , , , , , , , ,	
37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.p.A ITALY  39 GE POWER (NUOVO PIGNONE SPA) ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY	35	SCHOELLER-BLECKMANN NITEC GMBH	AUSTRIA
37 BELLELI S.P.A ITALY  38 FBM HUDSON ITALIANA S.p.A ITALY  39 GE POWER (NUOVO PIGNONE SPA) ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY	20	PODOING Cook!	OEDMANN/
38 FBM HUDSON ITALIANA S.p.A ITALY  39 GE POWER (NUOVO PIGNONE SPA) ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY	30	BURSING GMBH	GERMANY
38 FBM HUDSON ITALIANA S.p.A ITALY  39 GE POWER (NUOVO PIGNONE SPA) ITALY  40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY  41 WALTER TOSTO SpA ITALY	37	BELLELLS P.A	ITAI Y
39 GE POWER (NUOVO PIGNONE SPA) ITALY 40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.) ITALY 41 WALTER TOSTO SpA ITALY	01		117121
40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  41 WALTER TOSTO SpA  ITALY	38	FBM HUDSON ITALIANA S.p.A	ITALY
40 ROLLE S.P.A. (11 TO 60 kg/cm2 pr.)  41 WALTER TOSTO SpA  ITALY		·	
41 WALTER TOSTO SpA ITALY	39	GE POWER (NUOVO PIGNONE SPA)	ITALY
41 WALTER TOSTO SpA ITALY	40	ROLLES DA (11 TO 60 kalem2 pr.)	ΙΤΛΙ ∨
<u> </u>	40	NOLLE S.F.A. (11 10 00 kg/GHZ pr.)	HALI
	41	WALTER TOSTO SpA	ITALY
42 HITACHI ZOSEN JAPAN		·	
	42	HITACHI ZOSEN	JAPAN



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43	KOBE STEEL LIMITED	JAPAN
44	MITSUBISHI HEAVY INDUSTRIES LTD.	JAPAN
45	MITSUI ENGINEERING & SHIPBUILDING CO. LTD	JAPAN
46	DOOSAN MECATEC CO. LTD.	KOREA
47	HANJUNG DCM CO. LTD.	KOREA
48	HANTECH LIMITED	KOREA
49	KOREA HEAVY INDUSTRIES & CONSTN. CO. LTD	KOREA
50	MECANICA DE LA PENA S.A.	SPAIN
51	BEAIRD INDUSTERIES LOUISIANA	U.S.A
52	CHEM PROCESS SYSTEM PVT. LTD. (CS/SS upto 30 kg/cm^2g only)	INDIA
53	CICB-CHEMICON PVT. LTD. (upto 30 kg/cm^2 only (CS only ))	INDIA
54	ESSAR HEAVY ENGINEERING SERVICES	INDIA
55	FAB-TECH WORKS & CONSTRUCTIONS PRIVATE LIMITED	INDIA
56	GMM PFAULER LIMITED (CS/SS only)	INDIA
57	INDCON PROJECTS & EQUIPMENT LIMITED (for CS/LTCS/SS only upto 30 kg/cm^2g)	INDIA
58	MEENAKSHI ASSOCIATED (P) LTD. (CS/LTCS/SS up to 30 kg/cm^2g)	INDIA
59	NUBERG ENGINEERING LIMITED (CS/SS up to 30 kg/cm^2g)	INDIA
60	PHILS HEAVY ENGINEERING PVT. LTD. (up to 30 kg/cm^2g)	INDIA
61	PRAJ INDUSTRIES LIMITED (CS & SS ONLY)	INDIA
62	R.D. ENGINEERS (INDIA) PVT. LTD. (up to 30 kg/cm^2g)	INDIA
63	RELIANCE FABRICATIONS PVT. LTD. (CS/SS up to 30 kg/cm^2g )	INDIA
64	SPETECH PLANT EQUIPMENT PVT. LTD. (CS up to 30 kg/cm^2g)	INDIA
65	TECHNO PROCESS EQUIPMENTS (I) LTD. (CS/AS/SS up to 30 kg/cm^2g (AS only for P3 Material))	INDIA
66	UNIQUE CHEMOPLANT EQUIPMENTS (CS/SS only up to 30 kg/cm^2g)	INDIA



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67	UNIVERSAL HEAT EXCHANGERS LIMITED (CS/SS/LTCS	INDIA
68	upto 30 kg/cm^2g ) VIJYA TANKS & VESSELS LIMITED (CS/SS and LAS from	INDIA
00	11 to 30 kg/cm <sup>2</sup> g only )	INDIA
69	VIJYA TANKS & VESSELS LIMITED (KANDLA)(CS/SS upto	INDIA
03	30 kg/cm <sup>2</sup> g only )	INDIA
70	THE KCP LIMITED	INDIA
70	THE NOT ENWITED	11401/1
71	AERO ENGINEERS (CS only)	INDIA
72	AVADH INDUSTRIES (Upto 34 kg/cm2g), CS only	INDIA
73	GEMINI ENGI-FAB PVT. LTD. (Upto 40 Kg/cm2g)	INDIA
74	JINDAL STEEL & POWER LTD. (MACHINERY DIVISION) (CS only)	INDIA
75	BTL EPC LIMITED (up to 30 kg/cm2, CS only)	INDIA
76	ALPEC CO. LTD. (CS & AS only)	KOREA
77	SUNGJIN GEOTEC CO., LTD. (CS and SS only)	KOREA
VESSEL	S IN CS/AS/SS PRESSURE ABOVE 60Kg/cm2g	
VESSEL 1	S IN CS/AS/SS PRESSURE ABOVE 60Kg/cm2g BHPV	INDIA
	5 5	INDIA INDIA
1	BHPV	
1 2	B H P V BHARAT HEAVY ELECTRICALS LTD.	INDIA
1 2 3	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED	INDIA INDIA
1 2 3 4	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.	INDIA INDIA INDIA
1 2 3 4 5	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.	INDIA INDIA INDIA INDIA
1 2 3 4 5	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC),	INDIA INDIA INDIA INDIA
1 2 3 4 5	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)	INDIA INDIA INDIA INDIA INDIA
1 2 3 4 5	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant	INDIA INDIA INDIA INDIA INDIA
1 2 3 4 5 6	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment))	INDIA INDIA INDIA INDIA INDIA INDIA
1 2 3 4 5 6	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)	INDIA INDIA INDIA INDIA INDIA INDIA INDIA KOREA
1 2 3 4 5 6 7	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa)	INDIA INDIA INDIA INDIA INDIA INDIA INDIA KOREA GERMANY
1 2 3 4 5 6 7 8 9	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa)  FERROSTAAL AKTIENGES ELLSCHAFTG	INDIA INDIA INDIA INDIA INDIA INDIA INDIA  KOREA GERMANY GERMANY
1 2 3 4 5 6 7 8 9 10	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa)  FERROSTAAL AKTIENGES ELLSCHAFTG  KRUPP INDUSTRIES-TECHNIK	INDIA INDIA INDIA INDIA INDIA INDIA INDIA  INDIA  KOREA GERMANY GERMANY
1 2 3 4 5 6 7 8 9 10 11 12	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa)  FERROSTAAL AKTIENGES ELLSCHAFTG  KRUPP INDUSTRIES-TECHNIK  THYSSEN RHEINSTAHL TECHNIK GMBH	INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA  KOREA GERMANY GERMANY GERMANY GERMANY
1 2 3 4 5 6 7 8 9 10 11 12 13	B H P V  BHARAT HEAVY ELECTRICALS LTD.  G R ENGINEERING PRIVATE LIMITED  GODREJ & BOYCE MFG CO. LTD.  LARSAN & TOUBRO LTD.  THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment)  ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment)  HYOSUNG CORPORATION (CS/SS/LAS only)  BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa)  FERROSTAAL AKTIENGES ELLSCHAFTG  KRUPP INDUSTRIES-TECHNIK  THYSSEN RHEINSTAHL TECHNIK GMBH  ACCIAI SPECIALI TERNI	INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA  KOREA GERMANY GERMANY GERMANY GERMANY ITALY
1 2 3 4 5 6 7 8 9 10 11 12 13 14	BHPV BHARAT HEAVY ELECTRICALS LTD. GRENGINEERING PRIVATE LIMITED GODREJ & BOYCE MFG CO. LTD. LARSAN & TOUBRO LTD. THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment) HYOSUNG CORPORATION (CS/SS/LAS only) BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa) FERROSTAAL AKTIENGES ELLSCHAFTG KRUPP INDUSTRIES-TECHNIK THYSSEN RHEINSTAHL TECHNIK GMBH ACCIAI SPECIALI TERNI ATB ACCIAIERIA E TUBIFICIO DI BRESCIA SP BELLELI S.P.A	INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA  KOREA GERMANY GERMANY GERMANY GERMANY ITALY ITALY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	B H P V BHARAT HEAVY ELECTRICALS LTD. G R ENGINEERING PRIVATE LIMITED GODREJ & BOYCE MFG CO. LTD. LARSAN & TOUBRO LTD. THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment) HYOSUNG CORPORATION (CS/SS/LAS only) BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa) FERROSTAAL AKTIENGES ELLSCHAFTG KRUPP INDUSTRIES-TECHNIK THYSSEN RHEINSTAHL TECHNIK GMBH ACCIAI SPECIALI TERNI ATB ACCIAIERIA E TUBIFICIO DI BRESCIA SP BELLELI S.P.A FBM HUDSON ITALIANA S.p.A	INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA  INDIA  KOREA GERMANY GERMANY GERMANY GERMANY ITALY ITALY ITALY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	BHPV BHARAT HEAVY ELECTRICALS LTD. GRENGINEERING PRIVATE LIMITED GODREJ & BOYCE MFG CO. LTD. LARSAN & TOUBRO LTD. THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment) HYOSUNG CORPORATION (CS/SS/LAS only) BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa) FERROSTAAL AKTIENGES ELLSCHAFTG KRUPP INDUSTRIES-TECHNIK THYSSEN RHEINSTAHL TECHNIK GMBH ACCIAI SPECIALI TERNI ATB ACCIAIERIA E TUBIFICIO DI BRESCIA SP BELLELI S.P.A	INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA  INDIA  KOREA GERMANY GERMANY GERMANY ITALY ITALY ITALY ITALY ITALY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	B H P V BHARAT HEAVY ELECTRICALS LTD. G R ENGINEERING PRIVATE LIMITED GODREJ & BOYCE MFG CO. LTD. LARSAN & TOUBRO LTD. THE INDIAN SUGAR & GENERAL ENGG. CORPN. (ISGEC), DAHEJ (Except Urea Plant Critical Equipment) ISGEC HEAVY ENGINEERING LIMITED ((Except Urea Plant Critical Equipment) HYOSUNG CORPORATION (CS/SS/LAS only) BORSIG GmbH (upto 1500 Deg. C & upto 35000KPa) FERROSTAAL AKTIENGES ELLSCHAFTG KRUPP INDUSTRIES-TECHNIK THYSSEN RHEINSTAHL TECHNIK GMBH ACCIAI SPECIALI TERNI ATB ACCIAIERIA E TUBIFICIO DI BRESCIA SP BELLELI S.P.A FBM HUDSON ITALIANA S.P.A GE POWER (NUOVO PIGNONE SPA)	INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA INDIA  KOREA GERMANY GERMANY GERMANY ITALY ITALY ITALY ITALY ITALY ITALY



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21	KOBE STEEL LIMITED	JAPAN
22	MITSUBISHI HEAVY INDUSTRIES LTD.	JAPAN
23	SUMISHO MACHINERY TRADE CORPORATION	JAPAN
24	DOOSAN MECATEC CO. LTD.	KOREA
25	HANJUNG DCM CO. LTD.	KOREA
26	HUNDAI HEAVY INDUSTRIES	KOREA
27	KOREA HEAVY INDUSTRIES & CONSTN. CO. LTD	KOREA
28	SCHOELLER-BLECKMANN NITEC GMBH	AUSTRIA
29	HINDUSTAN DORR-OLIVER LTD. (CS/SS/LAS/LTCS only)	INDIA
30	SUNGJIN GEOTEC CO. LTD. (CS and SS only)	KOREA
31	TECHNO PROCESS EQUIPMENTS (INDIA) PVT. LTD. (NON IBR ONLY)	INDIA
32	ISGEC HITACHI ZOSEN LIMITED	INDIA
33	THE ANUP ENGINEERING LIMITED	INDIA
34	PATEL AIR TEMP INDIA LIMITED (CS ONLY)	INDIA
35	PRAJ INDUSTRIES LIMITED (CS/SS ONLY)	INDIA
36	ALPEC CO. LTD. (CS & AS only)	KOREA
37	GRAND PRIX ENGINEERING PRIVATE LIMITED( SC ONLY)	INDIA
	ABRICATED TANKS & NONCODED VESSELS	
1.	ALTECH INFRASTRUCTURE (INDIA) PVT. LTD.	INDIA
2.	ARTSON ENGINEERING LIMITD	INDIA
3.	BAKSHI CHEMPHARMA EQUIPMENTS PVT. LTD.	INDIA
4.	ESSAR HEAVY ENGINEERING SERVICES	INDIA
5.	FLOWLINK INDUSTRIES PVT. LTD. (CS/SS only)	INDIA
6.	G R ENGINEERING PRIVATE LIMITED	INDIA
7.	GANSONS LTD.	INDIA
8.	GAYATRI TANKS & VESSELS	INDIA
9.	GEMINI ENGI-FAB PVT. LTD.	INDIA
10.	GENERAL MECH & PROCESS EQUIPT. (P) LTD.	INDIA
11.	GODREJ & BOYCE MFG. CO. LTD.	INDIA
11. 12.	GODREJ & BOYCE MFG. CO. LTD.  GRANDPRIX ENGINEERING PVT. LTD	INDIA



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15.	ISHAN EQUIPMENTS PVT. LTD. (CS/SS only)	INDIA
16.	KINETICS TECHNOLOGY INDIA LTD.	INDIA
17.	LAXMI ENGINEERING INDUSTRIES (BHOPAL) PRIVATE LIMITD (CS/SS only)	INDIA
18.	LLOYDS STEEL INDUSTRIES LIMITED	INDIA
19.	MABEL ENGINEERS PVT. LTD.	INDIA
20.	MULTI-MAX ENGINEERING WORKS PVT. LTD.	INDIA
21.	NEWTON ENGG. & CHEMICALS LTD.	INDIA
22.	NIVITA ENGINEERING WORKS	INDIA
23.	NOVATECH PROJECT INDIA (P) LTD.	INDIA
24.	ORIENTAL MANUFACTURERS PRIVATE LIMITED (CS/SS only)	INDIA
25.	PRECISION EQUIPMENTS (CHENNAI) PVT. LTD.	INDIA
26.	PRECISION TANKS & VESSEL	INDIA
27.	PROJECT TECHNOLOGISTS PVT. LTD.	INDIA
28.	R.D. ENGINEERS (INDIA) PVT. LTD.	INDIA
29.	RAJ ENGG. CO.	INDIA
30.	RELIANCE FABRICATIONS PVT. LTD.	INDIA
31.	SHARP TANKS & STRUCTURALS PVT. LTD.	INDIA
32.	TAS ENGINEERING CO. (P) LIMITED	INDIA
33.	TATA CHEMICALS LTD.	INDIA
34.	UNITOP ENGINEERS PVT. LTD. (Max shell Dia 4.65m. Vol 140m3)	INDIA
35.	VIJAY TANKS & VESSELS LIMITED	INDIA
36.	VIP J INDUSTRIAL ENTERPRISES PVT. LTD.	INDIA
37.	RELIABLE FABRICATION & ENGINEERING INDUSTRIES	INDIA
38.	TITANIUM TANTALUM PRODUCTS LTD.	INDIA
39.	VIJAY TANKS & VESSELS LTD. (KANDLA)	INDIA



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40.	OSWAL INFRASTRUCTURE LIMITED	INDIA
41.	BTL EPC LIMITED (CS Only)	INDIA
42.	TECKSON STEEL INDUSTRIES	INDIA
43.	ATV PROJECTS INDIA LIMITED (NON CODED VESSED ,CS ONLY)	INDIA
44.	RELIANCE FABRICATIONS PVT. LTD.	INDIA
DEMIST	ERS	
1	EVERGREEN INDUSTRIES	INDIA
2	GRAND PRIX ENGINEERING PVT. LTD.	INDIA
3	HAVER STANDARD INDIA PVT. LTD. (Demister pads with grids)	INDIA
4	HEIN LEHMANN (I) LTD.	INDIA
5	MISTER – MESH WIRE PRODUCTS	INDIA
6	COSTACURTA VICO S.P.A	ITALY
7	GLITSH ITALIANA, SPA	ITALY
8	KNITMESH LTD.	U.K.
9	KEVIN ENTERPRISES PVT. LIMITED	INDIA
HEAT EX	KCHANGERS UPTO 30 Kg/cm2g	
1	ARTSON ENGINEERING LIMITED	INDIA
2	BHPV	INDIA
3	BHARAT HEAVY ELECTRICALS LTD.	INDIA
4	EXPO GAS CONTAINERS LTD.(Upto 30 Kg/sq (g) CS/SS Material.	INDIA
5	FABTECH PROJECTS & ENGINEERS LTD. (For CS	INDIA
6	Only) FLOWLINK INDUSTRIES PVT. LTD. (CS/SS Except	INDIA
	Urea service)	INDIA
7	G R ENGINEERING PRIVATE LIMITED	INDIA
8	GANSONS LTD.	INDIA
9	GEMINI ENGI-FAB PVT. LTD.	INDIA
10	GHANSHYAM STEEL WORKS LTD. (CS/SS)	INDIA
11	GODREJ & BOYCE MFG. CO. LTD.	INDIA
12	GRASIM INDUSTRIES	INDIA
13	HEATEX INDIAN CORPORATION	INDIA
14	HINDUSTAN DORR-OLIVER LTD.	INDIA
15	INDIA TUBE MILLS & METAL INDUSTRIES LTD.	INDIA
16	INDUS PROJECTS LTD. (FORMERLY INDUS ENGG.)	INDIA
17	LARSEN & TOUBRO LIMITED	INDIA
18	LAXMI ENGINEERING INDUSTRIES (BHOPAL)	INDIA
10	PRIVATE LIMITED (CS/SS only Except Urea service)	Aldnii
	TIMINATE LIMITED (CO/SS Office)	



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19	LLOYDS STEEL INDUSTRIES LIMITED	INDIA
20	MABEL ENGINEERS PVT. LTD.	INDIA
21	MANISH UDYOG HEAT EXCHANGERS PVT. LTD.	INDIA
22	MISTRY PRABHUDAS MANJI ENGG. PVT. LTD.	INDIA
23	MULTI-MAX ENGINEERING WORKS PVT. LTD. (CS	INDIA
	and SS Materials only)	
24	PATELS AIRTEMP (INDIA LIMITED)	INDIA
25	PRECISION EQUIPMENTS (CHENNAI) PVT. LTD.	INDIA
26	R.D. ENGINEERS (INDIA) PVT. LTD.	INDIA
27	RADIANT HEAT EXCHANGER PVT. LTD. (CS/SS only)	INDIA
28	RAJ ENGG. CO.	INDIA
29	REYNOLDS CHEMQUIP PRIVATE LIMITED (CS/SS)	INDIA
30	TAS ENGINEERING CO. (P) LIMITED	INDIA
31	TATA CHEMICALS LTD	INDIA
32	TEMA INDIA LIMITED(ACHHAD UNIT-1)	INDIA
33	THE ANUP ENGINEERING LIMITED	INDIA
34	ISGEC HEAVY ENGINEERING LIMITED	INDIA
35	TITANIUM EQUIPMENT AND ANODE MFG. CO. LTD.	INDIA
36	APPARATEBAU SCHWEISSTECHNIK GMBH	AUSTRIA
37	SCHOELLER-BLECKMANN NITEC GMBH	AUSTRIA
38	D'HONDT S.A.	BELGIUM
39	BORSING GmbH	GERMANY
40	BELLELI S.P.A.	ITALY
41	FBM HUDSON ITALIANA S.p.A.	ITALY
42	GE POWER (NUOVO PIGNONE SPA)	ITALY
43	OLMI SPA	ITALY
44	WALTER TOSTO SpA	ITALY
45	HITACHI ZOSEN	JAPAN
46	KAWASAKI HEAVY INDUSTRIES LTD.	JAPAN
47	KOBE STEEL LIMITED	JAPAN
48	MITSUI ENGINEERING & SHIPBUILDING CO. LTD	JAPAN
49	DOOSAN MECATEC CO. LTD.	KOREA
50	HANTECH LIMITED	KOREA
51	HYUNDAI CORPORATION	KOREA
52	KOREA HEAVY INDUSTRIES & CONSTN. CO. LTD.	KOREA
53	HANJUNG DCM CO. LTD	KOREA
54	MECANICA DE LA PENA S.A.	SPAIN
55	MANNING & LEWIS ENGINEERING CO.,	U.S.A
56	CHEM PROCESS SYSTEM PVT. LIMITED (CS/SS only)	INDIA
57	ESSAR HEAVY ENGINEERING SERVICES	INDIA
58	FAB-TECH WORKS & CONSTRUCTIONS PRIVATE	INDIA
	LIMITED	
59	GMM PFAUDLER LIMITES	INDIA
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61	PHILS HEAVY ENGINEERING PVT. LIMITED. (for AS	INDIA
	(P3 & P4) only)	
62	RELIANCE FABRICATIONS PVT. LTD. (CS/SS only)	INDIA
63	TECHNO PROCESS EQUIPMENTS (I) LTD.	INDIA
64	TEMA INDIA LIMITED (PANOLI, ANKLESHWAR-UNIT-III	INDIA
	& UNIT-IV) (IN Non ASME Certification LIKE U, U2, R	
	ETC. Category)	
65	TEMA INDIA LIMITED (SILVASSA, UNIT-II (In Non IBR	INDIA
	Category))	
66	TITANIUM TANTALUM PRODUCTS LTD. (CS & SS	INDIA
	Material)	
67	UNIQUE CHEMOPLANT EQUIPMENTS	INDIA
68	UNIVERSAL HEAT EXCHANGERS LIMITED	INDIA
	(CS/SS/LTCS Only)	
69	BTL EPC LIMITED (CS ONLY)	INDIA
70	SUNGJIN GEOTEC LTD. (CS and SS Only)	KOREA
71	CHEM PROCESS SYSTEMS PVT LTD (CS/SS Only)	INDIA
HEAT E	XCHANGERS 30 TO 60 kg/cm2G	
1	BHPV	INDIA
2	BHARAT HEAVY ELECTRICALS LTD.	INDIA
3	G R ENGINEERING PRIVATE LIMITED	INDIA
4	GODREJ & BOYCE MFG. CO. LTD.	INDIA
5	GRASIM INDUSTRIES	INDIA
6	HINDUSTAN DORR-OLIVER LTD. (CS/SS only)	INDIA
7	LARSEN & TOUBRO LIMITED	INDIA
8	LAXMI ENGINEERING INDUSTRIES (BHOPAL)	INDIA
	PRIVATE LIMITED (CS/SS only Except Urea service)	
9	LLOYDS STEEL INDUSTRIES LIMITED	INDIA
10	PATELS AIRTEMP (INDIA LIMITED)	INDIA
11	PRECISION EQUIPMENTS (CHENNAI) PVT. LTD.	INDIA
12	TEMA INDIA LIMITED (ACHHAD-I)	INDIA
13	THE ANUP ENGINEERING LIMITED	INDIA
14	THE INDIAN SUGAR & GENERAL ENGG. CORPN.	INDIA
	(ISGEC), DAHEJ (Except Urea Plant Critical Equipment)	
15	ISGEC HEAVY ENGINEERING LIMITED	INDIA
16	APPARATEBAU SCHWEISSTECHNIK GMBH	AUSTRIA
17	SCHOELLER-BLECKMANN NITEC GMBH	AUSTRIA
18	BORSING GmbH	GERMANY
19	FBM HUDSON ITALIANA S.p.A.	ITALY
20	OFFICIENCE LUIGI RESTA S.P.A.	ITALY
21	ROLLE S.P.A. (30 to 60 kg/cm2 pr.)	ITALY
22	HITACHI ZOSEN	JAPAN
23	MITSUBISHI HEAVY INDUSTRIES LTD.	JAPAN



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24	DOOSAN MECATEC CO. LTD.	KOREA
25	HANJUNG DCM CO. LTD.	KOREA
26	HANTECH LIMITED	KOREA
27	HUNDAI HEAVY INDUSTRIES	KOREA
28	MECANICA DE LA PENA S.A.	SPAIN
29	CICB-CHEMICON PVT. LTD. (CS Only)	INDIA
30	ESSAR HEAVY ENGINEERING SERVICES	INDIA
31	GMM PFAUDLER LIMITED	INDIA
32	INDCON PROJECTS & EQUIPMENT LIMITED (CS/SS	INDIA
	Only)	
33	MEENAKSHI ASSOCIATES (P) LTD. (CS/SS Only)	INDIA
34	TECHNO PROCESS EQUIPMENTS (I) LTD.	INDIA
35	TEMA INDIA LIMITED (SILVASSA, UNIT-II (In Non IBR	INDIA
	Category))	
36	SUNGJIN GEOTEC CO. LTD. (CS & SS Only)	KOREA
37	ALPEC CO. LTD. (CS & AS only)	KOREA
38	NEWTON ENGG. & CHEMICALS LTD. (Upto 36 Kg/cm2)	INDIA
39	GEMINI ENGI-FAB PVT. LTD.	INDIA
40	FABTECH PROJECTS & ENGINEERS LTD. (For CS only)	INDIA
41	EXPO GAS CONTAINERS LTD. (CS only)	INDIA
42	AVADH INDSTRIES (Upto 44 Kg/cm2g (CS Only))	INDIA
43	AERO ENGINEERS (Upto 46 Kg/cm2g (CS only))	INDIA
44	FAB-TECH WORKS & CONSTRUCTIONS PRIVATE LIMITED	INDIA
45	MULTI MAX ENGINEERING WORKS PVT. LTD (CS & SS ONLY)	INDIA
46	PRAJ INDUSTRIES LIMITED (CS/SS ONLY)	INDIA
40	TIVAS INDOSTINES EINITED (CO/OS CINET)	INDIA
DI ATE T	YPE HEAT EXCHANGERS	
1.	ALFA LAVAL INDIA LIMITED	INDIA
2.	APV (PRAJ)	INDIA
3.	DOVER INDIA LTD (TRANTER PHE DIVN)	INDIA
4.	KELVION INDIA PRIVATE LIMITED (FORMERLY GEA	INDIA
4.	ECOFLEX INDIA PV	INDIA
5.	LARSEN & TOUBRO LIMITED	INDIA
6.	SHRACHI ENGINEERINF & INDUSTRIES LTD.	INDIA
7.	URISAN HEAT EXCHANGERS PVT. LTD.	INDIA
8.	LINDE AG	GERMANY
9.	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
10.	MECANICA DE LA PENA S.A.	SPAIN
11.	MANNING & LEWIS ENGINEERING CO.,	U.S.A
12.	TRANTER PHE, INC.	U.S.A
40	LUBO DE COECO OVOTENA UNITED	13.15.14
13. 14.	HRS PROCESS SYSTEM LIMITED TRANTER INDIA PVT. LTD.	INDIA INDIA



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15.	SONDEX HEAT EXCHANGERS INDIA PRIVATE LIMITED	INDIA
FRP / PV	C TANKS & VESSELS	
1	GANDHI AND ASSOCIATES	INDIA
2	SONAL ENGG. PLASTIC FABRICATOR	INDIA
3	EPP COMPOSITES PVT. LTD.	INDIA
4	APPARATEBAU SCHWEISSTECHNIK GMBH (acid	AUSTRIA
	storage tanks up to 3.8 in dia.)	
FRP / PVC LINING		
1.	GANDHI AND ASSOCIATES	INDIA
2.	EPP COMPOSITES PVT. LTD.	INDIA

**Note:** LSTK contractor shall evaluate and decide present financial, performance credential and Shop loading conditions of the vendors.

LSTK bidder to furnish list of proven sub-suppliers for static equipment within the package Item with PTR (proven track record) & requisite documents subject to owner's/consultant approval during detail engg. Documents & PTR shall be in English language only. Integral static equipment in a package shall be fabricated by package vendor/ proven Sub-suppliers.

#### **ROTATING EQUIPMENTS:**

INSTRUMENT AIR COMPRESSOR (CENTRIFUGAL)		
1.	INGERSOLL RAND INDIA LTD.	INDIA
2.	ATLAS COPCO ENERGAS GMBH	GERMANY
3.	GHH BORSIG TURBOMASCHINEN AG	GERMANY
4.	LINDE AG WERKSGRUPPE	GERMANY
5.	MANNESMAN DEMAG AG	GERMANY
6.	SIEMENS AG PGI	GERMANY
7.	FIMA MASCHINENBAU GMBH	GERMANY
8.	GE POWER (FORMERLY NUOVO PIGNONE SPA)	ITALY
9.	EBARA CORPORATION	JAPAN
10.	HITACHI LTD	JAPAN
11.	KAWASAKI HEAVY INDUSTRIES LTD.	JAPAN
12.	KOBE STEEL LTD.	JAPAN
13.	MITSUBISHI HEAVY INDUSTRIES LTD.	JAPAN
14.	MITSUI ENGINEERING & SHIP BUILDING CO. LTD	JAPAN
15.	SULZER TURBO LIMITED	SWITZERLAND
16.	DRESSER-RAND CO.	SINGAPORE
17.	ELLIOT OVERSEAS CORPORATION	U.S.A
E.O.T C	RANES	



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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
RECIP	ROCATING COMPRESSOR	
1.	ATLAS COPCO (FOR AIR SERVICE ONLY)	INDIA
2.	DRESSER-RAND INDIA PVT LTD.	INDIA
3.	BURCKHARDT COMPRESSION ( INDIA) PVT. LTD.	INDIA
4.	CAMERON COMPRESSION SYSTEM	INDIA
5.	INGERSOLL RAND INDIA LTD. (FOR AIR & N2)	INDIA
6.	KIRLOSKAR PNEUMATIC CO. LTD (FOR AIR SERVICE ONLY)	INDIA
7.	HOWDEN (FORMERLY BURTON CORBLIN)	FRANCE
8.	LINDE AG WERKSGRUPPE	GERMANY
9.	GE POWER (NUOVO PIGNONE SPA)	ITALY
10.	ISHIKAWAJIMA HARIMA HEAVY INDS CO. LTD (IHI)	JAPAN
11.	KOBE STEEL LTD.	JAPAN
12.	MITSUI ENGINEERING & SHIP BUILDING CO. LTD	JAPAN
13.	BURCKHARDT COMPRESSION AG	SWITZERLAND
14.	THOMASSEN TURBINE SYSTEMS B.V	NETHERLANDS
COUPL	INGS	
1.	ELECON ENGG. CO. LTD (FOR FLEXIBLE COUPLING)	INDIA
2.	FENNER INDIA LTD. (FOR FLEXIBLE COUPLING)	INDIA
3.	HI-CLIFF (FOR GEAR COUPLING)	INDIA
4.	RATHI TRANSPOWER PVT. LTD	INDIA
5.	RATHI TURBOFLEX PVT. LTD	INDIA

#### **ELECTRICAL**

ITEM	NAME OF THE VENDOR	COUNTRY
INDUC	TION MOTORS – HV (FOR SAFE / HAZARDOUS AREA)	
1.	BHEL (Electrical Machines Divn.)	India
2.	Jeumont Industrie	France
3.	Fuji Electric Systems Co. Ltd	Japan



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ITEM	NAME OF THE VENDOR	COUNTRY
4.	Mitsubishi Corporation	Japan
5.	Toshiba Corporation	Japan
6.	Toshiba Mitsubishi Electric Industrial Systems Corporation (Excluding Flame-proof motors of frame size more than 900)	Japan
7.	Peebles Electrical Machines	UK
8.	Siemens	India / Germany
9.	ABB	Finland/ Switzerland/ India
10.	Jeumont Electric India Private Limited	India
INDUC	TION MOTORS – LV (415 V) (SAFE/HAZARDOUS AREA)	
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
INDUS	TRIAL HEATER	
1.	Alco Heating Co	India
2.	Batliboi & Co Ltd	India
3.	Elpro International Ltd	India
4.	Escorts Ltd	India
5.	Kantilal Chunnilal & Sons Appliances Pvt. Ltd.	India
6.	Macneil & Magor (Kilnburn)	India
7.	Middleton Engg Co	India
8.	Raycold Ltd	India
9.	T.M.I (Transformers Mfg. Industries)	India
10.	Klopper-Therm Gmbh & Co. KG	INDIA
HOSE	FLAME PROOF LOCAL CONTROL STATION/INDUSTRIAL TY	PE SWITCH SOCKET



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ITEM	NAME OF THE VENDOR	COUNTRY	
1.	Baliga Lighting Equipments Limited	India	
2.	Flameproof Equipments Pvt. Limited	India	
3.	FCG Power Industries Ltd.	India	
4.	FCG Flameproof Control Gears Pvt. Ltd.	India	
FCMA	FCMA SOFT STARTER		
1.	Jayashree Electron Pvt. Ltd	India	
2.	KIMO ELECTRONICS PVT. LTD.	India	
3.	LARSEN & TOUBRO LTD. (EL. PRODUCTS DIVN.)	India	
4.	ROCKWELL AUTOMATION INDIA LTD.	India	
5.	HITACHI HI-REL POWER ELECTRONICS PVT. LTD.	India	

#### NOTE:

Make of the equipment not indicated and any other make for the specified equipment shall be subject to TFL/ PDIL approval.

#### **MECHANICAL - PIPING**

Bidder shall select sub vendors from the vendor list as specified below. Bidder shall ensure that sub vendor for the specified item has supplied item for the specified service & the supplied item is in satisfactory service since last 3 years as on date of offer.

Vendor shall have well proven record for the specified services and shall be subjected to owner/consultant approval.

MEC	MECHANICAL - PIPING		
	CS PIPES IS-1239 (BLACK & GI)		
1	AMBICA TUBES CO.	INDIA	
2	ANIL METAL CORPORATION	INDIA	
3	CHETAN STEELS (Upto 6")	INDIA	
4	DADU PIPES (P) LIMITED (1/2" 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	

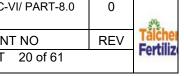


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9   INDUS TUBES LIMITED (½" to 6")   INDIA     10   JAY LAKSHMI STEEL & ENGINEERING CO.   INDIA     11   JINDAL PIPES LTD. (1/2" to 4")   INDIA     12   JOTINDRA STEEL & TUBES LTD. (½" to 6")   INDIA     13   KALPESH TUBE(INDIA), (TRADER) (upto a max order value Rs.25.0 lakh)   INDIA     14   MUKAT PIPES LTD   INDIA     15   NAVRATAN PIPE AND PROFILE LTD. (Upto 6")   INDIA     16   P.K.FORG & FITTING INDUSTRIES   INDIA     17   SAGAR STEEL CORPORATION (TRADER)   INDIA     18   SANGHVI METALS (TRADER)   INDIA     19   SURINDRA ENGINEERING CO. PVT. LTD.   INDIA     10   SURYA ROSHIN LTD. (15mm to 150mm)   INDIA     11   THE BENGAL MILL STORES SUPPLY CO.(TRADER)   INDIA     12   THE BENGAL MILL STORES SUPPLY CO.(TRADER)   INDIA     18   ZENTH LIMITED   INDIA     19   ZENTH LIMITED   INDIA     10   ANIL METAL CORPORATION   INDIA     10   ANIL METAL CORPORATION   INDIA     11   ANIL METAL CORPORATION   INDIA     12   ANIL METAL CORPORATION   INDIA     13   EVERGREEN HARDWARE STORES   INDIA     14   GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)   INDIA     16   HEAVY METAL & TUBES LIMITED   INDIA     17   INDIA   INDIA   INDIA     18   INDUS TUBES LIMITED (6" to 12")   INDIA     19   JAY LAKSHMI STEEL & ENGINEERING CO.   INDIA     10   JINDAL PIPES (TD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))   INDIA     10   JINDAL PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))   INDIA     11   JOTINDRA STEEL & ENGINEERING CO.   INDIA     12   KALPESH TUBES LIMITED (6" to 14")   INDIA     13   LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)   INDIA     14   MUKAT PIPES LTD   INDIA   INDIA     15   NAVRATAN PIPE AND PROFILE LTD. (Upto 10")   INDIA     16   P.K.FORG & FITTING INDUSTRIES   INDIA   INDIA     17   ZO mm)   SAGAR STEEL CORPORATION (TRADER)   INDIA     19   SAGAR STEEL CORPORATION (TRADER)			1
11   JINDAL PIPES LTD. (1/2" to 4")   INDIA     12   JOTINDRA STEEL & TUBES LTD. (%" to 6")   INDIA     13   KALPESH TUBE(INDIA), (TRADER) (upto a max order value Rs.25.0 lakh)   INDIA     14   MUKAT PIPES LTD   INDIA   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     19   SURYA ROSHNI LTD. (15mm to 150mm)   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     24   CS WELDED PIPES IS-3589   INDIA     25   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. (Upto 150mm dia, 8 mm thick.)   INDIA     6   HEAVY METAL & TUBES LIMITED   INDIA     7   MT TO STEEL TUBES 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     10   JINDAL PIPES LTD. (8" to 14")   INDIA     11   JOTINDRA STEEL & TUBES LTD. (6" to 14")   INDIA     12   KALPESH TUBE (INDIA), (TRADER)   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     19   SAGAR STEEL CORPORATION (TRADER)   INDIA     10   INDIA   INDIA   INDIA   INDIA   INDIA     17   PRATIBHA INDUSTRIES LTD. (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)   INDIA     19   SAGAR STEEL CORPORATION (TRADER)   INDIA   INDIA	-	INDUS TUBES LIMITED (½" to 6")	
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   INDIA   15   NAVRATAN PIPE AND PROFILE LTD. (Upto 6")   INDIA   16   P.K.FORGE & FITTING INDUSTRIES   INDIA   INDIA   17   SAGAR STEEL CORPORATION (TRADER)   INDIA   18   SANGHVI METALS (TRADER)   INDIA   18   SANGHVI METALS (TRADER)   INDIA   19   SURINDRA ENGINEERING CO. PVT. LTD.   INDIA   19   SURINDRA ENGINEERING CO. PVT. LTD.   INDIA   10   SURYA ROSHNI LTD. (15mm to 150mm)   INDIA   10   INDIA   1		JAY LAKSHMI STEEL & ENGINEERING CO.	
13   KALPESH TUBE (INDIA), (TRADER) (upto a max order value Rs.25.0 lakh)   INDIA   14   MUKAT PIPES LTD   INDIA   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   18   SANGHVI METALS (TRADER)   INDIA   19   SURINDRA ENGINEERING CO. PVT. LTD.   INDIA   19   SURINDRA ENGINEERING CO. PVT. LTD.   INDIA   10   SURYA ROSHNI LTD. (15mm to 150mm)   INDIA   10   SURINDRA ENGINEERING CO. PVT. LTD.   INDIA   10   SURINDRA ENGINEERING CO. (TRADER)   INDIA   10   SURINDRA ENGINEERING CO. (TRADER)   INDIA   10   SURINDRA ENGINEERING CO.   INDIA   11   11   11   11   11   11		JINDAL PIPES LTD. (1/2" to 4")	
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           24         WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")         INDIA           25         JANIL METAL CORPORATION         INDIA           26         CS WELDED PIPES IS-3589         INDIA           4         GOOD LUCK STEEL TUBES LTD.         INDIA           4         GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)         INDIA           4         GOOD LUCK STEEL TUBES LTD.         INDIA           4         GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)         INDIA           5         GUJART STEEL TUBES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickn	12	JOTINDRA STEEL & TUBES LTD. (1/2" to 6")	
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           24         WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")         INDIA           25         ZENITH LIMITED         INDIA           26         WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")         INDIA           27         ZENITH LIMITED         INDIA           28         ZENITH LIMITED         INDIA           29         JAVIL METAL & CORPORATION         INDIA           30         EVERGREEN HARDWARE STORES         INDIA           40         GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)         INDIA           50         GUJARAT STEEL TUBES LTD.         INDIA           61	13	KALPESH TUBE(INDIA), (TRADER) (upto a max order value Rs.25.0 lakh)	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           24         WELDED PIPES IS-3589         INDIA           25         ANIL METAL CORPORATION         INDIA           26         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 14")         INDIA           9         JAY LAKSHMI STEEL & TUBES LTD. (E" to 14"	14	MUKAT PIPES LTD	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           24         CS WELDED PIPES IS-3589         INDIA           25         ANIL METAL CORPORATION         INDIA           26         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           10         JINDAL PIPES LTD. (8" to 14") <td>15</td> <td>NAVRATAN PIPE AND PROFILE LTD. (Upto 6")</td> <td>INDIA</td>	15	NAVRATAN PIPE AND PROFILE LTD. (Upto 6")	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     24   WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")   INDIA     23   ZENITH LIMITED   INDIA     24   WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")   INDIA     25   WELDED PIPES IS-3589   INDIA     26   CS WELDED PIPES IS-3589   INDIA     27   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. (Upto 150mm dia, 8 mm thick.)   INDIA     6   HEAVY METAL & TUBES LIMITED   INDIA     7   MINTER AND HARDWARE STORES   INDIA     8   INDUS TUBES LIMITED (6" to 12")   INDIA     9   JAY LAKSHMI STEEL & ENGINEERING CO.   INDIA     10   JINDAL PIPES LTD. (8" to 14")   INDIA     11   JOTINDRA STEEL & TUBES LTD. (6" to 14")   INDIA     12   KALPESH TUBE(INDIA), (TRADER)   INDIA     13   LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)   INDIA     14   MUKAT PIPES LTD   INDIA     15   NAVRATAN PIPE AND PROFILE LTD. (Upto 10")   INDIA     16   P.K.FORGE & FITTING INDUSTRIES   INDIA     17   PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)   INDIA     18   RATNAMANI METALS & TUBES LIMITED   INDIA     19   SAGAR STEEL CORPORATION (TRADER)   INDIA	16	P.K.FORGE & FITTING INDUSTRIES	INDIA
19   SURINDRA ENGINEERING CO. PVT. LTD.   INDIA	17	SAGAR STEEL CORPORATION (TRADER)	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           23         ZENITH LIMITED         INDIA           2         ZENITH LIMITED         INDIA           2         ZENITH LIMITED         INDIA           4         CS WELDED PIPES IS-3589         INDIA           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         INDIA           8         INDUS TUBES LIMITED (6" to 12")         INDIA           9         JAY LAKSHMI STEEL & ENGINEERING CO.         INDIA           10         JINDAL PIPES LTD. (6" to 14")         INDIA           11	18	SANGHVI METALS (TRADER)	INDIA
21 THE BENGAL MILL STORES SUPPLY CO.(TRADER)  22 WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")  33 ZENITH LIMITED  4 CS WELDED PIPES IS-3589  1 ANIL METAL CORPORATION  5 DADU PIPES (P) LIMITED (6" to 12" (Thickness up to 9.5 mm))  6 EVERGREEN HARDWARE STORES  7 INDIA  8 GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)  9 JAYLAKSHMI STEEL TUBES LIMITED  1 INDIA  8 INDUS TUBES LIMITED (6" to 12")  9 JAY LAKSHMI STEEL & ENGINEERING CO.  1 INDIA  10 JINDAL PIPES LTD. (8" to 14")  11 JOTINDRA STEEL & TUBES LTD. (6" to 14")  12 KALPESH TUBE(INDIA), (TRADER)  13 LALIT PIPES LTD  14 MUKAT PIPES LTD  15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)  18 RATNAMANI METALS & TUBES LIMITED  18 INDIA  19 SAGAR STEEL CORPORATION (TRADER)  18 INDIA  19 SAGAR STEEL CORPORATION (TRADER)  19 SAGAR STEEL CORPORATION (TRADER)  10 INDIA	19	SURINDRA ENGINEERING CO. PVT. LTD.	INDIA
WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")  INDIA  ZENITH LIMITED  CS WELDED PIPES IS-3589  1 ANIL METAL CORPORATION  INDIA  2 DADU PIPES (P) LIMITED (6" to 12" (Thickness up to 9.5 mm))  INDIA  EVERGREEN HARDWARE STORES  INDIA  GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)  HINDIA  HEAVY METAL & TUBES LIMITED  HITECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))  INDIA  INDIA  INDIA  JAY LAKSHMI STEEL & ENGINEERING CO.  JINDIA  JINDAL PIPES LTD. (8" to 14")  KALPESH TUBE(INDIA), (TRADER)  LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  KALPESH TUBE (INDIA)  P.K.FORGE & FITTING INDUSTRIES  INDIA  RATNAMANI METALS & TUBES LIMITED  INDIA  RATNAMANI METALS & TUBES LIMITED  INDIA  RATNAMANI METALS & TUBES LIMITED  INDIA  SAGAR STEEL CORPORATION (TRADER)  INDIA	20	SURYA ROSHNI LTD. (15mm to 150mm)	INDIA
ZENITH LIMITED  CS WELDED PIPES IS-3589  1 ANIL METAL CORPORATION  2 DADU PIPES (P) LIMITED (6" to 12" (Thickness up to 9.5 mm))  3 EVERGREEN HARDWARE STORES  4 GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)  5 GUJRAT STEEL TUBES LTD.  6 HEAVY METAL & TUBES LIMITED  7 HI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))  8 INDUS TUBES LIMITED (6" to 12")  9 JAY LAKSHMI STEEL & ENGINEERING CO.  10 JINDAL PIPES LTD. (8" to 14")  11 JOTINDRA STEEL & TUBES LTD. (6" to 14")  12 KALPESH TUBE(INDIA), (TRADER)  13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  14 MUKAT PIPES LTD  15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 PRATIBHA INDUSTRIES LIMITED  18 RATNAMANI METALS & TUBES LIMITED  19 SAGAR STEEL CORPORATION (TRADER)  10 INDIA	21	THE BENGAL MILL STORES SUPPLY CO.(TRADER)	INDIA
CS WELDED PIPES IS-3589  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 10 JINDAL PIPES LTD. (8" to 14") INDIA 11 JOTINDRA STEEL & TUBES LIMITED (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 LIMITED INDIA 18 RATNAMANI METALS & TUBES LIMITED 19 SAGAR STEEL CORPORATION (TRADER)	22	WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (Upto 6")	INDIA
ANIL METAL CORPORATION INDIA  DADU PIPES (P) LIMITED (6" to 12" (Thickness up to 9.5 mm)) INDIA  EVERGREEN HARDWARE STORES INDIA  GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.) INDIA  HEAVY METAL & TUBES LIMITED INDIA  HI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm)) INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  JAY LAKSHMI STEEL & ENGINEERING CO. INDIA  JOTINDRA STEEL & TUBES LTD. (6" to 14") INDIA  KALPESH TUBE(INDIA), (TRADER) INDIA  LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm) INDIA  MUKAT PIPES LTD INDIA  NAVRATAN PIPE AND PROFILE LTD. (Upto 10") INDIA  PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)  RATNAMANI METALS & TUBES LIMITED INDIA  RATNAMANI METALS & TUBES LIMITED INDIA  RATNAMANI METALS & TUBES LIMITED INDIA  RATNAMANI METALS & TUBES LIMITED INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  RATNAMANI METALS & TUBES LIMITED INDIA  INDIA	23	ZENITH LIMITED	INDIA
DADU PIPES (P) LIMITED (6" to 12" (Thickness up to 9.5 mm))  SEVERGREEN HARDWARE STORES  INDIA  GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)  GUJRAT STEEL TUBES LTD.  HEAVY METAL & TUBES LIMITED  HI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))  NDIA  NDIA  NDIA  INDIA  INDIA  JINDUS TUBES LIMITED (6" to 12")  JAY LAKSHMI STEEL & ENGINEERING CO.  JINDIA PIPES LTD. (8" to 14")  INDIA  JOTINDRA STEEL & TUBES LIMITED (6" to 14")  KALPESH TUBE (INDIA), (TRADER)  LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  MUKAT PIPES LTD  NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  INDIA  PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)  RATNAMANI METALS & TUBES LIMITED  INDIA  RATNAMANI METALS & TUBES LIMITED  INDIA  INDIA  RATNAMANI METALS & TUBES LIMITED  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA  INDIA		CS WELDED PIPES IS-3589	
3 EVERGREEN HARDWARE STORES 4 GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.) 5 GUJRAT STEEL TUBES LTD. 6 HEAVY METAL & TUBES LIMITED 7 HI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm)) 8 INDUS TUBES LIMITED (6" to 12") 9 JAY LAKSHMI STEEL & ENGINEERING CO. 11 JINDIA 11 JOTINDRA STEEL & TUBES LTD. (6" to 14") 12 KALPESH TUBE(INDIA), (TRADER) 13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm) 14 MUKAT PIPES LTD 15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10") 16 P.K.FORGE & FITTING INDUSTRIES 17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm) 18 RATNAMANI METALS & TUBES LIMITED 19 SAGAR STEEL CORPORATION (TRADER) 1 INDIA	1	ANIL METAL CORPORATION	INDIA
4 GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)  5 GUJRAT STEEL TUBES LTD.  6 HEAVY METAL & TUBES LIMITED  7 HI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))  8 INDUS TUBES LIMITED (6" to 12")  9 JAY LAKSHMI STEEL & ENGINEERING CO.  10 JINDAL PIPES LTD. (8" to 14")  11 JOTINDRA STEEL & TUBES LTD. (6" to 14")  12 KALPESH TUBE(INDIA), (TRADER)  13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  14 MUKAT PIPES LTD  15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 20 mm)  18 RATNAMANI METALS & TUBES LIMITED  19 SAGAR STEEL CORPORATION (TRADER)  INDIA	2	DADU PIPES (P) LIMITED (6" to 12" (Thickness up to 9.5 mm))	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)) 8 INDUS TUBES LIMITED (6" to 12") INDIA 9 JAY LAKSHMI STEEL & ENGINEERING CO. INDIA 10 JINDAL PIPES LTD. (8" to 14") INDIA 11 JOTINDRA STEEL & TUBES LTD. (6" to 14") INDIA 12 KALPESH TUBE(INDIA), (TRADER) INDIA 13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm) INDIA 14 MUKAT PIPES LTD INDIA 15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10") INDIA 16 P.K.FORGE & FITTING INDUSTRIES INDIA 17 20 mm) INDIA 18 RATNAMANI METALS & TUBES LIMITED 19 SAGAR STEEL CORPORATION (TRADER) INDIA	3	EVERGREEN HARDWARE STORES	INDIA
6 HEAVY METAL & TUBES LIMITED 7 HI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm)) 8 INDUS TUBES LIMITED (6" to 12") 9 JAY LAKSHMI STEEL & ENGINEERING CO. 10 JINDAL PIPES LTD. (8" to 14") 11 JOTINDRA STEEL & TUBES LTD. (6" to 14") 12 KALPESH TUBE(INDIA), (TRADER) 13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm) 14 MUKAT PIPES LTD 15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10") 16 P.K.FORGE & FITTING INDUSTRIES 17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm) 18 RATNAMANI METALS & TUBES LIMITED 19 SAGAR STEEL CORPORATION (TRADER) 1 INDIA	4	GOOD LUCK STEEL TUBES LTD. (Upto 150mm dia, 8 mm thick.)	INDIA
THI-TECH PIPES LTD. (ERW MS / GI Pipes: 6" NB OD to 12", (Thickness 2.6 mm to 8.0 mm))  NDIA	5	GUJRAT STEEL TUBES LTD.	INDIA
mm to 8.0 mm))    INDIA	6		INDIA
9 JAY LAKSHMI STEEL & ENGINEERING CO. INDIA 10 JINDAL PIPES LTD. (8" to 14") INDIA 11 JOTINDRA STEEL & TUBES LTD. (6" to 14") INDIA 12 KALPESH TUBE(INDIA), (TRADER) INDIA 13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm) INDIA 14 MUKAT PIPES LTD INDIA 15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10") INDIA 16 P.K.FORGE & FITTING INDUSTRIES INDIA 17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm) INDIA 18 RATNAMANI METALS & TUBES LIMITED INDIA 19 SAGAR STEEL CORPORATION (TRADER)	7		INDIA
10 JINDAL PIPES LTD. (8" to 14")  11 JOTINDRA STEEL & TUBES LTD. (6" to 14")  12 KALPESH TUBE(INDIA), (TRADER)  13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  14 MUKAT PIPES LTD  15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)  18 RATNAMANI METALS & TUBES LIMITED  19 SAGAR STEEL CORPORATION (TRADER)	8	INDUS TUBES LIMITED (6" to 12")	INDIA
11 JOTINDRA STEEL & TUBES LTD. (6" to 14")  12 KALPESH TUBE(INDIA), (TRADER)  13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  14 MUKAT PIPES LTD  15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)  18 RATNAMANI METALS & TUBES LIMITED  19 SAGAR STEEL CORPORATION (TRADER)  INDIA	9	JAY LAKSHMI STEEL & ENGINEERING CO.	INDIA
12 KALPESH TUBE(INDIA), (TRADER)  13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  14 MUKAT PIPES LTD  15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)  18 RATNAMANI METALS & TUBES LIMITED  19 SAGAR STEEL CORPORATION (TRADER)  INDIA	10	JINDAL PIPES LTD. (8" to 14")	INDIA
13 LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)  14 MUKAT PIPES LTD  15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to 20 mm)  18 RATNAMANI METALS & TUBES LIMITED  19 SAGAR STEEL CORPORATION (TRADER)  INDIA	11	JOTINDRA STEEL & TUBES LTD. (6" to 14")	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 INDIA  18 RATNAMANI METALS & TUBES LIMITED INDIA  19 SAGAR STEEL CORPORATION (TRADER)	12	KALPESH TUBE(INDIA), (TRADER)	INDIA
15 NAVRATAN PIPE AND PROFILE LTD. (Upto 10")  16 P.K.FORGE & FITTING INDUSTRIES  17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to INDIA  18 RATNAMANI METALS & TUBES LIMITED  19 SAGAR STEEL CORPORATION (TRADER)  INDIA	13	LALIT PIPES & PIPES LIMITED (16" to 64", thickness upto 20mm)	INDIA
16 P.K.FORGE & FITTING INDUSTRIES INDIA  17 PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to INDIA  18 RATNAMANI METALS & TUBES LIMITED INDIA  19 SAGAR STEEL CORPORATION (TRADER)	14	MUKAT PIPES LTD	INDIA
PRATIBHA INDUSTRIES LTD., (16" NB to 24" NB, Wall Thickness: 6 mm to INDIA  18 RATNAMANI METALS & TUBES LIMITED INDIA  19 SAGAR STEEL CORPORATION (TRADER) INDIA	15	NAVRATAN PIPE AND PROFILE LTD. (Upto 10")	INDIA
17 20 mm) 18 RATNAMANI METALS & TUBES LIMITED INDIA 19 SAGAR STEEL CORPORATION (TRADER) INDIA	16		INDIA
19 SAGAR STEEL CORPORATION (TRADER) INDIA	17		INDIA
or to rate - EEE corn of the C	18	RATNAMANI METALS & TUBES LIMITED	INDIA
20 SANGHVI METALS (TRADER) INDIA	19	SAGAR STEEL CORPORATION (TRADER)	INDIA
	20	SANGHVI METALS (TRADER)	INDIA



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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
	CS WELDED PIPES TO API 5L SPIRAL/ LONG. WELDED	
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. (1/2" 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 MM THK))	INDIA
16	WELSPUN GUJARAT STAHL ROHREN LIMITED (ANJAR) (upto 100" (30 MM THK.))	INDIA
17	ETS TROUVAY & CAUVIN	FRANCE
18	PHOCEENNE	FRANCE
19	MANNESMANN HANDEL AG	GERMANY
20	THYSSEN-KRUPP STAHLUNION GMBH	GERMANY
21	DALMINE SPA	ITALY
22	RACCORTUBI SRL	ITALY
23	KOSEI SANGYO LTD	JAPAN
24	MARUBENI ITOCHU STEEL	JAPAN



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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
	CS/AS/ LTCS SEAMLESS PIPES	
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
13	SAINEST TUBES PVT. LTD. ( $\frac{1}{2}$ " NB TO 3" upto SCH. 160 (ASTM A 106 GR. B, A333 GR. 1 & 6 & A335 GR. P11))	INDIA
14	ETS TROUVAY & CAUVIN	FRANCE
15	PHOCEENNE	FRANCE
16	HORST KURVERS GMBH	GERMANY
17	MANNESMANN HANDEL AG	GERMANY
18	DALMINE SPA	ITALY
19	GAM RACCORDI S.P.A	ITALY
20	IBF SEAMLESS PIPES SPA	ITALY
21	RACCORTUBI SRL	ITALY
22	MARUBENI ITOCHU STEEL	JAPAN



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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.
	SS SEAMLESS/ WELDED PIPES	
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 UPTO GRADE SS 321))	INDIA
11	MARDALE PIPES PLUS LTD.	INDIA
12	MODERN TUBE INDUSTRIES LTD. (upto 2" (upto SS Grade 321))	INDIA
13	NUCLEAR FUEL COMPLEX	INDIA
14	P.K.FORGE & FITTING INDUSTRIES	INDIA
15	PRAKASH STEELAGE LTD. (Seamless: upto 12" & Welded: upto 24")	INDIA
16	QUALITY STAINLESS PVT. LTD. (Seamless: upto 6"(SCH40S), Welded: upto 20"(SCH40S)(UPTO SS GRADE 316L))	INDIA
17	RATNADEEP METAL & TUBES PVT. LTD. (SMLS<=168.3MM O.D., WELDED <=50.8MM O.D.)	INDIA
18	RATNAMANI METALS & TUBES LTD.	INDIA
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19	REMI EDELSTAHL TUBULARS LTD. (RAJENDRA MECHANICAL	INDIA
	INDUSTRIES (Welded Upto 48" seamless upto 8" (Thk: upto 12.7mm))	
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
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.



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51	CORUS TUBES LIMITED	U.K.
52	BRITISH STEEL CORPORATION	U.K.
	SS SEAMLESS TUBES	
1	ANIL METAL CORPORATION	INDIA
2	APEX TUBES PVT. LIMITED (UPTO 50.8 MM OD (THICKNESS UPTO 4.00 MM))	INDIA
3	BHANDARI FOILS & TUBES LIMITED (UPTO 50MM OD)	INDIA
4	DIVINE TUBES PVT. LTD. (UPTO 3")	INDIA
5	HEAVY METAL & TUBES LIMITED (UPTO 8" (THICKNESS UPTO 18.26 MM))	INDIA
6	KRYSTAL STEEL MANUFACTURING PVT. LTD. (UPTO 50.8 MM OD (MATERIAL UPTO GRADE SS 321))	INDIA
7	MODERN TUBE INDUSTRIES LIMITED (UPTO 50.80 MM OD (UPTO SS GRADE 321))	INDIA
8	PRAKASH STEELAGE LTD. (114.3 mm OD, Thickness upto 6 mm)	INDIA
9	RATNAMANI METALS & TUBES LTD.	INDIA
10	SANDVIK ASIA PVT. LTD. (OD UPTO 60.33 (THK: UPTO 8.74 MM))	INDIA
11	SCORODITE STAINLESS (INDIA) PVT.LTD. (19.05 mm OD TO 50.80mm OD, Thickness upto 3mm)	INDIA
12	SURAJ LIMITED (SURAJ STAINLESS LIMITED)	INDIA
13	WELSPUN SPECIALITY SOLUTIONS LIMITED (UPTO 114.3mm OD)	INDIA
14	T.T.ITUBACEX TUBOS INOXIDABLES, S.A.(Upto 250.0mm OD)	SPAIN
	SS PIPES UREA GRADE	
1	KEY-TECH ENGINEERING COMPANY (UPTO 8")	INDIA
2	BHDT GMBH	AUSTRIA
3	SCHOELLER-BLECKMANN NITEC GMBH	AUSTRIA
4	ETS TROUVAY & CAUVIN	FRANCE
5	PHOCEENNE	FRANCE
6	HORST KURVERS GmbH	GERMANY
7	MANNESMANN HANDEL AG	GERMANY
8	THYSSEN-KRUPP STAHLUNION GmbH	GERMANY
9	DALMINE SPA	ITALY
10	IBF SEAMLESS PIPES Spa	ITALY
11	MARUBENI ITOCHU STEEL	JAPAN
12	MITSUBISHI CORPORATION	JAPAN
13	NIPPON STEEL CORPORATION	JAPAN
14	NISHITANI & CO. LTD.	JAPAN
15	NISSHO IWAI CORPORATION	JAPAN
16	OKURA & CO. LTD.	JAPAN



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17	SOJITZ CORPORATION	JAPAN
18.	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
19	HYUNDAI CORPORATION	KOREA
20	T.T.I- TUBACEX TUBOS INOXIDABLES, S.A. (Upto 10")	SPAIN
21	AB SANDVIK STEEL	SWEDEN
22	BRITISH STEEL CORPORATION	U.K
23	CORUS TUBES LIMITED	U.K
24	VOMAL INTERNATIONAL LIMITED	U.K
27	HDPE/MDPE PIPES & PIPE FITTINGS	0.10
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
	SS WLEDED TUBES	
1	APEX TUBES PVT. LTD. (Upto 102mm OD (Thickness Upto 4.00mm)	INDIA
2	DIVINE TUBES PVT. LTD (Upto 4")	INDIA
3	KRYSTAL STEEL MANUFACTURING PVT. LTD (Upto 50.8 OD- (Material upto Gr. SS321))	INDIA
4	MAXIM TUBES COMPANY PVT. LTD (6mm to 114.3mm (0.5mm to 4.5mm thk))	INDIA
5	MODERN TUBE INDUSTRIES LTD (Upto 50.80 OD( UPTO SS321 Grade))	INDIA
6	PRAKASH STEELAGE LIMITED (114.3mm OD, thickness upto 6mm)	INDIA
7	QUALITY STAINLESS PVT. LTD (Upto 4"OD(upto 4.0mm thk)upto Grade SS316L))	INDIA
8	REMI EDELSTAHL TUBULARS LTD. (RAJENDRA MECHANICAL INDUSTRIES(50.8mm OD))	INDIA
9	SCODA TUBES LTD. (9.52 mm OD to 50.8mm OD)	INDIA
10	SCORODITE STAINLESS (INDIA) PVT. LTD. (19.05 mm OD to 50.80mm OD, thk upto 3mm)	INDIA
11	STEAMLINE INDUSTRIES LTD. (6.00mm OD to 50.8mm OD)	INDIA
	SUNRISE STAINLESS PVT. LTD (Upto 4" OD Thickness upto 6mm)	INDIA
12	CONTROL OF THE COPIO 4 OD THICKNESS upto CHILITY	
12 13	SURAJ LIMITED (SURAJ STAINLESS LIMITED)	INDIA



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	FITTINGS: CS/AS/SS SEAMLESS & FORGED	
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"	INDIA
5	(upto SCHXXS))	INDIA
6	EBY FASTENERS	INDIA
7	EBY INDUSTRIES	INDIA
8	FIT-TECH INDUSTRIES (Upto 24")	INDIA
9	FLASH FORGE(P) LTD.(Forged upto 4" (upto 9000#) & Seamless up to 42")	INDIA
10	GUJARAT INFRAPIPES PVT. LTD.	INDIA
11	JAY LAKSHMI STEELS & ENGINEERING CO.	INDIA
12	KALPESH TUBE(INDIA),(TRADER) (UPTO A MAX ORDER VALUE RS.25.0 LAKH)	INDIA
13	M.S FITTINGS MANUFACTURING CO. PVT LTD.	INDIA
14	MARDALE PIPES PLUS LTD.	INDIA
15	NAVKAR FORGINGS & FITTINGS PVT. LTD ( Forged 3"(UPTO 6000#) & Seamless(Upto 16" SCH XXS))	INDIA
16	NL HAZRA (upto SCH80)	INDIA
17	P.K TUBES & FITTINGS PVT. LTD. (Forged upto 1 ½" & Seamless upto 24" (SCH160))	INDIA
18	P.K FORGE & FITTING INDUSTRIES	INDIA
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



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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
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.
	FITTINGS: SS UREA GRADE	
1	KEY-TECH ENGINEERING COMPANY (Upto 8")	INDIA
2	PETROL RACCORD S.P.A (Size upto 14")	ITALY



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3	BHDT GMBH	AUSTRIA
4	ETS TROUVAY & CAUVIN	FRANCE
5	PHOCEENNE	FRANCE
6	VALLOUREC	FRANCE
7	HORST KURVERS GmbH	GERMANY
8	MANNESMANN HANDEL AG	GERMANY
9	SEIKMANN ANLAGEN-TECHNIK GMPH	GERMANY
10	TPS-TECHNITUBE ROHRENWERKE GMBH	GERMANY
11	DALMINE SPA	ITALY
12	IBF SEAMLESS PIPES Spa	ITALY
13	IND MECCANICA BASSI LUIGI & C.SPA	ITALY
14	RACCORTUBI SRL	ITALY
15	TECHNO FORGE SPA	ITALY
16	MARUBENI ITOCHU STEEL	JAPAN
17	NIPPON KOKAN	JAPAN
18	NISHITANI & CO. LTD	JAPAN
19	NISSHO IWAI CORPORATION	JAPAN
20	OKURA & CO. LTD	JAPAN
21	SOJITZ CORPORATION	JAPAN
22	SUMITOMO METAL INDUSTRIES LTD.	JAPAN
23	AVESTA CANDVITE TUBE AD	SWEDEN
24	HELENS ENERGY	SWEDEN
25	BRITISH STEEL CORPORATION	U.K
26	CORUS TUBES LTD	U.K
27	EUROTUBE LTD	U.K
28	VOMAL INTERNATIONAL LTD	U.K
	FRP/PVC PIPE AND PIPE FITTINGS	
1	ASTRAL POLYTECHNIK PVT. LTD. (1/2" to 12" Size)	INDIA
2	GANDHI AND ASSOCIATES	INDIA
3	SONAL ENGG. PLASTIC FABRICATOR	INDIA
	CAST IRON FITTINGS & PIPES	
1	CRAWLEY & RAY (F&E) PVT. LTD	INDIA
2	IISCO LTD	INDIA
3	KESORAM SPUN PIPES & FOUNDRIES	INDIA
4	SAYAJI IRON & ENGG. CO (P) LIMITED	INDIA
5	SHAKTI CAST (P) LTD	INDIA



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6	SHALIMAR WORKS LTD	INDIA
7	SHIVA ENGINEERING WORKS	INDIA
8	VISVESARAYA IRON & STEEL LTD.	INDIA
	FORGED FLANGES	
1	AJAY FORGING PVT. LTD	INDIA
2	AMFORGE INDUSTRIES(Upto 24"(upto1500#) & Upto 12"(FOR 2500#)	INDIA
3	ANANDMAYEE FORGINGS PVT. LTD.	INDIA
4	C D ENGINEERING	INDIA
5	CHANDAN STEELS LIMITED (ONLY SS Flanges- Upto36"-150#, Upto24"-300#, Upto20"-600#, Upto16"-900#, Upto12"-1500#, Upto8"-2500#)	INDIA
6	CHETAN STEELS (UPTO 6", 150#)	INDIA
7	CHW FORGE PVT. LTD. (FORMELY CHAUDHARY HAMMER WORKS)	INDIA
8	ECHJAY INDUSTRIES LTD	INDIA
9	FERROUS ALLOYS FORGING PVT. LTD	INDIA
10	GOLDEN IRON & STEEL WORKS	INDIA
11	GOOD LUCK ENGINEERING CO. (½"-12" (UPTO 2500#), 14"-16" (UPTO 900#), 18"-32" (UPTO 600#), 34"-48" (UPTO 300#),	INDIA
12	J.K FORGINGS (1/2" to 60" ANSI B 16.5, Class 150 to 2500)	INDIA
13	KUNJ FORGINGS PVT. LTD. (upto 60" (upto 300#) & upto 12" (upto 2500#))	INDIA
14	MAHESH INDUSTRIES (1/2" to 8"NB,Rating-150#,SWRF,SORF & BLRF material: ASTM A105 only; 2"NB to 4"NB, Rating- 150# WNRF FLANGES, Material-A105 only)	INDIA
15	METAL FORGINGS PVT. LTD. (Upto86"-150#; 60"-300# TO 600#; 48"-900# ; 24"-1500#; 12"-2500#)	
16	P.K TUBES & FITTINGS PVT. LTD. (Upto 24"(upto1500#) & Upto 12"(upto2500#) Spectacle Blind and Spacer & Blinds only)	INDIA
17	PARAMOUNT FORGE (CS,AS & SS : ½" TO 42" (UPTO 600#), ½" TO 24" (UPTO 900#), ½ " TO 16" ( UPTO 1500#), ½" TO 12" (UPTO 2500#)).	INDIA
18	PERFECT MARKETING (P) LTD.	INDIA
19	PUNJAB STEEL	INDIA
20	R D FORGE (A UNIT OF R D CHEMICALS PVT LTD) (1/2" to 54" (150#), $\frac{1}{2}$ " to 40"-300#, $\frac{1}{2}$ " to 42"- 600#,1/2" to 20"-900#, $\frac{1}{2}$ " to 20"-1500#, $\frac{1}{2}$ " 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



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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.
	PLATE RING FLANGES	
1	FABWELL ENGINEERS	INDIA
2	MAHESH INDUSTRIES (1/2" TO 16"NB -150# &300# SWRF, SORF & BLRF, Material: MS Plate Flanges of IS 2062 Grade)	INDIA
3	MOD FABRICATORS	INDIA
4	P K TUBES & FITTINGS PVT. LTD (Upto 48"- (Spectacle Blinds and Spacer & Blind only))	INDIA
5	PARAMOUNT FORGE (CS & SS: 1/2" to 84")	INDIA
6	PERFECT MARKETING (P) LTD	INDIA
7	R SQUARE ENGINEERS	INDIA
8	SANGHVI METALS (TRADER)	INDIA
	FITTINGS: CS/AS/SS WELDED	
1	PARAS ENGINEERING WORKS (8" to 36" NB- SCH 5 to SCH XXS- (CS&SS))	INDIA
2	CHETAN STEELS (Upto 10" SCH80)	INDIA
3	FIT- TECH INDUSTRIES (Upto 48")	INDIA
4	FLASH FORGE (P) LTD. (Upto 42")	INDIA
5	NAVKAR FORGING & FITTINGS PVT. LTD (Upto24"- (SCH XXS, Material: CS only))	INDIA
6	P K TUBES & FITTINGS PVT. LTD (Upto 48"- (SCH160))	INDIA
7	PETROCHEM INDUSTRIES (6" to 36" (all Fittings) & 6" to 56" (Only Conc/Ecc. Reducers) SCH :XXS/80S)	INDIA
8	RAJENDRA FORGE INDUSTRIES (CS & SS: Upto 12", SCH40)	INDIA
9	SAWAN ENGINEERS PVT. LIMITED (Upto 52" (SCH160))	INDIA
10	TOPAZ PIPING INDUSTRIES (8" to 48" (SCH 10 to SCH160))	INDIA



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11	PETROL RACCORD S.P.A (4"-56" (Tees/Reducers/Elbows))	ITALY
12	TK CORPORATION	KOREA
	PIPE COATING	
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
	GATE/ GLOBE/ CHECK VALVES CS/SS/AS < 900 LBS	
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	BRIGHTECH 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
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



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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" (150#); 24" (300#); 12" (600#) & Forged: Upto 2" (800#))	INDIA
44	ZED VALVES CO. PVT. LTD. (Upto 14" (600#))	INDIA
45	ZOLOTO INDUSTRIES. ( 40 MM TO 200 MM(ONLY CS & SS))	INDIA
46	VELAN INC. ( UPTO 48", Rating upto 600#)	CANADA
47	BOTELI VALVE GROUP CO. LTD.(Cast Upto 56" (150#), 36" (300#), 24" (600#) & Forged: Upto2" (800#))	CHINA
48	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
49	PEMTO VALVE	GERMANY
50	CESARE BONETTI SPA (Cast Upto 42" (Upto 300#), 24" (600#) Forged: upto 1 ½" (800#))	ITALY



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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.
	GATE/ GLOBE/ CHECK VALVES CS/SS/AS >=900 LBS	
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. (1/2" 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
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



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17 OSWAL INDUSTRIES LTD. (Upto 12" (900# & 1500#))	16	NSSL LIMITED. (CAST: Upto 36"(900#), 24" (upto 2500#) & FORGED: Upto 2" (Upto 2500#))	INDIA
150 (1500#)	17	· · · · · · · · · · · · · · · · · · ·	INDIA
19	18	, , , ,	INDIA
BOTELI VALVE GROUP CO. LTD. (Cast Upto 16" (Upto 1500#), 12" (2500#) & Forged: Upto 2" (1500# & 2500#))	19		INDIA
### ### ##############################	20	VELAN INC. ( UPTO 24" (Rating upto 2500#))	CANADA
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 (SOFT SEATED)         U.K.           4         BALL VALVES (SOFT SEATED)         INDIA           1         A V VALVES LIMITED (Upto 12" (Upto 600#))         INDIA           2         AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),         INDIA           3         AQUA VALVES PVT. LTD.         INDIA           4         BRIGHTECH VALVES & CONTROLS PVT. LTD.	21		CHINA
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           4         POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))         SPAIN           35         SUFA LIMITED         U.A.E.           36         BEL VALVES         U.K.           BALL VALVES (SOFT SEATED)         U.K.           1         A V VALVES LIMITED (Upto 12" (Upto 600#))         INDIA           2         AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),         INDIA           3         AQUA VALVES PVT. LTD.         INDIA           4         BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)         INDIA           5         CHEMTECH INDUSTRIAL VALVES PVT	22	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
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.           BALL VALVES (SOFT SEATED)         U.A.E.           1         A V VALVES LIMITED (Upto 12" (Upto 600#))         INDIA           2         AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),         INDIA           3         AQUA VALVES PVT. LTD.         INDIA           4         BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS inDIA         INDIA           5         CHEMTECH INDUSTRIAL VALVES PVT. LTD.         INDIA           6         CRAWLEY & RAY (FOUNDER & ENGINEERS) P	23	BFE BONNEY FORGE VALVE LICENSEE	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           4         POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))         SPAIN           35         SUFA LIMITED         U.A.E.           36         BEL VALVES         U.K.           8         BALL VALVES (SOFT SEATED)         INDIA           1         A V VALVES LIMITED (Upto 12" (Upto 600#))         INDIA           2         AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),         INDIA           3         AQUA VALVES PVT. LTD.         INDIA           4         BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS INDIA         INDIA           5         CHEMTECH INDUSTRIAL VALVES PVT. LTD.         INDIA           6         CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)         INDIA           7	24	CESARE BONETTI SPA (Upto 24" (Upto 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.           BALL VALVES (SOFT SEATED)         U.K.           4         A V VALVES LIMITED (Upto 12" (Upto 600#))         INDIA           2         AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),         INDIA           3         AQUA VALVES PVT. LTD.         INDIA           4         BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS inDIA         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         FLOC	25	FASANI S.P.A.	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#)) 35 SUFA LIMITED U.A.E. 36 BEL VALVES U.K.  BALL VALVES (SOFT SEATED) 1 A V VALVES LIMITED (Upto 12" (Upto 600#)) 1 AV VALVES LIMITED (Upto 12" (Upto 6", Rating 150# & 300#), INDIA 3 AQUA VALVES PVT. LTD. 4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS INDIA material) 5 CHEMTECH INDUSTRIAL VALVES PVT. LTD. (IDN25) 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	26	FRIULCO SPA (UPTO 32" (900#); 24" (1500#); 14" (2500#))	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.           BALL VALVES (SOFT SEATED)           1         A V VALVES LIMITED (Upto 12" (Upto 600#))         INDIA           2         AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),         INDIA           3         AQUA VALVES PVT. LTD.         INDIA           4         BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS india         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	27	GTC ITALIA S.R.L.	ITALY
30 VALVITALIA SPA  31 MATSURA H. P MACHINE WORKS CO.LTD.  32 NISHITANI & CO. LTD.  33 BABCOCK BORSIG ESPANA, S.A.  34 POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))  35 SUFA LIMITED  36 BEL VALVES  4 BALL VALVES (SOFT SEATED)  1 A V VALVES LIMITED (Upto 12" (Upto 600#))  2 AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#), INDIA  3 AQUA VALVES VT. LTD.  4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS INDIA material)  5 CHEMTECH INDUSTRIAL VALVES PVT. LTD.  6 CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25) INDIA  7 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#) INDIA	28	OMB S.P.A.	ITALY
MATSURA H. P MACHINE WORKS CO.LTD.  JAPAN  NISHITANI & CO. LTD.  JAPAN  BABCOCK BORSIG ESPANA, S.A.  SPAIN  POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))  SUFA LIMITED  LU.A.E.  BEL VALVES  BALL VALVES (SOFT SEATED)  A V VALVES LIMITED (Upto 12" (Upto 600#))  AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#), INDIA  AQUA VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)  CHEMTECH INDUSTRIAL VALVES PVT. LTD.  CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)  DELVAL FLOW CONTROL  FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  INDIA  FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  INDIA	29	PETROL VALVES S.R.L.	ITALY
32 NISHITANI & CO. LTD. 33 BABCOCK BORSIG ESPANA, S.A. 34 POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#)) 35 SUFA LIMITED 36 BEL VALVES 37 BALL VALVES (SOFT SEATED) 38 AV VALVES LIMITED (Upto 12" (Upto 600#)) 39 AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#), INDIA 3 AQUA VALVES PVT. LTD. 4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material) 5 CHEMTECH INDUSTRIAL VALVES PVT. LTD. 6 CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25) INDIA 3 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#)) 8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#) INDIA 1NDIA	30	VALVITALIA SPA	ITALY
BABCOCK BORSIG ESPANA, S.A.  POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))  SPAIN  SUFA LIMITED  U.A.E.  BEL VALVES  BALL VALVES (SOFT SEATED)  1 A V VALVES LIMITED (Upto 12" (Upto 600#))  AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#), INDIA  AQUA VALVES PVT. LTD.  BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)  CHEMTECH INDUSTRIAL VALVES PVT. LTD.  CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25) INDIA  DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  FLOW CONTROL  INDIA	31	MATSURA H. P MACHINE WORKS CO.LTD.	JAPAN
POYAM VALVES, (AMPO S. COOP.) (SIZE UPTO 30" (RATING UPTO 2500#))  SPAIN  U.A.E.  U.K.  BALL VALVES  BALL VALVES (SOFT SEATED)  INDIA  A V VALVES LIMITED (Upto 12" (Upto 600#))  AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),  INDIA  AQUA VALVES PVT. LTD.  INDIA  BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)  CHEMTECH INDUSTRIAL VALVES PVT. LTD.  CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)  INDIA  DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  INDIA  FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  INDIA	32	NISHITANI & CO. LTD.	JAPAN
35 SUFA LIMITED U.A.E. 36 BEL VALVES U.K.  BALL VALVES (SOFT SEATED)  1 A V VALVES LIMITED (Upto 12" (Upto 600#))  2 AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#), INDIA  3 AQUA VALVES PVT. LTD.  4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)  5 CHEMTECH INDUSTRIAL VALVES PVT. LTD.  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	33	BABCOCK BORSIG ESPANA, S.A.	SPAIN
BEL VALVES (SOFT SEATED)  1 A V VALVES LIMITED (Upto 12" (Upto 600#))  2 AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#), INDIA  3 AQUA VALVES PVT. LTD.  4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)  5 CHEMTECH INDUSTRIAL VALVES PVT. LTD.  6 CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25) INDIA  7 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  9 FLOW CONTROL	34		SPAIN
BALL VALVES (SOFT SEATED)  1 A V VALVES LIMITED (Upto 12" (Upto 600#))  2 AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),  3 AQUA VALVES PVT. LTD.  4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS material)  5 CHEMTECH INDUSTRIAL VALVES PVT. LTD.  6 CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)  7 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  9 FLOW CONTROL  INDIA	35	SUFA LIMITED	U.A.E.
1 A V VALVES LIMITED (Upto 12" (Upto 600#)) 2 AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#), 3 AQUA VALVES PVT. LTD. 4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS INDIA material) 5 CHEMTECH INDUSTRIAL VALVES PVT. LTD. 6 CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25) 7 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#)) 8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#) 9 FLOW CONTROL 1 INDIA	36	BEL VALVES	U.K.
AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),  AQUA VALVES PVT. LTD.  BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS INDIA material)  CHEMTECH INDUSTRIAL VALVES PVT. LTD.  CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)  DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  PLOW CONTROL  INDIA		BALL VALVES (SOFT SEATED)	
3 AQUA VALVES PVT. LTD. 4 BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS INDIA material) 5 CHEMTECH INDUSTRIAL VALVES PVT. LTD. 6 CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25) 7 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#)) 8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#) 9 FLOW CONTROL INDIA	1	A V VALVES LIMITED (Upto 12" (Upto 600#))	INDIA
BRIGHTECH VALVES & CONTROLS PVT. LTD. (4" x 150# for CS, AS & SS INDIA  5 CHEMTECH INDUSTRIAL VALVES PVT. LTD.  6 CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)  7 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  9 FLOW CONTROL  INDIA	2	AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),	INDIA
material)  CHEMTECH INDUSTRIAL VALVES PVT. LTD.  INDIA  CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)  DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  PLOW CONTROL  INDIA	3	AQUA 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	4	,	INDIA
7 DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))  8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  9 FLOW CONTROL  INDIA	5	CHEMTECH INDUSTRIAL VALVES PVT. LTD.	INDIA
8 FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)  9 FLOW CONTROL  INDIA	6	CRAWLEY & RAY (FOUNDER & ENGINEERS) PVT. LTD. (DN25)	INDIA
9 FLOW CONTROL INDIA	7	DELVAL FLOW CONTROLS PVT. LTD. (Upto 12" (Upto 900#))	INDIA
	8	FLOCON SYSTEMS PVT. LTD. (CS upto 6", 150#)	INDIA
10 FLOWCHEM INDUSTRIES ( UPTO 300# and upto 10") INDIA	9	FLOW CONTROL	INDIA
	10	FLOWCHEM INDUSTRIES ( UPTO 300# and upto 10")	INDIA



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#### INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED VENDOR LIST

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ए	INSTRUMENT AIR/PLANT AIR SYSTEM TALCHER FERTILIZERS LIMITED	PC183E/4016/SEC-VI/ PART-8	3.0	0	ig the
L	VENDOR LIST	DOCUMENT NO	R	EV	Tälcher
	VENDOR EIGT	SHEET 35 of 61	•		Fertiliz
	FLUIDTECH EQUIPMENT PVT. LTD( UPTO 4" (300#))		INI	DΙΑ	
	FORWARD ALLOYS AND CASTINGS (Upto 900#)		INI	DΙΑ	
	GURU INDUSTRIAL VALVES PVT. LTD. (Cast CS of 300#), 4" (Upto 900#) & Forged: Upto 2" (800#))	only: Upto 12" (Upto	INI	DIA	
	HAWA ENGINEERS LTD. (Upto 16" (150# & 300#), 900#))	Upto 12" (600# &	INI	DIA	
	INTERVALVE POONAWALLA LTD. (Forged: Upto 2" 12" (Upto 300#))	(800#), Cast: Upto	INI	DIA	
	JC VALVES & CONTROLS INDIA PVT. LTD. (CA: 600#),12" (900#, 1500#) & 10"(2500#))	ST UPTO 28" (upto	INI	DIA	
	KSB PUMPS LTD. (VALVES DIVN.) (CS upto 100DN, 2	(0 bar)	INI	DΙΑ	
	LEADER VALVES LTD. (Casting <=6" upto 600# & forg	ing <=2" upto 800#)	INI	DΙΑ	
	MEVADA ENGINEERING WORKS PVT. LTD., MUN (Forged), UPTO 14"(300#), Material: CS/AS/SS	IBAI (Upto 2"(800#),	INI	DIA	
	MICON ENGINEERS (HUBLI) PVT. LTD. (Cast: Upto Forged: Upto 2" (800#)	6" (150# & 300#) &	INI	DIA	
	MICROFINISH VALVES (P) LTD.		INI	DΙΑ	
	NEOSEAL ENGINEERING PVT. LTD (Upto 12" rating 8" upto 2500#)	upto 600# and Upto	INI	DIA	
	NSSL LTD. (Upto 12" (150# & 300#))		INI	DΙΑ	
	OSWAL INDUSTRIES LTD. (Upto 24" (150#, 300# & 60	00#))	INI	DΙΑ	
	SHALIMAR VALVES PVT. LTD. (Upto 18" (600#) Mater	ial: CS/AS/SS)	INI	DΙΑ	
	VIBA FLUID CONTROL (Upto 300#)		INI	ΟIA	
	VIRGO ENGINEERS LTD. (Upto 16" (upto 600#))		INI	DΙΑ	
	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. L (150# & 300#), 20" (600#), 16" (900#), 12" (1500#) (800#))		INE	DIA	
	YOMOY SANMAD LTD / EIGHED YOMOY)		INI	אור	



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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
	BALL VALVES (METAL SEATED)	
1	AIRA EURO AUTOMATION PVT. LTD. (Upto 6", Rating 150# & 300#),	INDIA
2	BRIGHTECH 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
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



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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
	BUTTERFLY VALVES	
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
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



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28	BHDT GMBH	AUSTRIA
29	VELAN INC. (Size upto 48"(Rating upto 600#)	CANADA
30	BOTELI VALVE GROUP CO. LTD. (Upto 36" (150# & 300#)	CHINA
31	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
32	GRISS SAPAG INDUSTRIAL VALVES	FRANCE
33	ADAMS ARMATUREN	GERMANY
34	GTC ITALIA, S.R.L.	ITALY
35	HAITIMA CORPORATION	TAIWAN
36	LEEDS VALVE LTD	U.K
37	WEIR VALVES & CONTROLS DIVISION.	U.K
38	CURTIS WRIGHT FLOW CONTROL CORPOARATION	U.S.A.
39	EMERSON PROCESS MGT	U.S.A.
40	LEAR SIEGLER MEAS. CTRLS. CORP	U.S.A.
41	SPX VALVES & CONTROLS (COPES-VULCAN LTD)	U.S.A.
42	TYCO INTERNATIONAL INC.,U.S.A.	U.S.A.
43	XOMOS (CRANE CO.)	U.S.A.
	BLOWDOWN VALVES	
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.
	SAMPLING VALVES/ NEEDLE VALVES	
1	ASSOCIATED TOOLINGS (I) PVT. LTD. (1/2" to 11/2", Rating: 800#)	INDIA
2	CHEMTECH INDUSTRIAL VALVES PVT LTD	INDIA
3	EXCELSIOR ENGG WORKS	INDIA
4	EXPERT ENGINEERING ENTERPRISES(UPTO 12"-150# & 300#)	INDIA
5	LEADER VALVES LIMITED(SIZE<=1 ½"-800#)	INDIA
6	TECNOMATIC (INDIA) PVT LTD.	INDIA
7	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (UPTO 50MM SIZE (upto 2500#))	INDIA
	PLUG VALVES (NON LUBRICATED)	
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
		INIDIA
4	BDK PROCESS CONTROL PVT LTD.	INDIA
5	CHEMTECH INDUSTRIAL VALVES PVT LTD	INDIA



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7 CRAWLE	DLS SAMIL (INDIA) PVT LTD (Upto 12"-150# & 300#))	INDIA
+		INDIA
	CH EQUIPMENT PVT. LTD. (Upto 4" (300#))	INDIA
	DUSTRIAL VALVES PVT. LTD. (Cast CS only: Upto 12" (Upto to 4" (Upto 900#)) & Forged: Upto 2" (800#))	INDIA
, ,	GINEERS LTD. (1/2" TO 8" (150#))	INDIA
11 JC VALVE	S & CONTROLS INDIA PVT. LTD. (Upto 12" (Upto 300#))	INDIA
12 LARSON	& TOUBRO LTD ( 1/2" TO 24")	INDIA
13 LEADER	/ALVES LIMITED (Upto 6" (Upto 300#))	INDIA
	( VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (UPTO 16"(150#), , 3" (600#))	INDIA
15 XOMOX S	ANMAR LIMITED (FISHER XOMOX)	INDIA
16 ZHEJIANO	G JIEHUA VALVE CO. LTD.	CHINA
17 O.M.S. SA	LERI DI SALERI P & FIGLI S.M.C.	ITALY
	ALVES, (AMPO S. COOP.) (UPTO 30" (UPTO 900#) FOR LIFT LVES ONLY.)	SPAIN
PLUG VA	LVES (LUBRICATED)	
1 A V VALV	ES LIMITED (Upto 20"-150# CS & SS)	INDIA
2 AUDCO II	IDIA LTD (L&T VALVES DIVISION)	INDIA
3 BDK PRO	CESS CONTROLS PVT. LTD	INDIA
4 ECONO V	ALVES PVT. LTD (<=8" (150 - 300#), <= 1 ½" (<=800#))	INDIA
5 FLUIDTE	CH EQUIPMENT PVT. LTD (Upto 4"-300#)	INDIA
	OUSTRIAL VALVES PVT. LTD (Cast CS only: Upto 12"-300#, 4" & Forged: upto 2"-800#)	INDIA
7 HAWA EN	GINEERS LTD. (1/2" TO 8" -150#)	INDIA
8 JC VALVE	S & CONTROLS INDIAN PVT. LTD (Upto 12"-300#)	INDIA
9 WEIR BDI	( VALVES (A UNIT OF WEIR INDIA PVT.LTD)Upto 8"-125#	INDIA
10 ZHEJIANO	S JIEHUA VALVES CO. LTD	CHINA
11 DELTA VA	ALVES EUROPE	ITALY
12 O.M.S SA	LERI DI SALERI P & FIGLI S.M.C	ITALY
13 BABCOCK	( BORSIG ESPANA, S.A	SPAIN
DIAPHRA	GM VALVES/RUBBER LINED CHECK VALVES	
1 A V VALV	ES LIMITED (Upto 12"-125#)	INDIA
2 AKAY INC	USTRIES PVT LTD	INDIA
3 BDK PRO	CESS CONTROLS PVT. LTD. (Upto 150#, 6 mm to 350mm)	INDIA
4 CHEMTE	CH INDUSTRIAL VALVES PVT. LTD	INDIA
5 CRAWLEY 200NB)	/ & RAY (FOUNDERS & ENGINEERS) PVT. LTD (25NB to	INDIA



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		Į.
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
	CAST IRON VALVES	
1	A V VALVES LTD. (Upto 48" (125#))	INDIA
2	CRAWLEY & RAY (F&E) PVT. LTD. (BUTTERFLY)	INDIA
3	FLUIDTECH EQUIPMENT PVT. LTD. (Upto 24" (PN 1.0 & PN 1.6))	INDIA
4	GEETA ENGINEERING WORKS	INDIA
5	KIRLOSKAR BROTHERS LIMITED ( Sluice, gate, butterfly valves PN1.0 & PN1.6)	INDIA
6	LEADER VALVES LTD. (size<=24" upto PN16 rating)	INDIA
7	S & M INDUSTRIAL VALVES LIMITED (ONLY GATE & GLOBE VALVES, 50mm-600mm, 125#)	INDIA
8	VENUS PUMPS & ENFINEERING WORKS (sluice<900mm, Diaphragm<300mm, stop<500mm)	INDIA
9	WEIR BDK VALVES (A UNIT OF WEIR INDIA PVT. LTD.) (Upto 12" (PN6))	INDIA
	PVC/CPVC VALVES	
1	ASTRAL POLYTECHNIK PVT. LTD (Size ½"-6", BUTTERFLY VALVE Upto 24")	INDIA
2	S & M INDUSTRIAL VALVES LTD. (32mm-80mm)	INDIA
	FLAT GASKETS/ RUBBER GASKET	
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



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18	UNIQUE INDUSTRIAL PACKINGS PVT. LTD.	INDIA
	SPIRALLY WOUND GASKETS	
1	GASKETS (INDIA) PVT. LTD	INDIA
2	GOODRICH GASKET PVT. LTD. (upto 24")	INDIA
3	IGP ENGINEERS LIMITED(10 TO 3550MM, 150#-2500# FOR EXCH GSKT)	INDIA
4	MADRAS INDUSTRIAL PRODUCTS(UPTO 52")	INDIA
5	NEOSEAL ENGINEERING PVT. LTD (Upto 84" 150#- AND 30" UPTO600#)	INDIA
6	PACKINGS & JOINTINGS PVT. LTD	INDIA
7	PERFECT MARKETING (P) LTD,	INDIA
8	PRASHANT ENGG STORES	INDIA
9	SPIRASEAL GASKETS PVT. LTD.(SS UPTO 12" & 150#)	INDIA
10	STARFLEX SEALING INDIA PVT. LTD.	INDIA
11	THE BENGAL MILL STORES SUPPLY CO. (TRADER)	INDIA
12	UNIQUE INDUSTRIAL PACKINGS PVT.LTD. (UPTO 42"(600#) & UPTO 24" (2500#))	INDIA
13	ZHEJIANG JIEHUA VALVE CO. LTD.	CHINA
	LENS GASKETS & RING JOINT (METALLIC)	
1	GASKETS (INDIA) PVT. LTD	INDIA
2	GOODRICH GASKET PVT. LTD. (0.5" to 24")	INDIA
3	IGP ENGINEERS LTD. (150# to 2500#)	INDIA
4	MADRAS INDUSTRIAL PRODUCT	INDIA
5	METROPOLITAN INDUSTRIES (3mm thk, 300#)	INDIA
6	NEOSEAL ENGINEERING PVT. LTD. (Upto 30", Upto 900# AND Upto 20"- upto 2500#)	INDIA
7	PACKINGS & JOINTINGS PVT. LTD.	INDIA
8	PRASHANT ENGG STORES	INDIA
9	SPIRASEAL GASKET PVT. LTD	INDIA
10	STARFLEX SEALING INDIA PVT. LTD	INDIA
11	UNIQUE INDUSTRIAL PACKINGS PVT. LTD (Ring Joint Gasket only, Upto 16"-1500#)	INDIA
12	BHDT GMBH	AUSTRIA
13	MANTOVANI SPA	ITALY
	EXPANSION JOINTS & BELLOWS	
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



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4	FLEXICAN BELLOWS & HOSES PVT. LTD	INDIA
5	FLUIDYNE ENGINEERS (I) PVT. LTD(METALLIC BELLOWS UPTO 800mm DIA)	INDIA
6	KELD ELLENTOFT INDIA PVT. LTD (For Fabric)	INDIA
7	LONESTAR INDUSTRIES	INDIA
8	MB METALLIC BELLOWS PVT. LTD	INDIA
9	PRASHANT ENGG. STORES	INDIA
10	STANDARD PRECISION BELLOWS	INDIA
11	TUBOFLEX	GERMANY
12	FLEXIDER S.P.A.	ITALY
	STRAINERS (PERMANENT INCLUDING Y-TYPE)	
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
11	ZOLOTO INDUSTRIES (15MM TO 100MM)	INDIA
12	BOTELI VALVE GROUP CO. LTD. (Y - TYPE ONLY: 14" (150#) & 3" (300# & 600#))	CHINA
	STEAM TRAPS	
1	GREAVES LTD.	INDIA
2	MOD FABRICATORS (for Drip Rings)	INDIA
3	PENNANT ENGINEERING PVT. LTD.	INDIA
4	VIRGO ENGINEERS LTD. (1/2" to 4" (upto 600#) (CS/SS))	INDIA
5	YARWAY CORPORATION	INDIA
6	ZOLOTO INDUSTRIES (15 mm to 25 mm)	INDIA
7	GESTRA AG	GERMANY
8	ARMSTRONG INTERNATIONAL INC.	U.S.A
9	OGONTZ CORPORATION	U.S.A
10	TYCO INTERNATIONAL INC.,U.S.A.	U.S.A
	SPRING SUPPORTS	



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_		l .
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
	FLAME ARRESTORS	
1	AIROIL FLAREGAS (INDIA) PVT. LIMITED	INDIA
2	EMFA INDUSTRIES	INDIA
3	M.H. VALVES PVT. LTD (1/2"-1.5" :800#, 2"-6" :600#)	INDIA
4	NIRMAL INDUSTRIAL CONTROLS PVT. LTD (1/2" TO 8", RATING:150#)	INDIA
5	PETROL SERVICE INDIA PVT. LTD.	INDIA
6	L & J TECHNOLOGIES	U.S.A.
	SPRAY NOZZLE ASSEMBLY	
1	CHEMTROLS SAMIL (INDIA) PVT. LTD.	INDIA
	FASTENERS	
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



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20	SUNDARAM FASTENERS LIMITED	INDIA	
21	UDHERA FASTENERS	INDIA	
	FIRE FIGHTING SYSTEM		
1	AGNICE FIRE PROTECTION LTD.	INDIA	
2	BHARTIYA CACCIALANZA FIRE SYSTEMS LTD	INDIA	
3	BLUE STAR LTD.	INDIA	
4	DE'S TECHNICO	INDIA	
5	DE'S TECHNICO PVT. LTD.	INDIA	
6	FUTECH CONSULTANTS PVT. LTD.	INDIA	
7	GENERAL MECHANICAL WORKS	INDIA	
8	HD FIRE PROTECTION COMPANY	INDIA	
9	LAL ENTERPRISES	INDIA	
10	MATHER & PLATT (INDIA) LTD. (A Subsidiary of WILO SE German)	INDIA	
11	MX SYSTEMS INTERNATIONAL PVT. LTD.	INDIA	
12	NEWFIRE ENGINEERS SERVICES	INDIA	
13	PRAGATI ENGG. (PVT.) LTD.	INDIA	
14	PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA	
15	RADIANT FIRE PROTECTION ENGINEERS	INDIA	
16	STEELAGE INDUSTRIES LTD.	INDIA	
17	TECHNOFAB ENGG.	INDIA	
18	TRI-PARULEX FIRE PROTECTION SYSTEMS	INDIA	
19	UNITECH MACHINES LTD	INDIA	
20	VIJAY FIRE PROTECTION SYSTEM LTD.	INDIA	
	HOSE PIPE (METALLIC) & CAM LOCK COUPLING		
1	AEROFLEX INDUSTRIES LIMITED (Size 6mm to 250mm dia. (SS Corrg. Flex. Hose with Braid, Braid & Assembly)	INDIA	
2	CHHATARIA RUBBER CHEMICALS INDUSTRIES	INDIA	
3	D. WREN & CO.	INDIA	
4	FLEXATHERM EXPANLLOW PVT. LTD. (1/2" to 6")	INDIA	
5	GAYATRI INDUSTRIES	INDIA	
6	GAYATRI INDUSTRIAL CORPORATION (UPTO 6" ID)	INDIA	
7	HELIFEX HYDRAULICS & ENGG CO. LTD.	INDIA	
8	SENIOR INDIA PVT. LTD.	INDIA	
	HOSE PIPE (NON-METALLIC) & CAM LOCK COUPLING		
1	CHHATARIA RUBBER CHEMICALS INDUSTRIES	INDIA	
2	D. WREN & CO.	INDIA	
3	GAYATRI INDUSTRIES	INDIA	



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GAYATRI INDUSTRIAL CORPORATION (UPTO 8" ID)	INDIA
HELIFEX HYDRAULICS & ENGG CO. LTD.	INDIA
PADMINI INDUSTRIES LIMITED	INDIA
PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
SENIOR INDIA PVT. LTD.	INDIA
FIRE WATER PUMPS	
BEST & CROMPTON ENGG. CO.	INDIA
GREAVES COTTON & CO. LTD.	INDIA
JAYANT ENGINEERING & MARKETING (P) LTD.	INDIA
KIRLOSKAR BROTHERS LIMITED	INDIA
MATHER & PLATT INDIA LTD. (A Subsidiary of WILO SE German)	INDIA
PORTABLE FIRE EXTINGUISHERS & FIRE FIGHTING CHEMICALS	
CEASEFIRE INDUSTRIES LTD	INDIA
PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
UNITECH MACHINES LTD.	INDIA
ZENITH FIRE SEVICES INDIA PVT. LTD	INDIA
SMOKE / GAS DETECTOR	
CEASEFIRE INDUSTRIES LTD	INDIA
PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
UNITECH MACHINES LTD.	INDIA
ZENITH FIRE SEVICES INDIA PVT. LTD	INDIA
FIRE FIGHTING EQUIPMENTS	
DE'S TECHNICO PVT. LTD. (Deluge Valve and Sprinklers only.)	INDIA
HD FIRE PROTECT PVT. LTD.	INDIA
PYROTEK INDUSTRIES (INDIA) PVT. LTD.	INDIA
VENUS PUMP & ENGG. WORKS	INDIA
WINCO VALVES PVT. LTD. (Equipments for Fire Hydrant System)	INDIA
ZENITH FIRE SEVICES INDIA PVT. LTD	INDIA
MARINE LOADING ARM	
LLOYDS STEELS INDUSTRIES LIMITED (8" TO 20")	INDIA
TRUCK/WAGON LOADING ARM	
LLOYDS STEELS INDUSTRIES LIMITED (2" TO 4")	INDIA
WOODFIELD SYSTEMS INTERNATIONAL PVT LTD (upto SIZE: CORE-4"/ JACKET-6")	INDIA
	HELIFEX HYDRAULICS & ENGG CO. LTD.  PADMINI INDUSTRIES LIMITED  PYROTEK INDUSTRIES (INDIA) PVT. LTD.  SENIOR INDIA PVT. LTD.  FIRE WATER PUMPS  BEST & CROMPTON ENGG. CO.  GREAVES COTTON & CO. LTD.  JAYANT ENGINEERING & MARKETING (P) LTD.  KIRLOSKAR BROTHERS LIMITED  MATHER & PLATT INDIA LTD. (A Subsidiary of WILO SE German)  PORTABLE FIRE EXTINGUISHERS & FIRE FIGHTING CHEMICALS  CEASEFIRE INDUSTRIES LTD  PYROTEK INDUSTRIES (INDIA) PVT. LTD.  UNITECH MACHINES LTD.  ZENITH FIRE SEVICES INDIA PVT. LTD  SMOKE / GAS DETECTOR  CEASEFIRE INDUSTRIES (INDIA) PVT. LTD.  UNITECH MACHINES LTD.  ZENITH FIRE SEVICES INDIA PVT. LTD.  UNITECH MACHINES LTD.  ZENITH FIRE SEVICES INDIA PVT. LTD.  JENITH FIRE SEVICES INDIA PVT. LTD.  PYROTEK INDUSTRIES (INDIA) PVT. LTD.  FIRE FIGHTING EQUIPMENTS  DE'S TECHNICO PVT. LTD. (Deluge Valve and Sprinklers only.)  HD FIRE PROTECT PVT. LTD.  PYROTEK INDUSTRIES (INDIA) PVT. LTD.  VENUS PUMP & ENGG. WORKS  WINCO VALVES PVT. LTD. (Equipments for Fire Hydrant System)  ZENITH FIRE SEVICES INDIA PVT. LTD  MARINE LOADING ARM  LLOYDS STEELS INDUSTRIES LIMITED (8" TO 20")  TRUCK/WAGON LOADING ARM  LLOYDS STEELS INDUSTRIES LIMITED (2" TO 4")  WOODFIELD SYSTEMS INTERNATIONAL PVT LTD

NOTE(Piping vendor list):

1. Make of the items not indicated and any other make for the specified item shall be subject to owner's / consultant's approval.



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- 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.

#### **INSTRUMENTATION:**

SI.No	Vendor's Name	Country
SODIUM ANA	LYSER	
1.	ABB	
2.	HACH	
3	THERMOFISHER	
4	WALTRON	
5	AWA	
6	METTLER TOLEDO	
CHLORINE AI	NALYSER	
1.	ABB	INDIA
2.	HACH	FRANCE
3.	KROHNE	U.K
4	E&H	
5	WALTRON	
6	THERMOFISHER	
MOISTURE A	NALYSERS	
1.	GE PANAMETRICS	ITALY
2.	AMETEK INC	U.S.A
3.	Chemtrols Industries Limited	India
TURBIDITY A	NALYSERS	
1.	HACH	
2.	YOKOGAWA	JAPAN
SDI ANALYSE	ERS	
1.	RODI	USA
pH, conductiv	ity & ORP Analyser	
1.	ABB India Limited	India
2.	BELA INSTRUMENTS (For Knick, GmbH make), Mumbai(For	India
	ConductivityAnalyser )	
3	Chemtrols Industries Limited	India
4	Emerson Process Management (I) Pvt. Ltd	India
5	Endress+ Hauser (India) pvt. Ltd. (Liquid Analyser)	India
6	Forbes polymetron Pvt. Ltd.	India
7	POTENCE CONTROLS (for GLI International make), Mumbai.(For	India
	ConductivityAnalyser)	
8	Yokogawa India Ltd.	India



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9	Emerson Process Mgt Singapore Ltd.	Singapore
10	Foxbro Far East PTE Ltd.	Singapore
11	Hach Company	U.S.A
12	Yokogawa Electric Corporation	Japan
13	Zellweger SA	France
Gas & Fire De	tection System	
1.	Andrew Yule & Company Ltd. (Fire)	India
2.	Chemtrols Industries Limited	India
3.	Honeywell Automation India Limited (Gas)	India
4.	J B Boda And Brothers Pvt. Ltd. (Gas Make-International Sensor Technology)	India
5.	Pollution Protection System Mumbai Pvt Ltd (Gas)	India
6.	General Monitors (Gas)	U.K
7	Teledyne Fluid Systems (Gas)	Thailand
FIRE ALARM		
1	HONEYWELL	INDIA
2	SIEMENS	INDIA
PC / SERVERS		•
1.	DELL	India
Flow Element	: Orifice/ Venturi/ Flow Nozzle	•
1.	Baliga Lighting (only Orifice)	India
2.	Chemtrol Industries Ltd.	India
3.	Delta Engineering, Pune	India
4.	Eureka Industrial Equipments Pvt. Ltd.	India
5	FORBES MARSHALL	India
6	Flowtech Instruments (Orifice/Venturi)	India
7	General Instruments Consortium	India
8.	Instrumentation Ltd.	India
9.	Micro Precision Products Private Ltd.	India
10.	Micro India Flow Elements Pvt. Ltd.	India
11	Minco(India) Flow Instruments Pvt. Ltd.	India
12	Unicontrols Instrument Pvt. Ltd.	India
13	Bopp & Reuther Messtechnik GMBH	Geramny
14	Daniel Measurement & Control	USA
15	ISA Controls Limited	U.K
16	Technomatic SPA	Italy
Pitot Tube/ Ar	ınubar	<u> </u>
1.	ABB India Limited	India
2.	Control Engineers	India
3.	Emerson Process Management (I) Pvt. Ltd.	India
4	Micro Precision Products Private Ltd.	India
5.	Unicontrols Instruments Pvt. Ltd.	India
6.	Daniel Measurement & Control	U.S.A
7.	ISA Controls Limited	U.K
8	Technomatic Spa	Italy
Rotameters	-1	1 ** 1
1.	ABB india Ltd.	India
2.	Chemtrols Industries Ltd.	India
3.	Delta Control	India
4.	Eureka Industrial Equipments Pvt. Ltd.	India
5	Flowtech Instruments services	India
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6.	Instrumentation Engineers Pvt. Ltd.	India
7.	Krohne Marshall Pvt. Ltd.	India
8.	Placka Instruments & Controls Pvt. Ltd. (Purge Rotameter Only)	India
9.	Rota Instrumentation	India
10	Yokogawa	India
11	Rota Yokogawa Gmbh& Co. Kg	Germany
12	Tokyo Keiso Co.Ltd.	Japan
13	Azbil Corporation	Japan
14	Emerson Process Mgt	U.S.A
15	Krohne	Germany
Mass Flov	v Meter (Coriolis Type)	
1.	ABB India Limited	India
2	Chemtrol Industries Ltd	India
3.	Emerson Process Management (I) Pvt. Ltd.	India
5	Endress + Hauser	India
6.	SIEMENS Ltd.	India
7.	Yokogawa	India
8.	Bopp & Reuther Messtechik GMBH	Germany
7	Krohne	Germany
8	Schlumberger resource management Ltd.	U.S.A
Turbine F	lowmeter	
1.	ABB India Ltd.	India
2.	Chemtrol Industries Ltd	India
3.	Krohne	India
4.	Yokogawa	India
5.	Azbil Corporation	Japan
6.	Bopp & Reuther Messtechnik Gmbh	Germany
7.	Barton Instrument System Ltd.	U.K.
8.	Emerson Process Mgt	U.K.
9.	Emerson Process Mgt.	U.S.A
10.	Instromet International N.V.	Holland
11.	Itochu Corporation	Japan
12.	Oval Asea Pacific Pte Ltd.	Singapore
13.	Rockwell International Corporation	U.S.A
Vortex me	ster	
1.	ABB India Ltd.	India
2.	Emerson Process Management (I) Pvt. Ltd.	India
3.	Krohne Marshall Pvt. Ltd.	India
4	Siemens Ltd.	India
5.	Yokogawa Limited	India
6	Bopp & Reuther MesstechnikGmbh	Germany
7.	Endress + Hauser	Germany
8	Itochu Corporation	Japan
9.	Krohne	Germany
10.	Schlumberger resource management Ltd.	U.S.A
PD Meter	· · · · · · · · · · · · · · · · · · ·	•
1.	Chemtrols Industries Ltd.	India
2.	Rock Flow Meters (i) Pvt. Ltd.	India
3.	Bopp & Reuther MesstechnikGmbh	Germany
4.	Emerson Process Managment	U.S.A



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		1 -
5.	Oval Asea Pacific Pte Ltd.	Singapore
6.	Schlumberger resource management Ltd.	U.S.A
Magnetic Fl		
1.	ABB India Ltd.	India
2.	Chemtrol Industries Ltd	India
3.	Emerson Process Management (I) Pvt. Ltd.	India
4.	Endress + Hauser (India) Pvt. Ltd.	India
5.	Krohne Marshall Pvt. Ltd.	India
6	Siemens Ltd.	India
7	SBEM Pvt. Ltd.	India
8	Yokogawa	India
9.	Azbil Corporation	Japan
10.	Bopp & Reuther MesstechnikGmbh	Germany
11	Krohne	Germany
Ultrasonic I	Flow Meter	
1	Chemtrol Industries Ltd	India
2.	Endress + Hauser (India) Pvt. Ltd.	India
3.	Emerson Process Management	India
4	Siemens Ltd.	India
5	Yokogawa	india
Orifice Mete	er	<u> </u>
1	Chemtrol Industries Ltd	India
Pressure G	auges	<u> </u>
1.	Ashcroft India(P) Ltd. (standard normal type)	India
2.	A.N. Instruments Pvt. Ltd.	India
3.	Baumer Technologies India Pvt . Ltd	India
4.	Forbes Marshall	India
5.	General Instruments Consortium,	India
6.	H.Guru Industries	India
7.	Peejee Engg. Works	India
8.	Precision Industries Ltd. (standard normal type)	India
9.	Premium Instrument & Controls Ltd.	India
10.	Manometer (India) Pvt. Ltd.	India
11.	Walchand Nagar Industries Ltd.	India
12.	Wika	India
13.	Budenberg Gauge Co. Ltd	U.K
14.	Dresser Europe S.A	Germany
15.	Nagano keiki Seisakusho	Japan
16.	Rueger Sa	Switzerland
17	Spriano Spa	Italy
18	WikaAlexenderWiegardGmbh& Co.	Germany
Local D/P Ir	•	, 30
1.	Precision Mass Products Pvt. Ltd	India
2.	Switzer Instrument Co.	India
3	Wika	India
4	Barton Instrument Systems Limited	U.K
5	Delta Controls Ltd.	U.K
	D/P Transmitters	0.10
1.	ABB India Ltd.	India
2.	Emerson Process Management (I) Pvt. Ltd.	India
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3.	Endress + Hauser (India) Pvt.Ltd.	India
4.	Honeywell Automation India Limited	India
5	Siemens Ltd.	India
6.	Yokogawa Limited	India
7.	Azbil Corporation	Japan
8.	Emerson Process Mgt Singapore Ltd	Singapore
9.	Honeywell Inc.	U.S.A
10	Moore Products Company	U.S.A
11	Siemens Ag, Germany	Germany
12	Smar Singapore Pte. Ltd.	Singapore
13	VEGA Grieshaber KG	Germany
14	Yokogawa Electric Corporation	Japan
Transpare	nt/ Reflex / Bicolor Mag.Level Gauges	, ,
1.	ABB India Ltd.	India
2.	Bliss Anand Private Ltd.	India
3.	Chemtrols Samil(India) Pvt Ltd.	India
4.	Flowtech Instruments services	India
5.	LEVCON INSTRUMENTS PVT. LTD.	INDIA
6	Nisan Scientific Process Equipments Pvt. Ltd	India
7.	Pune Techtrol Pvt. Ltd. (=<300#)	India
8	Technomatic (India) Pvt. Ltd.	India
9.	V-Automat Instruments Pvt. Ltd. (upto 300#)	India
10	Clark-Reliance Corp.	U.S.A
11	CesareBonetti	Italy
12	Jerugson Gauge & Valve Co.	U.S.A
13	Nihon Klingage Co. Ltd.	Japan
14	Richard Klinger Ag	Austria
15	Technomatic Spa	Italy
	ches (Float & Displacer Type)	1
1.	ABB India Ltd.	India
2.	Bliss Anand Private Ltd.	India
3.	Chemtrols Samil(India) Pvt Ltd.	India
4.	Pune Techtrol Pvt. Ltd.	India
5.	SBEM Pvt. Ltd.	India
6.	Siemens Ltd.	India
7.	V.Automat & Instruments (P) Ltd.	India
8.	ISA Controls Limited	U.K.
9	KDG. MOBREY Ltd.	U.K.
10	Magnetrol International N.V	Belgium
11	SOR Inc.	U.S.A
12.	Vega Grieshaber KG	Germany
	Type Level Transmitters	1
1.	Chemtrols Industries Limited (Eckdart Make Electronics)	India
2.	Dresser Valve India Pvt Ltd (Rating <= 600#)	India
3.	Dresser Masoneilan	France
4.	Foxboro EckardtGmbh	Germany
5.	Magnetrol International N.V. (Lvdt)	Belgium
6.	Parcol Spa (Pneumatic Transmission Only)	Italy
	I Instruments	1)
1.	ABB India Limited	India



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1.	2.	Emerson Process Management (i) Pvt. Ltd.	India
5.         SBEM Pvt. Ltd.         India           6         ErrafSingaporePte. Ltd.         Singapore           7.         Endress + Hauser Gmbh& Co., (Non-Contact & Servo)         Germany           8.         Krohne (Non-Contact Type)         Germany           9.         L & J Technologies         U.S.A           10.         Toyo Keiso Co. Ltd.         Japan           Ultrasonic Level Transmitter           1.         Forbes Marshell         India           2.         Siemens Ltd.         India           3.         Vega Grieshaber KG         Germany           1.         Endress + Hauser ( India) Pvt. Ltd         India           2.         Forbes Marshell         India           3.         Magnetrol         India           4.         Vega Grieshaber KG         Germany           Temperature Elements (Thermocouple, Rtd)         India           1.         Altop Industries Ltd.         India           2.         ABB India Ltd.         India           3.         Detriv Instrumentation & Electronics Ltd.         India           4.         Electrical & Electronics Ltd.         India           5.         Eleind Engineering Pvt. Ltd.         India	3.		India
5.         SBEM Pvt. Ltd.         India           6         ErrafSingaporePte. Ltd.         Singapore           7.         Endress + Hauser Gmbh& Co., (Non-Contact & Servo)         Germany           8.         Krohne (Non-Contact Type)         Germany           9.         L & J Technologies         U.S.A           10.         Toyo Keiso Co. Ltd.         Japan           Ultrasonic Level Transmitter           1.         Forbes Marshell         India           2.         Siemens Ltd.         India           3.         Vega Grieshaber KG         Germany           1.         Endress + Hauser ( India) Pvt. Ltd         India           2.         Forbes Marshell         India           3.         Magnetrol         India           4.         Vega Grieshaber KG         Germany           Temperature Elements (Thermocouple, Rtd)         India           1.         Altop Industries Ltd.         India           2.         ABB India Ltd.         India           3.         Detriv Instrumentation & Electronics Ltd.         India           4.         Electrical & Electronics Ltd.         India           5.         Eleind Engineering Pvt. Ltd.         India	4.	Siemens Ltd. (Radar level Transmitter, guided wave Radar)	India
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8 Precision Mass Products Pvt. Ltd. India 9 Nagano Keiki Seisakusho Japan			
9 Nagano Keiki Seisakusho Japan			
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Technomatic SPA 11 Italy Trend Instrument Inc. U.S.A Dial Thermometer (Hg In Steel/Glass) A N Instruments Pvt. Ltd. India 1. 2. Ashcroft India(P) Ltd. India 3. Baumer Technologies India Pvt. Ltd. India 4. General Instruments Consortium, India Goa Instruments Industries Ltd 5. India H.Guru Industries 6. India Precision Mass Products Pvt. Ltd 7. India 8. Pejee Engg Works India Walchand Nagar Industries Ltd. India **Radiation Pyrometer** Tempsens Instruments Pvt. Ltd. India 1. C.C.R Technico 2. Italy 3. Chino Corpn. Japan 4. Land Infrared U.K. 5. Siemens AG Germany Wahal Instruments U.S.A **Temperature Transmitters ABB India Limited** India 1. 2. **Emerson Process** India 3. Endress+ Hauser (India) Pvt. Ltd. India 4. Siemens Ltd. India Yokogawa 5 India Gate/Plug Valves Audco India Limited(L&T Valves Divn.) India 2. BHEL(Valves Division) India 3. Chemtrols Engineering Limited (Plug Valves) India Flowserve India Control Pvt. Ltd.(Plug Valve upto 12"300# upto 6" 600#) 4. India 5. Ksb Pumps Limited (Valves Divn) India NU Tech Controls (MOV Gate :1/2" to 8" 2500#, 10" to 14",300#) 6 India 7. Samsons Contols Pvt. Ltd. (Upto 34", 300#) India Valve Tech Industries (Mov -8" upto 2500#) 8. India 9. Velan Inc. Canada 10 Weir Bdk Vlaves India 11 **Bel Valves** Japan 12 CesareBonetti Italy 13 Fasani S.P.A Italy 14 MalbranqueS.A. France Matsura H. P Machine works co. Ltd. 15 Japan 16 Petrol Valves S.R.L Italy Globe / Angle Valves AST S.P.A (Upto 8"900#) India 2 Chemtrol Industries Ltd. India Circor Flow Technologies India Pvt. Ltd. 3 India 4 Dresser Valve India Pvt. Ltd.(Rating =<600#,size 3/4" to 6") India Emerson Process Management India Ltd India Emet Controls Pvt. Ltd.(Globe Valve up to 4",300# angle valve upto 1-5 India 1/2",2500#)



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6	Flowserve india control pvt. Ltd. ( globe valve upto 30" 600# upto 24" 900#, upto 16" 2500# upto 4" 4500# )	
7	Koso fluids controls pvt. Ltd. ( globe valves: upto 8" 2500# 10 to 18" 300# angle	
8	Instrumentation Ltd. (Palakkad)	India
9.	Mil Controls Limited	India
10.	NU Tech Controls	India
11	Pneucon valves Pvt. Ltd. (upto 6" 300#) noncritical)	India
12	Samson Control Pvt Ltd(upto 6" &=<600#) India	
13	Tecnik valves pvt Ltd. (air & water service upto 4" 150#)	
14	Valve-Tech Inducstries (non-critical)	India
15	Azbil Corporation (=< 2500#)	Japan
16	Arca Regler GMBH	Germany
17	Dresser Masoneilan	France
18	Flowserve (=<2500#)	U.S.A
19.	Fisher Xomox (=< 2500#)	Singapore
20.	Parcol Spa	Italy
21	Nippon Fisher Co. Ltd. (=<2500#)	Japan
22	Severn Glocon (1 to 12" 600#)	U.K.
Ball Valves		_
1.	Tyco Valves & Controls (I) Ltd (=< 150 #)	India
2.	Virgo Engineers Ltd. (=<600# With Maccair Actuators)	India
3.	Anand teknow aids engineering india limited (upto 6",600# (ON-OFF)	India
4.	Bray Controls India Pvt. Ltd.(upto 4",300#)	India
5.	Emerson	India
6	EMET controls pvt. Ltd.(upto 8",150# for air service)	India
7	Fisher Xomox Sanmar	India
8	Flowserve India controls Pvt. Ltd. ( upto 16" 600# )	India
9	Intervalve ponnawalla limited (uptp 10",150#)	India
10	Koso Fluid Controls pvt. Ltd. ( upto 8 " ,2500# ,10" to 18" 900# )	India
11	NU Tech Controls (14",600# for non-critical purpose)	India
12	Pentair Valves and controls India Pvt. Ltd. (<=150#)	India
13	Pneucon valves pvt. Ltd. (upto 6",150# non-critical)	India
14	Samson Control Pvt Ltd(upto 24" &=<1500#)	India
15	Valve tech industries ltd. (18",150# non critical)	India
16	Weir Bdk Vlaves (upto 16",150#)	India
17	G.T.C. Italia S.R.L(=<300#)	Italy
18	Metso Automation (=<2500#)	Singapore
19	Orbit Valves PLC (=<2500#)	Singapore
20	Petrol Valves S.R.L	Italy
21	PERRIN Gmbh (size ½" to 12",& rating 150# to 2500#,size 14"to 18", rating 150#	Germany
· · ·	to 1500#, size 20"to 24" rating 150# & 300#)	
22	Pibiviesse S.P.A. (Rating Upto 2500 #)	Italy
23	Rotex manufacturers & Engineers Pvt. Ltd. (upto 6" 600#, 6" to 10" 150#)	India
24	Velan Inc. (ball valves on/off size: ¼" to 6" (rating upto 2500#) size 8"to 16" (rating upto 900#) size 18" to 30 " (rating upto 300#)	Canada
Butterfly Val		
טעננפוווא val	Advance valves pvt. Ltd.(size 2"to 24" upto 600#)	India
2	Bray controls india pvt. Ltd. (upto 300#)	India
3	Dresser Masonelian Valves	
J	טובספו ועומסטוופוומוו עמועפס	India



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4	Emet controls pvt. Ltd. (upto 4",900#, 6",150# to 16",150# double eccentric)	India
5	Flowserve india control pvt. Ltd. ( upto 30",300# upto 12" 600#)	India
6	Fisher	India
7	Intervalve ponnawaala ltd. (2" to 48",150#)	India
8	Instrumentation Ltd. (Palakkad) (=< 300#) India	
9	Koso fluid controls (pvt.) ltd. (=< 150#)	
10	Nu tech controls (16",300# for non-critical services ) India	
11.	Pneucon valves pvt. Ltd. (upto 8",150# non critical )	
12.	Samson controls pvt. Ltd. India	
13	Tyco Valves & Controls (I) Ltd (=< 150 #)	India
14	Valve tech industries ( non-critical services)	India
15	Virgo Engineers Ltd. (=<300#)	India
16	Weird BDK valves (upto 16",300#0	India
17	Bray Controls(=<300#)	U.S.A
18	Keystone (Upto 2500#)	Singapore
19	Leeds valve ltd.	UK
20	Korea Unicom Valve Co. Ltd.	Korea
21	Parcol Spa (=< 2500# Urea Service Also)	Italy
22	Pentair Valves and controls India Pvt. Ltd. (<=150#)	,
23	Metso Automation (Upto 2500#)	Singapore
24	Orton S.r.I. (upto 2500#)	0 1
PRDS & SPRAY	NOZZLE, VENT VALVEŚ upto 2500#	
1.	ARCA (Forbes Marshal) (Mech. Spray nozzle type desuperheater only)	India
2.	Chemtrols Industries Ltd. (PRDS Combine &Split)	India
3.	Circor Flow Technolgies India Pvt. Ltd. (1" to 20",upto 150#, 1 to 10" upto 1500#,	India
	1"to 8",upto 2500#)	
4	Control components INC	India
5	FisherControls	India
6.	Samson Controls Pvt. Ltd. (upto 6",150#)	India
7.	CCI Valve Technology AB	Sweden
8	SPX Valves & Controls (COPES-VULCAN LTD.)	U.S.A
Electric Actuato	r	
1.	Cair euromatic Automation Pvt. Ltd. (non-critical)	India
2.	Marsh Automation (for safe area)	India
3.	Biffi Italia S.R.L	Italy
4.	Limitorque, U.S.A	U.S.A
5.	Rotork Control (Deutschland) Gmbh	Germany
Air Filter cum Pi	ressure Regulator	
1.	ABB India Limited	India
2.	Divya Control Elements Pvt. Ltd.	India
3.	Dresser	India
4.	Emerson Process Managenment	india
5.	Mil Controls Limited	India
6.	Placka Instruments & Controls Pvt. Ltd.	India
7.	Shavo Norgren(India) Pvt Ltd.	India
8.	Schrader Duncan Ltd. (1/4" to 2" port size)	India
Valve Actuator (	Pneumatic/Rotary)	
1.	Bray Control India Pvt. Ltd.	India
2.	EL-O-Matic India Pvt. Ltd.	India
3	Rotex Manufacturers & Engineers Pvt Ltd	India



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4	Schrader Ducan Ltd.	India
Self actuated pro	essure control valve	
1	FisherControls India	
2	Nirmal Industrial controls private limited ( size ½" to 6 " & rating : < =300#)	India
3	Nu tech Controls (upto 10",600#)	India
4	Pneucon Valves Pvt.Ltd. (upto 4",150#)	India
5	Samsons Controls Pvt. Ltd. (upto 2",150#)	India
Electropneumat	ic Positioner	
1.	FisherControls	India
2	Siemens Ltd.	India
Desuperheaters		
1.		
	multinozzle 3" to 4",upto 2500#)	
2.	Chemtrols	India
3	CCI	India
4	EMET Controls Pvt. Ltd.(Desuperheating Control Valves 1-1/2", 600# * 3",2500#)	India
5	Fisher	India
6	Тусо	India
Safety Valves &	Thermal Relief Valves Upto 2500#	
1.	AST S.P.A	India
2.	Bliss anand private limited (8" * 10" 300#, 6" * 8 " 600# ,4 * 6" 1500#)	India
3.	FaingerLeser Valves (P) Ltd. (Upto 600#, ½" To 6")	India
4.	Instrumentation Ltd. (Palakkad)	India
5.	Keystone	India
6	Pentair Sanmar Ltd.	India
7	Nu tech controls (upto 2",300# * 3",150#)	India
8	Valve Tech Industries	India
9	Weir Bdk Valves	India
10	BOPP & Reuther Messtechnic GMBH	Germany
11	Crossby valve & Engg. Company Ltd.	U.K
12	Dresser Industries Incorporated	U.S.A
13	Dresser Valve & Controls	Canada
14	Farris	U.K
15	Itochu Corporation	Japan
16	Parcol Spa (For Urea Service Also)	Italy
17	Sapag Gec Alsthom	France
18	Tai Milano S.P.A	Italy
19	Teledyne Fluid Systems	Thailand
Vaccum Breaker		
1.	Fainger Engineering	India
2.	Potego India Pvt. Ltd.	India
3.	Braunschweiger Flammenfilter	
4.	Itochu Corporation	Japan
5.	Parcol Spa	Italy
6.	Safety Systems UK Ltd.	U.K
7.	Tai Milano S.P.A	Italy
8.	Whessoe Varec Limited	U.K
Rupture Discs		
1.	Bs&B Safety Systems (India) Limited	India
2.	Fainger Engineering	India



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3.	Tyco Sanmar	India
4.	Continental Controls Inc.	U.S.A
5.	Fike Europe	Belgium
6.	Sapag GEC Alsthom	France
7.	Teledyne Fluid Systems	Thailand
Pilot relief va	alves	
1.	AST S.P.A (inlet size upto 3", upto 1500#, outlet size upto 4", upto 300#,inlet size upto 4",upto 300# ,inlet size upto 6", upto 150#,outlet size upto 8", upto 150#)	
2.	Bliss Anand Private Limited (Size 1"* 2" 2500#)	India
Low pressure	e relief valve	
1.	Protego India Pvt. Ltd. (less than 1 BAR with flame arrestor)	India
Flame arresto	or	
1.	Protego India Pvt. Ltd	India
Control Pane		
1.	Electronics corporation of india ltd.	India
2.	Ex protecta	India
3.	Hulasi metals pvt. Ltd.	India
4.	Industrial control appliances (p) ltd.	India
5.	Jaisun & hutchisun control ltd.	India
6.	Prima automation (india) pvt. Ltd.	India
7.	Pyrotech electronics pvt. Ltd.	India
8	Tan swa technologies INC	India
9	United electric co (delhi ) pvt. Ltd,	India
10	Yokogawa india limited	India
11	Instromet international N.V.	Holland
Programable	Logic Controller- Package	
1.	ABB India Limited	India
2.	Emerson Process Management (I) Pvt. Ltd.	India
3.	Ge Fanuc Systems Prvitate Limited	India
4.	Honeywell Automation India Limited	India
5.	Rockwell Automation India Ltd.	India
6	Siemens Ltd.,	India
7.	Yokogawa	India
8	GE fanuc automation north America INC (fault tolerant TMR)	U.S.A
9	Hima paul Hiildebrandt Gmbh +Co KG (fail safe )	Germany
10	Marconi italiana (non fail safe )	Italy
11.	Omron corporation (Relay)	Japan
12	RTP Control system	U.S.A /India
13	Triconex (fault tolerant TMR)	Singapore
14	Triconex ( Schenider)	Singapore
Distributed C	Control System	
1.	ABB India Limited	India
2.	Emerson process management India Pvt. ltd.	India
3.	Foxboro	India/Intl.
4.	Honeywell Automation India Limited	India
5.	Siemens Ltd.	India
6	Yokogawa Limited	India
7	Bailey controls company	U.S.A
8	Emerson process management Singapore ltd.	Singapore



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9	Honeywell Inc.	U.S.A
10	Invensys	Holland
11	Siemens AG	Germany
12	Yokogawa Electric Corporation	Japan
Alarm Annuncia		1
1.	Industrial Instruments & Controls	India
2.	Shree Electronics	India
3.	M.T.L., U.K.	U.K
4.	Rochester Instrument Systems Ltd.	U.K
5.	Riley Panalarm	U.S.A
6.	Ronan Engg. Co.	U.S.A
Temperature Sc		
1.	Industrial Instrumentation	India
2.	Protocontrol Instruments (I) Pvt. Ltd.	India
Cctv / Access S		
1.	Honeywell Automation India Limited	India
2.	Yokogawa Limited	India
Surge Protectio		maia
1.	Phoenix Contact (India) Pvt. Ltd.	India
Wiring Ducts		
1.	Trinity touch Pvt.Ltd.	India
DIN Rail	,,	
1.	Trinity touch Pvt.Ltd.	India
Interface Modul		
1.	Trinity touch Pvt.Ltd.	India
Cable connecto		l
1.	Phoenix contact (India) Pvt. Ltd.	India
Burner Manage	ment System	<u>.</u>
1.	Siemens (TMR/QMR)	India
2.	Triconex (TMR/QMR)	U.S.A
3.	Honeywell (TMR/QMR)	Japan
4.	Yokogawa (TMR/QMR)	Japan
5.	Rockwell Automation Pvt. Ltd. (TMR/QMR)	Germany
Instrument Pow	er & Control Cables	
1.	Associated Cables Ltd.	India
2.	Associated Flexibles & Wires Pvt. Ltd.	India
3.	Cords Cable Industries Ltd.	India
4.	Delton Cables Ltd	India
5.	Insucon Cables & Conductors (P) Ltd. (For Smaller Non-Critical Projects)	India
6.	J K Cables Limited	India
7.	Kei Industries Limited	India
8.	Leoni cable solutions	India
9.	Paramount Cable Corporation	India
10.	T C Communications Pvt Ltd	India
11.	Thermo Cables Limited	India
12.	Toshniwal Cables	India
13	Udey Pyro Cables Pvt Ltd	India
	mpensating Cables	
1.	Associated Cables Ltd.	India
2.	Associated Flexibles & Wires Pvt. Ltd.	India



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3.     Cords Cable Industries Ltd.     India       4.     Delton Cables Ltd     India       5.     General Instruments Consortium,     India       6.     J K Cables Limited     India       7.     Kei Industries Limited     India       8.     Paramount Cable Corporation     India       9.     ThermopadsPvt. Ltd.     India       10.     Toshniwal Cables     India       Cable Trays & Accessories (FRP)     India       1.     D-Y Engineers     India       2.     Globe Electrical Industries     India       3.     HOPPES     India       4.     Indiana Engg Works Pvt Ltd     India       5.     Metalite Industries     India       6.     Parekh Engineering Company     India       7     Sadhana Engineering Company     India       8     Steelite Engineering Limited     India       Multi Transit Inlet System     India     U.K       2.     McIBrattbergAktiebolag     Sweden       3.     RoxtecAb     Sweden       Junction Box (FRP) & Cable Gland     India       1.     Baliga Lighting Equipments Limited     India       2.     Cag Flameproof Control Gears Pvt.Ltd.     India       4.     Flameproof EquipmentsPvt. Ltd. </th <th></th>	
5.       General Instruments Consortium,       India         6.       J K Cables Limited       India         7.       Kei Industries Limited       India         8.       Paramount Cable Corporation       India         9.       ThermopadsPvt. Ltd.       India         10.       Toshniwal Cables       India         Cable Trays & Accessories (FRP)       India         1.       D-Y Engineers       India         2.       Globe Electrical Industries       India         3.       HOPPES       India         4.       Indiana Engg Works Pvt Ltd       India         5.       Metalite Industries       India         6.       Parekh Engineering Company       India         7       Sadhana Engineering Company       India         8       Steelite Engineering Limited       India         Multi Transit Inlet System       U.K         2.       MctBrattbergAktiebolag       Sweden         3.       RoxtecAb       Sweden         Junction Box (FRP) & Cable Gland       India         1.       Baliga Lighting Equipments Limited       India         2.       Ceag Flameproof Control Gears Pvt.Ltd.       India         3.       Ex	
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7.       Kei Industries Limited       India         8.       Paramount Cable Corporation       India         9.       ThermopadsPvt. Ltd.       India         10.       Toshniwal Cables       India         Cable Trays & Accessories (FRP)       India         1.       D-Y Engineers       India         2.       Globe Electrical Industries       India         3.       HOPPES       India         4.       Indiana Engg Works Pvt Ltd       India         5.       Metalite Industries       India         6.       Parekh Engineering Company       India         7       Sadhana Engineering Corporation       India         8       Steelite Engineering Limited       India         Multi Transit Inlet System       U.K         1.       Hawke International       U.K         2.       MctBrattbergAktiebolag       Sweden         3.       RoxtecAb       Sweden         Junction Box (FRP) & Cable Gland       India         1.       Baliga Lighting Equipments Limited       India         2.       Ceag Flameproof Control Gears Pvt.Ltd.       India         3.       Ex-protecta       India         4.       Flameproof Equipmen	
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9. ThermopadsPvt. Ltd. India 10. Toshniwal Cables India Cable Trays & Accessories (FRP) 1. D-Y Engineers India 2. Globe Electrical Industries India 3. HOPPES India 4. Indiana Engg Works Pvt Ltd India 5. Metalite Industries India 6. Parekh Engineering Company India 7 Sadhana Engineering Corporation India 8 Steelite Engineering Limited India Multi Transit Inlet System 1. Hawke International U.K 2. MctBrattbergAktiebolag Sweden 3. RoxtecAb Sweden Junction Box (FRP) & Cable Gland 1. Baliga Lighting Equipments Limited India 2. Ceag Flameproof Control Gears Pvt.Ltd. India 3. Ex-protecta India 4. Flameproof EquipmentsPvt. Ltd. India 5. Flexpro Electicals Pvt. Ltd. India 6. TAN SWA technologies Inc (Junction Box) India	
Toshniwal Cables       India         Cable Trays & Accessories (FRP)         1.       D-Y Engineers       India         2.       Globe Electrical Industries       India         3.       HOPPES       India         4.       Indiana Engg Works Pvt Ltd       India         5.       Metalite Industries       India         6.       Parekh Engineering Company       India         7       Sadhana Engineering Corporation       India         8       Steelite Engineering Limited       India         Multi Transit Inlet System       U.K         2.       MctBrattbergAktiebolag       Sweden         3.       RoxtecAb       Sweden         Junction Box (FRP) & Cable Gland       U.K       Sweden         1.       Baliga Lighting Equipments Limited       India         2.       Ceag Flameproof Control Gears Pvt.Ltd.       India         3.       Ex-protecta       India         4.       Flameproof EquipmentsPvt. Ltd.       India         5.       Flexpro Electicals Pvt. Ltd.       India         6.       TAN SWA technologies Inc (Junction Box)       India	
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3.       RoxtecAb       Sweden         Junction Box (FRP) & Cable Gland         1.       Baliga Lighting Equipments Limited       India         2.       Ceag Flameproof Control Gears Pvt.Ltd.       India         3.       Ex-protecta       India         4.       Flameproof EquipmentsPvt. Ltd.       India         5.       Flexpro Electicals Pvt. Ltd.       India         6.       TAN SWA technologies Inc (Junction Box)       India	
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5. Flexpro Electicals Pvt. Ltd. India 6. TAN SWA technologies Inc (Junction Box) India	
6. TAN SWA technologies Inc (Junction Box) India	
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T       T	
7. Trinity Touch Pvt. Ltd. (Only cable Glands upto size 25M) India	
8 Stahl-Und Apparatebau Hans LefferGmbh Germany	
CS Seamless Pipes –As per Piping list	
1 Indian tube Co.(Tata Div of tubes & pipes) India	
2 ISMT limited India	
3 Maharasthra seamless limited India	
4 Dalmine SPA Italy	
5 ETS Trouvay & Cauvin France	
6 Horst kurvers Gmbh Geramny	
7 Hyundai Corporation Korea	
8 IBF seamless pipes SPA Italy	
9 Mannesmann Hnadel AG Geramny	
10 Marubeni Itochu Steel Japan	
11 Nippon steel corporation Japan	
12 Nissho IWAI Corporation Japan	
13 Okura & Co. Ltd. Japan	
14 Sojitz Corporation Japan	
15 Sumitomo metal industries Ltd. Japan	
16 Phoceenne France	
17 Vomal International Limited UK	
SS Seamless Pipes-As per piping list	
1 Choksi tube company limited India	



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2	Maxim tubes company pvt. Ltd.	India
3	Nuclear fuel complex	India
4	Ratnamani metals & tubes limited	India
5	Remi edelstahl tubular ltd.	India
6	Dalmine SPA	Italy
7	Phoceenne	France
8	TPS technitube Rohrenwerke	Germany
9	T.T.I tubecex tubos inoxidables S.A. (1/2" NB SS pipe)	Spain
SS Tubes		
1.	Choksi Tube Company Ltd.	India
2.	Matim Tubes Company Pvt. Ltd.	India
3.	Nuclear Fuel Complex	India
4.	Ratnamani Metals & Tubes Limited	India
5.	Sandvik	India
6	Itochu Corporation (Rep.KubotaCorpn.)	Japan
7.	Nishitani& Co. Ltd.	Japan
8	Sumitomo Metal Industries Ltd.	Japan
Pipe Fittin		1 1
1.	Eby industries	India
2.	Excel hydropneumatics pvt. Ltd.	India
3.	Micro precision products pvt. Ltd.	India
4	Precision engineering industries	India
5	Tecnomatic (india) pvt. Ltd.	India
6	Wesmec engineering pvt. Ltd.	India
7	Celleir	France
8	Cesare bonetti SPA	Italy
9	Dewrance & Co. Ltd.	U.K.
10	Hopkinsons Ltd.	U.K.
11	Siemens AG PGI	germany
12	Sumitomo metal industries ltd.	Japan
13	Thysen krupp stahlunion Gmbh	germany
14	Tecnomatic SPA	Italy
Instrumen	t Miniature Valves	1
1.	Audco India Limited(L&T Valves Divn.)	India
2.	Aura Inc	India
3.	Bhel (valves division)	India
4.	Chemtrol Industries Ltd	India
5.	Chemtrols Samil(India) Pvt Ltd	India
6.	Comfit & Valves Pvt. Ltd.	India
7.	Excel Hydro-Pneumatics Pvt Ltd,	India
8.	Excelsior Engg Works	India
9.	Hyd- Air Engineering works Lonavla	India
10.	Ksb Pumps Limited (Valves Divn)	India
11	Panam Engineers	India
12	Tecnomatic (India) Pvt. Ltd.	India
13	Anderson Greenwood & Co.	U.S.A
14	BFE boneey forge valve License	Italy
15	Celleir S.A.	France
16	Crane Company International Sales	U.S.A
17	Dewrance & Co. Ltd.	U.K.
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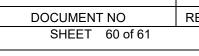


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18	Euromisure Cremona	Italy
19	Hopkinsons Ltd.	U.K.
20	Kosei Sanyog Ltd.	Japan
21	Swagelok company/creximco	U.S.A
22	Sumitomo metal industries ltd.	Japan
23	Technomatic SPA	Italy
24	Velan engineering Co. Limited	U.K.
25	Wesmec engineering pvt. Ltd	India
Purge rota		maid
1	Eureka industrial equipments Pvt. Ltd.	India
2	Instrumentation engineers pvt. Ltd.	India
3	Placka instruments & engineers pvt. ltd	India
-	PER/ADPOT	III C
1	Wesmec engineering pvt. Ltd.	India
Condensa		i i i i i i i i i i i i i i i i i i i
1	HYDROPNEUMATICS	India
2	MICRO-PRECISION PRODUCTS	India
3	TECHNOMATIC (I) P. LTD.	India
4	Wesmec engineering pvt. Ltd.	India
Valve mar		maid
1	Comfit & Valves Pvt. Ltd.	India
2	EXCEL HYDROPNEUMATICS PVT. LTD.	India
3	HYDER	India
4	INSTRUMENTATION LTD.	India
5	MICRO PRECISION	India
6	NORDIVAL (SWAGELOC)	India
7	PARKER	India
8	TECHNOMATIC	India
9	Wesmec engineering pvt. Ltd.	India
	n equipment & services	muid
1	Tempsens instruments (i) pvt. Ltd.	India
2	Fluke	Singapore
3	Omega Engineering	US
Enclosure		100
1	Trinity touch pvt. Ltd. (weatherproof size 80 * 80 mm)	India
Instrumen	at contractor for inst. Construction /erection works	maid
1	Blue star	India
2	Bells control ltd.	India
3	Godrej & Boyce mfg. co. Itd	India
4.	ICB Contractor Pvt. Ltd.	India
5.	Jasubhai Industries	India
6.	Koso india pvt. Ltd. ( kent introl control valve divn.)	India
7.	L&T ( construction contracts Divn.)	India
8.	Miraj instrumentation service (upto 0.5 crores)	India
9.	Narayan engineering (< Rs. 5 lacs (small project))	India
10.	Pace process control pvt. Ltd.	India
11.	Peron engg. Construction ltd.	India
12.	Protect control pvt. Ltd.	India
13	Technimont ICB ltd.	India
10		Inuia



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